

**EVALUATION OF LOCAL CHILLI (*Capsicum
annuum* L.) GENOTYPES FOR MORPHOLOGICAL,
FLOWERING AND YIELD ATTRIBUTING
CHARACTERS AND THEIR CHARACTERIZATION
THROUGH MOLECULAR MARKERS**

by

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OCTOBER, 2020

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A thesis submitted to the

Dr. BALASAHEB SAWANT KONKAN KRISHI VIDYAPEETH,
DAPOLI, (Agricultural University)
DIST. RATNAGIRI (M.S.), INDIA

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

HORTICULTURE (VEGETABLE SCIENCE)

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C E R T I F I C A T E

This is to certify that, the thesis entitled, “EVALUATION OF LOCAL CHILLI (*Capsicum annuum* L.) GENOTYPES FOR MORPHOLOGICAL, FLOWERING AND YIELD ATTRIBUTING CHARACTERS AND THEIR CHARACTERIZATION THROUGH MOLECULAR MARKERS” submitted to Faculty of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratanagiri, (Maharashtra state), in the partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY (AGRICULTURE) in HORTICULTURE (VEGETABLE SCIENCE), embodies the results of a piece of bona-fide research carried out by Mr. YOGESH RAVINDRA PARULEKAR under my guidance and supervision. No part of this thesis has been submitted for any other degree or diploma. All the assistance and help received during the course of investigation and the sources of literature have been duly acknowledged by him.

Place: Dapoli

Date: / /2020

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COLLEGE OF HORTICULTURE, DAPOLI

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ABSTRACT

Chilli is well known vegetable and spice crop grown throughout the country. In Konkan region of Maharashtra, chilli is grown during *rabi* season after harvest of the rice. Similarly, during *kharif* season also it is cultivated on small scale especially in kitchen gardens. The local genotypes are preferred for cultivation during both the seasons due to their better adaptability, specific taste and flavour as well as their suitability for preparation of various value-added products. Large variability in these *gundu* type chillies exists in South Konkan as well as Goa.

During present investigation the efforts were made for collection and evaluation of such chilli types under the title "Evaluation of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular

markers". During the investigation, two sets of experiments were conducted under following subheads, 1) Performance of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters under Konkan conditions and their stability. 2. Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers.

The twenty eight local chilli genotypes along with Arka Lohit and Konkan Kirti were tested for various quantitative and qualitative morphological characters for four successive seasons during two years *i.e.*, 2018-19 and 2019-20. The highest plant height (123.05 cm) was recorded in DPL-CA-29 (Arka Lohit) whereas DPL-CA-30 (Konkan Kirti) was superior in number of branches per plant. The highest plant canopy width (56.26 cm) was depicted in DPL-CA-20. Days for commencement of flowering as well as days to fifty per cent flowering differed significantly and it was lowest in DPL-CA-1 (42.81 DAP and 45.71 DAP respectively). Days to fruiting is a character which says earliness of the variety and were minimum in DPL-CA-1 (58.80) whereas the per cent fruit set was highest (59.02 %) in DPL-CA-14. The days to achieve horticulture and physiological maturity from anthesis were minimum in DPL-CA-9 (15.34 days) and DPL-CA-16 (29.03 days) respectively. The highest number of flowers were produced by DPL-CA-13 (257.70) which was also superior for number of fruits per plant (116.17). The highest fruit bearing period varied significantly and it was most wide in DPL-CA-12 (56.33 days). The fruit breadth and fruit length is also important consideration in crop like chilli and it was maximum in DPL-CA-14 (20.85 mm) and DPL-CA-29 (6.61 cm) respectively. The difference between various quality parameters also differed significantly. Capsaicin content was highest in DPL-CA-27 (0.970 %), ascorbic acid was more in DPL-CA-14 (187.12 mg/100 g) whereas DPL-CA-30 was superior in β -carotene content (346.78 mg/100 g). The pedicel length was highest (3.11 cm) in DPL-CA-29 (Arka Lohit). The maximum fruit weight was produced by DPL-CA-14 (5.48 g). Highest number of seeds per fruit were exhibited by DPL-CA-22 (99.26/fruit) whereas 100 seed weight was

maximum in DPL-CA-23 (618.81 mg). Fresh to dry fruit ratio was highest in DPL-CA-14 (0.214). Yield is ultimate important character and DPL-CA-8 proved superior over other genotypes by producing yield of 384.35 g per plant whereas yield per hectare was also highest in DPL-CA-8 (18.70 t/hectare) and was statistically superior over other characters.

Among various qualitative characters, out of thirty genotypes the nodal anthocyanin was green in seven, light purple in fourteen and dark purple in nine genotypes. Stem shape of all the genotypes under study was cylindrical whereas stem pubescence was predominantly sparse and only nine genotypes exhibited intermediate pubescence. Plant growth habit was intermediate in twenty genotypes, dense in eight genotypes and sparse in two genotypes. Intermediate type of branching habit was more dominant (20 genotypes). Leaf colour was light green in eight, dark green in five and was green in remaining types. Thirteen genotypes exhibited ovate leaf shape and remaining in it was lanceolate with sparse leaf pubescence in all genotypes. Eighteen genotypes exhibited intermediate flower position, in nine it was pendant and only three had erect flower position. Only one genotype had three flowers per axil (DPL-CA-23), in seven genotypes two flowers per axil and remaining produced one flower per axil. The corolla colour was light yellow in only two genotypes (DPL-CA-6 and DPL-CA-9) whereas all others produced white colour flowers. Shape of corolla was rotate (10 genotypes) and campanulate (20 genotypes). The anther colour was observed either pale blue (22) or blue (8). Filament colour was yellow in only four genotypes and all other produced white colour filaments. The calyx margin was either entire (6), intermediate (22) or dentate (2). The calyx angular constriction was absent in eleven genotypes and present in nineteen genotypes. Neck at base of the fruit was present in 14 genotypes and absent in 16 genotypes. Triangular fruits were produced by fourteen genotypes whereas it was elongated in remaining genotypes. Cordate fruit shape at pedicel attachment was noted in DPL-CA-1 whereas it was obtuse in thirteen and truncate in remaining sixteen genotypes. The fruit

shape at blossom end was either pointed (17) or blunt (13). On the basis of the ranking, DPL-CA-8 was the most superior genotype whereas DPL-CA-4, DPL-CA-14, DPL-CA-25. DPL-CA-9 and DPL-CA-23 were also found elite based on the ranking. The analysis of variance revealed highly significant difference due to genotype and environment for all characters under study except fruit length, fruit breadth and capsaicin content. Based on stability analysis, genotype DPL-CA-8 was superior in mean fruit yield and found better for unfavourable environments. Genotypes DPL-CA-1 and DPL-CA-15 recorded average response with high stability. Whereas DPL-CA-21 was found better for favourable environment.

In molecular studies, out of twenty one ISSR primers ten ISSR primers depicted scorable amplifications with 591 DNA fragments and hundred per cent polymorphism. The polymorphic information content (PIC value) ranged in between 0.52 to 0.86. the similarity matrices was in the range of 0 to 0.556 and the dendrogram constructed by using UPGMA separated the genotypes under study in two main clusters which were further divided in two sub-clusters each. Thus in present studies, the genotype DPL-CA-4, DPL-CA-8, DPL-CA-9, DPL-CA-14, DPL-CA-23 and DPL-CA-25 were found superior and needs further testing for developing superior variety for commercial cultivation under Konkan conditions.

CHAPTER I

INTRODUCTION

Chilli, a small bushy perennial herb but cultivated as annual is one of the very popular spice known for its medicinal and health benefiting properties. This species was also known as chili, chile, chilli, aji, and paprika (Yoon *et al.*, 1989). Chilli belong to genus *Capsicum* and family Solanaceae. There are about 27 species, but five among them are well domesticated species and are in commercial cultivation. These five species are *C. annum*, *C. frutescens*, *C. pubescens*, *C. chinense* and *C. baccatum* (Zewdie *et al.*, 2004; Moscone *et al.*, 2007). India is considered to be the secondary centre of diversity for chilli (Dhaliwal, 2014). The world trade in chilli account for 18 per cent of the total spice trade in the world occupying second position after black pepper (Geetha and Selvarani, 2017). The chilli is a fruit pod of the plant belonging to the nightshade family (Solanaceae), of the genus, *Capsicum* having diploid nature with mostly $2n=2x=24$ in cultivated species and $2n=2x=26$ in wild species. The plant is characterized with a woody stem, growing up to a meter in height. It is variable herb with shoot erect or branched, strong tap root system, stem erect or branched, leaves simple and variable in size, flowers and fruits either born singly or in cluster and fruit is indehiscent many seeded berry. It is native to the Central America where it is employed as one the main spice ingredients in Mexican cuisine from centuries. Later, it was introduced to the rest of the world by Spanish and Portuguese explorers during the 16th and 17th centuries. Today chilli grown widely in many parts of the world as an important commercial crop. Chillies are used in cooking, pickles, sauces, chutney and several other region specific delicacies. Red chillies are used as dried as well as in powdered form both in vegetarian and non-vegetarian cooking. Fresh green and red chillies are great source of vitamin C. Chilli contains good amount of other antioxidants such as vitamin A, B-complex group of vitamins such as niacin, pyridoxine (vitamin B₆), riboflavin and thiamin (vitamin B₁) and flavonoids like

β -carotene, α -carotene, lutein, zeaxanthin and cryptoxanthin. Chilli also carries different minerals like potassium, manganese, iron and magnesium (Chakrabarty *et al.*, 2017). Potassium is an important component of cell and body fluids that helps controlling heart rate and blood pressure. Capsaicin is the main bioactive compound which is responsible for imparting pungency and other health benefits. Capsaicin has numerous uses in pharmaceuticals to relief pain, anti-arthritis, anti-bacterial, anti-inflammatory, anti-rhinitis and analgesic properties. It has also prominent role in boosting immunity for the management of cardiovascular diseases, type-2 diabetes and obesity and also in controlling prostate cancer (Chakrabarty *et al.*, 2017).

After its introduction to India, it was adapted to the various agro climatic conditions in the country. Today, India is the largest producer and exporter of the chillies in the world. Myanmar, Bangladesh, Pakistan, Vietnam, Thailand, Romania, China, Nigeria and Mexico are the other major chilli growing countries in the world. India contributes 36 per cent to total chilli production in the world and remained in first position in terms of international trade by exporting nearly 30 per cent from its total production (<http://faostat.fao.org/site>). In India, the crop is grown in almost all the states in India for both green as well as dry red purpose. The area under chilli for green purpose during 2017-18 was 308.63 thousand hectares with production of 3592.17 thousand MT (Anonymous, 2018). Karnataka, Bihar, Madhya Pradesh, Maharashtra and Chhattisgarh are the predominant producers of green chillies. The area under dried chillies in the country was 751.61 thousand hectare with production of 2149.23 thousands MT (Anonymous, 2018). Among the various dried chilli growing states, Andhra Pradesh, Karnataka, Madhya Pradesh, Telangana, Odisha and West Bengal are leading. Maharashtra is leading state in area and production of chilli. It is cultivated round the year *i.e.* in *kharif*, *rabi* as well as during summer especially for green chilli purpose. The area under the crop during 2017-18 was 30.59 thousand ha with the production of 342.48 MT (Anonymous, 2018).

Konkan region of Maharashtra is not known for commercial chilli production. The region is characterized by warm and humid climate with average annual rainfall of 3500 mm. Due to heavy rains and high humidity near saturation the improved and hybrid varieties of chilli cannot be cultivated during *kharif* season. Similarly, during *rabi* season also the prevailing high humidity above 75 per cent favours incidence of various diseases like powdery mildew, anthracnose as well as fruit rot and hence commercial varieties have limitations for their cultivation on large scale. Present chilli cultivation is confined, mostly in rice based cropping system on small scale. Considering the limitations of improved and hybrid varieties, local chilli genotypes are preferred for cultivation in the region due to their specific taste, hardy nature which is well adapted to the soil and climatic conditions. There are several chilli growing pockets in the entire Konkan region where chilli is grown during *kharif* in uplands and during *rabi* in rice fields after harvest of the *kharif* rice. These local genotypes are grown for their characteristic shape (*Gundu* type – fat chillies round or triangular in shape with high seed content) and specific taste and flavour. The dry chillies of these types have considerable demand in local markets as well as from the adjoining state like Goa due to its specific flavour; enhancing the taste of fish curry which is recognised as food delicacy of south Konkan as well as Goa. The mature green chillies of these genotypes are widely used for preparation of chilli pickle, mixed pickle as well as preparation of salted and spiced chillies which is a popular local delicacy known as *sandagi mirchi*. Due to their popularity fruits of these genotypes are fetching approximately 40 to 50 per cent more market price as compared to regular improved or hybrid chillies.

The study of existing variability in any crop in particular locality provides extensive opportunity for the plant breeder to develop a new and improved cultivars with desirable characteristics, with respect to farmer-preferred traits (colour, size, yield, potential etc.) as well as breeders preferred traits like earliness, its suitability during particular

season, plant architecture, superiority in yield and yield attributing characters etc. (Govindaraj *et al.*, 2015). Besides this it will also help to conserve this variability for the future use in plant breeding otherwise with the time it will become extinct. In spite of having high variability of such *gundu* type chillies in the region, no improved variety have been developed so far which is hardy, uniform, high yielding with better fruit quality. Development of such variety will help to increase the area under chilli during *kharif* as well as *rabi* season. So far very limited systematic efforts were made to collect, study and exploit these chilli genotypes for their potential commercial cultivation particularly in the Konkan region.

Characterization of genetic resources refers to the process by which accessions are identified or differentiated (De Vicente *et al.*, 2005). Since cultivar/variety identification and characterization are the initial steps of any crop introduction and improvement program, rapid identification and characterization of cultivars/varieties would therefore provide valuable information for their introduction and genetic improvement. Similarly, the breeding efforts are facilitated by such information on the available genotypes for their further direct use as a variety or for using as parent in the focused breeding programme depending upon the objectives (Nicholas *et al.*, 2012).

The various morphological markers are conventionally used for identification of the variety and analysis of genetic diversity for which extensive data needs to be collected over a long period. However, sometimes the level of polymorphism for morphological characters of superior genotype is very limited for discrimination of the variety (Geleta *et al.*, 2004). Similarly, the traditional methods of DUS (Distinctiveness, Uniformity and Stability) are time consuming and are more influenced by the climatic factors. In past few years the various molecular markers like RFLP (Restricted Fragment Length Polymorphism), SSR (Simple Sequence Repeat), AFLP (Amplified Fragment Length Polymorphism) and RAPD (Random Amplified Polymorphic DNA) markers have been

developed for chilli (Moon *et al.*, 2003, Jang *et al.*, 2004 and Lee *et al.*, 2004). These markers have proven to be very useful in characterization of the genotypes as well as assessment of the genetic diversity.

The performance of variety of any crop plant depends on the genotypic constituent as well as the environmental conditions in which crop is being grown. It has been experienced that the effectiveness of the variety also varies from season to season. One of the purposes of the present study is to develop a variety which is stable and can perform satisfactorily in *kharif* as well as *rabi* season under Konkan agro climatic conditions. Hence, assessment of the environment and the genotype and identification of the phenotypically stable genotype need to be focused. Identification of the variety which is high yielding and stable in performance during *kharif* as well as *rabi* season is important before its release for commercial cultivation.

In consideration with the above facts, it is high time to collect and conduct systematic study of the available variability of chilli in entire Konkan region; so that the superior genotypes can be identified and maintained for their future use either as a elite genotype for the cultivation or use as a parent in the breeding programme for developing improved varieties or hybrids with superior characters especially suitable for commercial cultivation in Konkan region. Hence a systematic study was planned and undertaken under the title “Evaluation of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular markers” with following specific objectives.

1. To evaluate some local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and stability under Konkan conditions.
2. To establish genotype profiles using molecular markers in local chilli genotypes (*Capsicum annuum* L.).
3. To analyse genetic diversity among the local chilli (*Capsicum annuum* L.) genotypes by using molecular markers.

CHAPTER II

REVIEW OF LITERATURE

Chilli belongs to genus *Capsicum* and family Solanaceae. Among the various species of genus *Capsicum*, *Capsicum annuum* is most widely cultivated species in entire world (Aguilar-Meléndez *et al.*, 2009). It contains both pungent type commonly known as hot pepper and non-pungent type commonly known as bell pepper. In Asia and Central America, the pungent types are predominantly grown as compared to non-pungent types whereas non-pungent forms are very common in European countries. In India, Chilli was introduced by Portuguese during late 1700 AD. India is considered as secondary centre of diversity for chilli (Kumar and Rai, 2005). During present investigation entitled “Evaluation of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular markers”; the extensive review of research regarding aspects under investigation was done. The review conducted has been presented in this chapter under following sub heads.

- 2.1 Evaluation of chilli genotypes for various growth and yield attributing characters
- 2.2 Stability analysis of chilli genotypes for various growth and yield attributing characters
- 2.3 Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers

2.1 Evaluation of chilli genotypes for various growth and yield attributing characters

Krishnamurthy *et al.* (1998) estimated capsaicin content in green chilli and it was found in range of 0.042 per cent in Simla to 0.165 per cent in Kolhapur (Lavangi).

Kumar and Tata (2009) analyzed the ascorbic acid content in eighteen genotypes of chilli and the highest value was estimated in IC-119262 (CA²) which was 208 mg per 100 g on fresh weight basis.

Delelegn (2011) evaluated nine chilli varieties under Ethiopian conditions for assessing the growth and yield parameters. It was reported that the maximum plant height was recorded in variety Weldele (36.50 cm) whereas minimum plant height was in variety Oda Haro (22.16 cm). Earliest 50% flowering was observed in variety Gojeb Local (46.67 days), Melka Zala registered maximum days to attain 50% flowering. The highest number of flowers per plant was recorded in variety Melka Shote (159.67). The lowest number of days to first harvest was recorded in variety Gojeb local (66 days). The highest days for first harvest was recorded in variety Dube Short (149). The highest number of primary branches was attained from variety Weldele (11) the least number of primary branches was recorded from Oda Haro (4.27). Variety Weldele had the maximum number of fruits per plant (72.3) whereas the minimum number of fruits per plant was recorded from Bako Local (24.55). The variety Dube Short recorded maximum number of seed per plant (160.67) whereas the least number of seeds were recorded in Gojeb Local (46.38).

Barche and Nair (2013) conducted experiment with twenty two genotypes and reported that days required for harvesting from anthesis varied significantly. Early harvest was observed in 2011/ Chivar – 8 (76.66 days) whereas late in 2011/Chivar-2 (97.55 days).

Thirty seven local and introduced genotypes of hot pepper (*Capsicum annuum* L.) for various qualitative and quantitative characters were studied under greenhouse condition in Uganda. The significant difference among these genotypes was observed. Analysis of variance showed highly significant variability among the genotypes. In general, the local genotypes were taller in height, late bearing having smaller fruit size and shy bearer compared to improved exotic bearer. Genotype number. 27 produced wider and heavier fruits. (Nsabiyera *et al.*, 2013).

Peeraullee and Ranghoo-Sanmukhiya (2013) studied the genetic diversity of five chilli (*Capsicum annuum* L.) varieties cultivated in Mauritius by using morphological markers. Morphological assessment

was done for fruit, leaf, height and canopy size of the plant. Morphological characters, namely from the fruit can be used as reliable morphological markers to distinguish between the different varieties. A high degree of similarity was observed among the chilli varieties which include plant characteristics and leaf characteristics. In contrast, there appeared to be greater variation in the fruit traits. Each fruit character had a large number of character states with many intermediate gradations between extremes.

Amit *et al.* (2014) evaluated twenty three genotypes of chilli (*Capsicum annuum* L.) for various growth and yield parameters. Pusa Sadabahar produced highest number of branches (10.62) whereas minimum branches were found in PCB-08-CH (4.70). The early initiation of flowering was observed in Kashmir Long (60.20 days) and late in DCL-352 (86.30 days). The earliest harvesting of green chilli was recorded in variety Surajmukhi (121.67 days) whereas it was late in PCP-CH-4-08 (140.26 days). The highest number of fruits per plant was harvested in Surajmukhi (198.25) followed by Pusa Jwala (194.25) and lowest in genotype CCH-05 (66.64). The maximum fruit weight was observed in LCA-357 (5.19 g) whereas K-1 produced fruit with minimum weight (1.71 g). The highest per plant yield and per hectare yield (854.65 g and 25 t respectively) was recorded in CH-1 followed by Pusa Jwala (840.49 g/pl) and LCA- 357 (24 t/ha).

Bhaskar and Pradhan (2014) reported that the ascorbic acid content in chilli was in the range of 38.59 to 107.52 mg per 100 g in Pimento variety.

Hasan *et al.* (2014) studied genetic diversity of 54 chilli genotypes for 12 quantitative characters like plant height, number of secondary branch per plant, canopy breadth , days to first flowering, days to 50% flowering, fruits per plant, fruit length, fruit diameter, seeds per fruit, 1000 seed weight and yield per plant. On the basis of cluster analysis, the entire population under study was segregated in seven clusters. The mean plant height in different clusters was in the range of 77.8 cm in

cluster I to 100 in cluster III. The canopy spread was in the range of 51.2 cm (Cluster I) to 100 cm (cluster III). Number of fruits per plant ranged in between 105.7 (Cluster I) to 538 (Cluster V). Yield per plant also varied significantly and recorded the mean range of 334.1 g per plant in cluster I to 2210 g per plant in Cluster III.

Vijaya *et al.* (2014) experimented evaluation of 24 chilli genotypes for different growth and yield parameters in Chikballapur district of Karnataka. The growth parameters *viz.* plant height, number of primary branches, plant spread, days to 50% flowering and days to first fruit harvest were recorded at the time of harvest. The differences obtained among different genotypes in relation to the above said characters were statistically significant. The genotype 'Chikballapur Local' recorded maximum plant height (118.6 cm) as well as higher plant spread (0.481 m²), maximum branches per plant were produced in Sankeshwar (7.47) and minimum branches were observed in LCA-424 (7.27). Fruit length also varied from 4.91 cm in Chikballapur Local to 14.61 cm in Sankeshwar with the mean fruit length of 8.78 cm. The higher fruit diameter (1.6 cm), pericarp weight (0.80 g) and more number of seeds fruit⁻¹ (98.42) were noticed in genotype 'Byadgi Dabbi'. The minimum number of fruits per plant (49.63) was recorded in CKBL and was maximum in Sankeshwar (186.30). The highest dry fruit weight per plant (97.33 g) was recorded by variety Sankeshwar which was at par with LCA- 206 (91.00 g) and DCA – 96 (85.93 g).

Indu Arora *et al.* (2015) conducted the experiment to evaluate 24 chilli genotypes and concluded that genotypes *viz.* G₂₃ (PC-2062), G₂₄ (PC-2064) and G₂₂ (PC-2057) had significantly greater number of fruits per plant. G₂₀ (PC-7), G₂₁ (PC-56) and G₂ (Co-4) performed better for weight of fruits per plant. Genotypes G₂₃ and G₂₁ produced 110.26 and 71.60 per cent higher yield, respectively over check variety Pant C-1. Longest fruits (13.59 cm) were obtained in G₂₀ (PC-7). More number and weight of seeds per fruit were noted in G₂₂ (PC-2057).

Dhaliwal *et al.* (2015) evaluated eleven elite genotypes along with check (Punjab Surkha) in Punjab under two distinct environments. The genotype SD 463 registered maximum red ripe fruit yield (0.586 kg plant⁻¹) and fruit weight (4.1 g); Mehma Sarja had the highest plant height (93.5 cm) and fruit width (13.4 mm); Selection 7 exhibited the lowest plant height (37.6 cm) and fruit width (7.0 mm); PC-6-1 had the longest fruits (8.6 cm); DCL 524 possessed maximum number of seeds fruit⁻¹ (43.5); Selection 36-1 produced maximum seed weight (0.211 g fruit⁻¹). The genotype PC-6-1 had the longest fruits at both the locations. The genotype PC-6-1 produced lowest seed yield (0.073 g fruit⁻¹) that was at par with Selection 20 (0.096 g), Selection 1-1 (0.100 g fruit⁻¹) and VR-16 (0.107 g fruit⁻¹). Number of seeds fruit⁻¹ and dried seed weight fruit⁻¹ revealed that these traits were highly influenced by environment.

Zhani *et al.* (2015) conducted agronomical evaluation of Tunisian chilli pepper under Tunisian conditions. The Korba accession had the superior vegetative characters (stem height, stem width, leaf area, plant height, number of bifurcations) and produced the highest number of flowers (356), fruits (211) as well as yield (22 t/ha). Fruits of Tebourba accession was superior for parameters of the fruit *viz.* longest (118 mm), widest (15 mm), and heaviest (12 g) fruit with thickest (2 mm) pericarp, longest (96 mm) placenta and highest number of seeds (127 seeds per fruit). The positive correlation between yield and plant height, yield and number of branches as well as yield and number of fruits was also reported.

Hadora *et al.* (2017) conducted experiment for evaluation of 25 F₁ hybrids along with three check varieties *viz.* KBCH-1, Arka Haritha and Arka Meghana for various characters *viz.* green fruit yield per plant, red fruit yield per plant, number of fruits per plant, average fruit length, average fruit width and fruit weight per plant. All the characters under study were highly significant.

Kahsay (2017) conducted an experiment to investigate the performance of different varieties of hot pepper for growth, dry pod yield

and quality. The significant differences were recorded with respect to plant height, days of 50 per cent flowering, fruit length, fruit diameter, fruit weight, number of fruit per plant, marketable yield, unmarketable yield and total yield. The earliest variety to attain 50% flowering was Marekofana; the earliest harvesting was observed in MelkaShote and Melkazala, while the highest fruit number per plant was recorded in MelkaShote. The highest fruit diameter was recorded in Melkaeshet and Marekofana varieties whereas the lowest fruit diameter was recorded in MelkaShote. The highest total yield was recorded by MelkaShote but was at par with all other varieties under study.

Padma and Sivasubramaniam (2017) studied the morphological characterization of chilli varieties released by Tamilnadu Agriculture University, Coimbatore. Among the 33 characters studied, 8 qualitative morphological characters (intensity of anthocyanin coloration of nodes, stem pubescence, plant growth habit, leaf colour, leaf pubescence, flower position, anther colour and calyx annular constriction) were found important for identification of the variety. Based on intensity of anthocyanin colouration on nodes, genotypes were categorized medium and strong colouration. The genotype PLR1 had strong pigmentation whereas rest of the other genotypes was grouped as medium. The stem pubescence was sparse in four genotypes *viz.* K2, CCH1, CA97 and Sln1; intermediate in K1, PKM1, PMK1, KKM1 whereas CO1, CO2 and PLR1 had dense pubescence. None of the genotypes was having prostrate growth habit whereas CO1, KKM1, CCH1, CA97 and Sln1 were included in intermediate category. The genotype K1, K2, PLR1, PKM1, PMK1 and CO2 came under erect group. The leaf colour of genotype CO1, CCH1, CA97 and Sln1 was dark green while other genotypes *viz.* CO2, K1, K2, KKM1, PLR1, PKM1 and PMK1 were grouped as light green. Leaf pubescence was sparse in K2, CCH1, CA97 and Sln1; intermediate in K1, PLR1, PKM1, PMK1 and KKM1 and dense in CO1 and CO2. The eleven genotypes were having pendant flower position. K1, K2, KKM1, PLR1, PKM1 and PMK1 were grouped as intermediate flower type and

CO1, CO2, CCH1, CA97 and Sln1 were grouped as erect type. In the case of anther colour, eleven chilli genotypes were grouped as white anther colour, CO1, K1, K2 and PMK1 were fall under pale blue colour whereas CO2, PLR1, PKM1 and KKM1 were categorized under blue. Other genotypes such as CCH1, CA97 and Sln 1 came under purple colour. The calyx annular constriction was absent in K1, PKM1 and KKM1. However, it was present in CO2, K2, PLR1, PMK1, CCH1, CA97 and Sln1. In case of leaf pubescence, K2, CCH1, CA97 and Sln1 had sparse pubescence, K1, PLR1, PKM1, PMK1 and KKM1 came under intermediate pubescence whereas CO1 and CO2 possessed dense pubescence. In case of leaf pubescence, K2, CCH1, CA97 and Sln1 had sparse pubescence, K1, PLR1, PKM1, PMK1 and KKM1 came under intermediate pubescence whereas CO1 and CO2 possessed dense pubescence. In case of leaf pubescence, K2, CCH1, CA97 and Sln1 had sparse pubescence, K1, PLR1, PKM1, PMK1 and KKM1 came under intermediate pubescence whereas CO1 and CO2 possessed dense pubescence.

Ritu Rani *et al.* (2017) conducted an experiment for evaluation of 15 genotypes under Allahabad conditions and reported that maximum fruit diameter was observed in 12CHIV AR-6 (1.44 cm) and minimum in ACS-08-09 (0.49 cm). The fruit length was highest in 12CHIV AR-8 (9.07 cm) whereas it was shortest in HC- 68 (4.72 cm). The maximum number of branches were observed in 12CHIV AR-1 (28.27) whereas those were minimum in HC- 50 (13.87). The earliest flowering (48.47 DAT) was found in 12CHIV AR-4 whereas it was late in 12CHIV AR-1 (69.93 DAT). The maximum days of first harvest was noticed in 12CHIV AR-1 (94.01) followed by KA-2(C) (91.18) and IIHR- 2006 (90.62) and the minimum number days of first harvest was seen in genotype 12CHIV AR-4 (74.15) followed by Kashi Anmol (77.43) and ACS- 08-09 (77.48) with an average mean of 81.95.

Yatagiri *et al.* (2017) evaluated nineteen genotypes of chilli during *rabi* season under coastal climatic conditions of Maharashtra for growth,

yield as well as pest and disease incidence. The fruit length varied from 4.36 cm to 12.40 cm with a mean value of 8.38 cm. All the genotypes were observed in 'long length' except DPL-C1 and Pashighat-1 which had medium length. The maximum fruit length was observed in Karvi Local followed by LCA-206 and minimum in Pashighat-7. The fruit diameter ranged between 0.66 cm to 1.00 cm with an average magnitude of 0.83 cm. Maximum fruit diameter (1.00 cm) was noted in the genotype Pashighat-1 followed by DPL-C1 (0.95 cm) and minimum in Pashighat-2 (0.66 cm). Karvir Local exhibited earliest harvest (74.50 days) followed by Pashighat-1 (78.50 days) whereas late picking was observed in Pashighat-7 (116.50 days). The average fruit weight ranged from 1.65 g to 6.01 g with mean value 3.83 g. The highest fruit weight was found in Karvir Local (6.01 g) followed by Arka Supriya (4.56 g) whereas it was lowest in Pashighat-7 (1.65 g) followed by Konkan Kirti (2.45 g). The highest number of fruits per plant (173) was seen in the Konkan Kirti followed by LCA-336 (156.70) and Jayanti (155.50) while it was lowest in Phule Sai (32.30). The fruit yield per plant ranged between 118.30 g to 555.63 g. The maximum fruit yield per plant (g) and per hectare (t) was obtained in Pant-C3 (555.63 g and 19.72 t, respectively), followed by LCA-334 (531.43 g and 19.61 t respectively) whereas minimum was found in Pashighat-2 (118.30 g and 4.50 t, respectively).

Bharadwaza *et al.* (2018) evaluated fifteen genotypes of chilli for yield and yield attributing characters under Allahabad conditions. Results indicated that genotype 2012/CHIVAR-3 (36.67 days) was found to be early as far as days to initiation of flowering was concerned, whereas genotype 2010/CHIVAR-4 (55.3 days) and 2011/CHIVAR-9 (54.20 days) flowered late. For number of fruits per plant, significant variation was observed. The highest (104.97) and lowest (58.43) value was seen for the genotypes 2012/CHIVAR-8 and 2010/CHIVAR-5 respectively. The tallest plant was found in 2011/CHIVAR-4 (61.17 cm) and lowest plant height was registered in KA-2 (41.65 cm). The maximum number of primary and secondary branches (22.73) was noticed in 2012/CHIVAR-2. The genotype, 2012/CHIVAR-2, exhibited

highest fruit weight (6.54 g), fruit width (1.44 cm) and fruit length (10.21 cm) whereas lowest fruit weight (2.41 g), fruit width (0.49 cm) and fruit length (3.72 cm) was observed in the genotypes 2012/CHIVAR-5, 2012/CHIVAR-8 and 2011/CHIVAR-5, respectively. Significantly maximum green fruit yield was noted for 2012/CHIVAR-2 (148.62 q ha⁻¹) and minimum in 2012/CHIVAR-5 (51.62 q ha⁻¹).

Kerketta *et al.* (2018) experimented evaluation of seventeen genotypes of chilli (*Capsicum annum* L.) for different growth and yield attributing characters under Allahabad conditions for different characters *viz.* plant height (cm), number of branches per plant, plant spread, days to flower anthesis, days to 50 per cent flowering, days to first harvest, fruit length (cm), fruit diameter (mm), fruit weight (g), number of fruits plant⁻¹, number of seeds fruit⁻¹, green fruit yield plant⁻¹, 100 seed weight, fruit yield hectare⁻¹ (q) and ascorbic acid (mg/100 g). Significant differences were recorded among the genotypes studied for all the characters indicating presence of adequate variability. The plant height was in the range of 34.85 cm to 118.28 cm with a general mean of 54.15 cm. Days to flowering varied from 25.56 to 45.28 whereas days to first harvest ranged between 52.42 to 75.26. Range of fruit length (5.17 cm to 12.80 cm) and fruit width (5.6 mm to 29.80 mm) also recorded significant difference among the various genotypes. 100 seed weight ranged between 0.25 g to 0.73 g with mean of 0.47 g. Ascorbic acid content in green fruit also varied significantly and deviated from 127.02 mg per 100 g to 168.95 mg per 100 g. Large variation was also observed in fruit yield per plant (70.36 g to 1432.83 g per plant) and fruit yield per hectare (2.64 t to 36.82 t per hectare).

Nahak *et al.* (2018) studied eleven chilli genotypes for various characters for growth and yield attributing parameters under Bhubaneswar conditions. Among all the genotypes, 2014/CHIVAR-9 produced the maximum fruit weight (15.14 g). A wide range of variation was also seen for number of fruits per plant (22.64 to 94.85). The genotype 2014/CHIVAR-10 recorded the maximum number of fruits per

plant (94.85) followed by 2014/CHIVAR-8 and LCA-334. The minimum number of fruits per plant was found in 2014/CHIVAR-9. The genotype 2014/CHIVAR-7 exhibited the greatest fruit yield per plant (161.74 g) which was better over LCA-334 (48.54 g) and KA-2 (83.19 g).

Pawar *et al.* (2018) evaluated thirteen local genotypes of chilli collected from various pockets in Konkan region along with Konkan Kirti as check during *rabi* season for various growth and yield attributing characters. The genotypes DPL CA-5.1 and DPL CA-8.1 had cluster fruiting habit while rest of the genotypes showed solitary fruiting habit. The genotypes DPL CA-1.1, DPL CA-2.1, DPL CA-5.1, DPL CA-10.1, DPL CA-11.1, DPL CA-13.1, DPL CA-14.1, DPL CA-15.1, DPL CA-7.1 and Konkan Kirti exhibited elongated shape of fruits while DPL CA-3.1, DPL CA-4.1 and DPL CA-6.1 had triangular fruits. The fruits of DPL CA-1.1, DPL CA-2.1, DPL CA-4.1, DPL CA-6.1, DPL CA-10.1, DPL CA-7.1 and Konkan Kirti produced fruits with light green colour whereas the remaining genotypes had dark green fruits. The maximum fruit length (7.93 cm) was seen in genotype DPL CA-11.1; maximum fruit diameter (1.47 cm) in DPL CA-15.1 and highest fruit weight (3.70 g) in genotype DPL CA-1.1. The β - carotene ($\mu\text{g} / 100 \text{ g}$) content in fruits of various genotypes was significantly maximum in DPL CA-13.1 (594.00 $\mu\text{g} / 100 \text{ g}$). Variation observed in ascorbic acid was also significant. The ascorbic acid content in fruit was highest in Konkan Kirti (160.8 mg/100 g). DPL CA-13.1 produced fruits with highest capsaicin content (0.254 mg/100 g). The genotype DPL CA-6.1 was superior (173.99) for number of fruits per plant. However, overall yield was highest (23.43 t/ha) in genotype DPL CA-15.1.

Chernet and Zibelo (2019) experimented on evaluation of six genotypes of hot pepper in Ethiopia successively for two years and observed that all the traits under study differed significantly except days to 50 per cent flowering. Humera Jeju scored highest marketable green pod yield (19.47 t ha⁻¹), which was at par with Marecofana (19.35 t ha⁻¹). Traits such as fruit yield per plant, fruit diameter and single fruit weight

were important yield deciding factors which had highly significant positive association with marketable green yield. The selection based on these important traits succeeded in selections for higher fruit yield per hectare.

Mena *et al.* (2019) evaluated sixteen genotypes of king chilli under Arunachal Pradesh conditions. It was reported that the plant height was in the range of 61.33 to 117.50 cm. Days to fifty per cent flowering were in the range of 62 to 79.67. Number of fruits per plant was in range of 31.67 to 47.00 whereas the yield also varied significantly and was in the range of 0.10 to 0.26 kg per plant. The ascorbic acid content was in the range of 92.07 to 301.11 mg per 100 g with a mean of 165.41 mg per 100 g whereas the capsaicin content varied between 0.75 to 4.65 per cent with a mean of 1.86 %.

Naganirmala *et al.* (2019) characterized 20 chilli cultivars based on morphological characters in association with yield. Twenty cultivars had purple node, twelve had light purple and remaining eight cultivars had dark purple nodal anthocyanin. The growth habit of the plants was observed to be either intermediate or prostrate. 18 cultivars had intermediate type of plant growth and 2 cultivars had erect type of plant growth. The variety G- 4 recorded significantly highest (114.60 cm) plant height while significantly low plant height (63.87 cm) was seen in variety G-5. Majority of cultivars under study had green fruits and three of them (LCA-334, LCA-625, 999) had parrot green fruits while only five (LCA-305, LCA-424, LCA-436, LCA-960 and Mycoteja) had dark green fruits. Maximum cultivars produced solitary fruits except Mycoteja, Rabbi, and Vajra, which registered cluster bearing habit. The fruit length recorded was in the range of 4.42 cm to 12.90 cm with a mean of 9.50 cm. The maximum fruit length was found in LCA-353 (12.90 cm) followed by Super-10 (8.61 cm) and LCA-235 (8.60 cm) while the minimum was recorded in Rabbi (4.42 cm). The number of seeds per fruit varied between 45.90 to 96.50 with a mean of 72.88. The yield per plant recorded by various genotypes under study varied from 85.99 g to

305.50 g with a mean of 159.51 g. The maximum mean performance was observed for genotype LCA-625 (305.50 g) followed by LCA-620 (251.90 g) and LCA-424 (164.50 g) while the minimum magnitude was observed in Super 10 (85.99 g).

Pragya Singh *et al.* (2019) evaluated growth and phenological behaviour of 18 chilli genotypes under Jabalpur conditions of Madhya Pradesh and reported that height of Pusa Jwala was 20.25, 35.37, 41.42, 47.42 and 46.86 cm at 30, 60, 90, 120 and 150 DAT respectively. The minimum number of days to first flowering was observed in genotype 2014/CHIVAR-8 (32.00 days) whereas the maximum were in Guljar (42.00 days). Fruit colour was observed to be green, light green and dark green. Genotypes 2014/CHIVAR-2, 2014/CHIVAR-7, 2013/CHIVAR-1, 2013/CHIVAR-3 and 2014/CHIVAR-10 had green fruits whereas, genotypes 2014/CHIVAR-1, 2014/CHIVAR-3, 2014/CHIVAR-4, 2014/CHIVAR-5, 2014/CHIVAR-6, 2014/CHIVAR-8, 2014/CHIVAR-9, LCA-334(C), Guljar and Pusa Jwala produced light green fruits. Genotypes 2013/CHIVAR-4, 2013/CHIVAR-2, and KA-2 (C) exhibited dark green fruits.

Ngullie and Biswas (2019) studied vegetative and yield performance of four chilli genotypes in Nagaland and observed that Guntur Hope was the best performer followed by Pusa Jwala for most of the parameters like plant height, branches, fruit number, fruit length, etc.

Santhosha *et al.* (2019) studied characterization of 31 genotypes of bird eye chilli for various horticultural characters under Karnataka conditions. Much variation was observed in most of the characters studied like plant height (51 - 106.5 cm), plant spread (43.5 - 91 cm), days to 50% flowering (71 - 112), fruit length (0.85 - 2.85 cm), fruit diameter (0.79 - 2.65 cm), fruit pedicel length (2 - 3.2 cm) and fruit yield per plant (165 - 412 g). Twenty seven genotypes recorded upright habit whereas four genotypes recorded semi upright growth habit. Leaf color ranged from light green in 5 genotypes, medium green in 23 genotypes and dark green 3 genotypes. All genotypes under study recorded

lanceolate leaf shape, weak undulation in leaf margin, greenish white petal, pale blue anther, semi drooping flowers, green colour erect fruits with moderately triangular shape, without curvature and neck at basal end. Sparse leaf pubescence was observed on the youngest mature leaves in all genotypes studied. At ripe stage fruit colour was red in all the lines evaluated while intensity of fruit colour at maturity was dark in 9 types and medium 22 genotypes.

2.2 Stability analysis of chilli genotypes for various growth and yield attributing characters

The analysis of variance and stability was done in respect of various yield attributing characters *viz.* days to commencement of flowering, days to fifty per cent flowering, fruit length, fruit weight, 100 seed weight, number of seed per fruit, yield per plant, yield per hectare, ascorbic acid and capsaicin content in the green fruit. The extensive review regarding the work done on these aspects was done and is presented under following sub heads.

2.2.1 Stability analysis

Senapati and Sarkar (2002) studied adaptability and genetic stability of 20 chilli cultivars in a field experiment conducted at West Bengal, India. It was revealed that genotype x environment interaction was found significant for fruit yield, number and weight, dry chilli recovery percentage and plant height. The linear and non-linear components equally contributed to the genotype x environment interactions in plant height, fruit weight, dry chilli recovery percentage and fruit yield. The linear component was significant against the non-linear component in fruit number only. Kakdwip Local and Kalimpong Local were stable for all the characters examined. EC 12473-1 was found stable for fruit yield, number and weight and dry chilli recovery percentage and IC 119746 was found stable for fruit yield, number, weight and plant height.

Srividhya and Ponnuswami (2010) studied the stability of paprika genotypes and reported that the fruits per plant ranged from 55.32 (P_1) to 81.23 ($P_1 \times P_2$) with a mean of 64.49. Seven genotypes (P_3 , P_4 , P_5 , $P_3 \times P_2$, $P_4 \times P_5$, $P_5 \times P_4$) exhibited significant deviation from regression (S^2_{di}). The number of fruits for six genotypes (P_3 , P_4 , $P_3 \times P_2$, $P_4 \times P_5$, $P_5 \times P_4$ and check) exhibited significant deviation from regression (S^2_{di}). The fruit weight of the genotypes varied from 12.34 g (P_1) to 20.88g ($P_3 \times P_2$) with a population mean of 15.68 g. Six genotypes (P_3 , $P_1 \times P_2$, $P_3 \times P_2$, $P_4 \times P_5$, $P_5 \times P_4$ and check) showed significant deviation from linearity (S^2_{di}). The yield per plant varied from 631.16g (P_1) to 1347g ($P_3 \times P_2$) with a mean of 947.15 g. Only 3 genotypes P_2 (-21.83), P_3 (-380.90), $P_5 \times P_4$ (-893.73) showed their non-significant deviation from regression (S^2_{di}). The hybrid $P_5 \times P_4$ alone registered above average yield per plant and regression coefficient (bi) was above 1.

Syukur *et al.* (2011) studied stability of seven hybrid chilli genotypes. Based on the yield stability analysis, the stable genotype was IPB CH28, whereas IPB CH3 was the best genotype compared to the checks based on pair wise GxE interaction test. The genotypes found to be stable in all locations were IPB CH1, IPB CH2, IPB CH25, IPB CH28, and IPB CH50.

Datta and Jana (2012) conducted an experiment to find the stability of 15 chilli (*Capsicum annuum* L.) genotypes during *rabi* (winter) and *kharif* (rainy) seasons under West Bengal conditions. The genotype x environment (GxE) interaction affected all characters and indicated that the genotype exhibited a differential response due to planting season. It was concluded that the genotype Ulka- 686 was suitable for cultivation in both *rabi* and *kharif* season in the terai zone of West Bengal. CA-29 exhibited better performance during *rabi* season whereas Jwala, Tejaswini and Pusa Sadabahar were better adapted for *kharif* season.

Gurung *et al.* (2012) reported that results of combined analysis of variance for yield were significant among the cultivars, environments, and for cultivar X environment interactions for all traits under study. A

large proportion of variation (47.9 %) on yield in dry weight per plant was attributed to environments. Source of variation on yield by Cultivar (G) X environment (E) and cultivar accounted for 19.5 and 19.5 % respectively of the total variation.

Rahadi *et al.* (2013) analyzed nonparametric stability of yield of nine chilli cultivars in eight different environments. The variance analysis showed that the environment, genotype and the interaction of genotype x environment had significant effect on the production characteristics of each plant. Nonparametric Stability Index (NSI) showed that Tit Super was the most stable genotype. The next stable genotype was IPB002003, while the genotype IPB019015 was an unstable one.

Tembhurne and Rao (2013) estimated stability of twenty cytoplasmic sterility based F_1 hybrids of chilli with VNR-332 as a standard check in three macro environments by transplanting the seedlings on different dates *viz.* 17th June, 2009 (E₁), 3rd August, 2009 (E₂) and 20th August, 2009 (E₃) under Jabalpur conditions. The analysis of variance concluded that GxE interaction was statistically significant in most of the characters under study. The genotypes, JCH-47, BCH-24, BCH-54 and BVC-37 were found to be stable, as regression coefficient (bi) $H \sim 1$, non-significant deviations from regression (S^2_{di}) and the highest mean performance than population mean for fruit yield while, genotype JCH-40 was found to be suitable for cultivation under favourable conditions. In case of 50 per cent flowering, hybrids JCH-05, JCH-47 and BCH-05 were found to be highly stable when lateness is desirable while JCH-23, BCH-23 and BCH-24 were stable for earliness. It was concluded that, the genotypes JCH-47, BCH-24, BCH-54 and BVC-37 exhibited good stability over all environments, whereas, JCH-40 registered above average stability. JCH-05, JCH-14, JCH-23, JCH-24, JCH-54 and RCH-23 recorded below average stability for dry fruit yield. The high yielding F_1 hybrid, JCH-54 was suitable in unfavourable environment for early flowering, number of fruits plant⁻¹, fresh and dry fruit weight plant⁻¹ and net plot yield, whereas it exhibited good stability

for dry fruit weight fruit⁻¹, fruit length, fruit diameter, number of primary branches and 1000 seed weight which was suitable for favourable environment with respect to the characters *viz.* number of pickings, plant height and number of seeds.

Syukur *et al.* (2014) estimated stability based on the Barlett's test, the data obtained were homogenous for all study environments ($p = 0.41$). The combined variance analysis showed that genotypes, environment and GEI significantly influenced the yield. Sum square of environments contributes 83.51%, genotypes 8.33% and GEI 8.16%. It was also reported that IPB CH3, IPB CH25 and imperial were the most stable genotypes compared to other genotypes. The lowest value of the parameter indicated the most stable genotype. Imperial, IPB CH3 and IPB CH5 were ranked 1, 2 and 3. IPB CH50 was the most unstable genotype. The three most stable genotype were IPB CH5, Imperial and Adipati. The IPB CH50 was the most unstable genotype. According to the parameters of the RS, Gada and IPB CH28 were the most stable genotype followed by Biola and IPB CH1. IPB CH5 was the most unstable genotype.

Noman *et al.* (2015) investigated ten chilli (*Capsicum frutescens* L.) genotypes for analysis of stability and genotype X environment interaction of various characters like number of fruits per plant, fruit diameter, leaf area index, fruit length without panicle, number of seeds per fruit and individual plant fruit yield. The G x E interactions for all the traits were found significant, which indicated significant differences between regression coefficients. Kalo Dhawna morich showed positive P_i , significant b_i and insignificant S^2d_i indicating the high responsiveness to the rich environments. DBP 14 5G (China) and Suryamukhi showed negative phenotypic index, significant regression coefficient and insignificant S^2d_i indicated the high responsiveness to the poor environments. BD-2059 showed positive P_i , insignificant b_i and S^2d_i indicated genotype stability over all the environments with comparatively high fruit diameter. In the case of fruit yield (g) per plant the genotypes

BD-2059 and Bogura Jatt showed positive phenotypic index (Pi), insignificant regression coefficient and deviation from regression indicated comparatively stable genotype over the entire environment.

Suchitra Desai (2016) studied stability of chilli under Konkan agroclimatic conditions and reported that among various female lines VI060632B, VI060629B and VI060630B and among male lines DPL C-1 and BC- 28 were found to be stable for fresh fruit yield. The female lines VI060629B and VI060630B were also stable for number of fruits per plant, fruit yield per plant and fruit length whereas, the male parents DPL C-1 and BC- 28 were found to be stable for plant height, number of fruit per plant, fresh fruit per plant, dry weight of fruit and number of fruits per plant.

Suhana *et al.* (2016) studied five promising chilli genotypes tested in three three different environments in Malaysia. Analysis of stability indicated that the best performer 'Ch5' was also the most stable, with $S_i^3 = 0.09$. Commercial controls 'Kulai' and 'MC 12' showed instability in yield ($S_i^3 = 2.80$ and 2.38 respectively). 'Ch5' appeared to have good prospects to replace existing commercial cultivars of chilli in Malaysia. CMS10A x Gouribidanur proved to be the best yielding genotype among 25 test hybrids and it was stable for most of the characters.

Hadora *et al.* (2017) investigated the stability of 25 test hybrids along with three commercial check varieties across different locations. Pooled analysis of variance showed the presence of significant genetic variability among the hybrids for all the characters studied. Variance due to hybrid x environment interaction was non-significant for red fruit yield plant⁻¹, number of fruits plant⁻¹, average fruit length (cm), fruit weight and fruit width except green fruit yield plant⁻¹. The test hybrid, CMS10A x Byadgikaddi recorded higher mean with unit regression coefficient and the deviation non-significantly different from zero ($S^2 d_i = 0$) for average fruit weight and fruit width. Similarly, the hybrid, CMS10A x Gouribidanur for green fruit yield plant⁻¹, CMS10A x LCA 206 for red fruit yield plant⁻¹ and CMS8A x Byadgidabbi for number of fruits,

exhibited high mean with unit regression co-efficient ($b_i=1$) and the deviation was non-significantly different from zero ($S^2 d_i = 0$). The test Hybrids, CMS 6A x Tiwari for the character average fruit weight and CMS 9A x LCA 206 for the character fruit width were exhibited nearer to unit regression co-efficient and non-significant deviation from regression. Further, CMS10A x Gouribidanur has higher yield level than the check.

Barchenger *et al.* (2018) estimated stability of yield and yield components of ten chilli lines. The AMMI analysis revealed that environments, genotypes, and GxE interactions were highly significant for yield, fruit width, fruit weight, fruit length and days to 50% anthesis ($P \# 0.0001$). For yield, the environment, genotype and G X E interaction accounted for 77 %, 2 %, and 21 % of the treatment combinations of sums of squares, respectively. The ICPN15 lines 9, 7 and 10 were the greatest yielding lines (13.9, 13.0 and 12.7 t ha⁻¹ respectively), whereas ICPN15-6, ICPN15-8, ICPN15-9, and ICPN15-10 had the most stable yield across the growing environments, although ICPN15-8 had less yield than the grand mean. However, the majority of the ICPN15 lines performed differently in each environment, illustrating the large GxE interaction.

Wondimu and Aklilu (2018) evaluated five chilli genotypes for two years at three locations to evaluate the performance and yield stability. The combined analysis of variance of five chilli genotypes over six growing environments indicated significant variations of genotypes in fruit yield at ($P < 0.05$) due to their inherent difference in performances. The genotypes PBC-586 and PBC-142A were the top yielding genotypes, followed by PBC-401. The GEI mean squares were also significant. The overall marketable yield performance was the highest from PBC-586 and PBC-142 (28 q/ha and 27 q/ha), respectively. The mean fruit yield per hectare across the six environments ranged from 21 q ha⁻¹ for (local check) to 33 q ha⁻¹ (PBC-586). The analysis of variance (ANOVA) of fruit yield of the five genotypes showed that 25 % of the total SS of the model

was attributable to environmental effects and the rest to genotype effects (45 %) and Genotype x Environment interaction (5 %). PBC-586 and PBC-142A were found the most stable varieties. This enabled PBC-586, PBC-142A and PBC-401 attractive with respect to yield stability across environments.

2.3 Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers

Paran *et al.* (1998) examined genetic relationships among thirty four pepper (*Capsicum annuum*) cultivars of different types with RAPD and AFLP markers. The average numbers of polymorphic product per primer were 1.6 and 6.5 for RAPD and AFLP primers, respectively, *i.e.* AFLP primers were four times more efficient than RAPD primers in their ability to detect polymorphism in pepper.

Bhadragoudar and Patil (2011) subjected 45 accessions of chilli for sixteen RAPD primers. On an average, total number of bands generated per primers was 6 of which 3.9 were polymorphic and 2.25 were monomorphic. The primer OPA-07 (88 %) and OPC-03 (83.33 %) showed higher levels of polymorphism. OPA-3 exhibited a very low percentage of polymorphism (33.33 %). The similarity coefficient ranged from 0.20 to 0.94 indicated substantial diversity present in the germplasm. Highest diversity was observed between accessions Byadgi Dabbi and DCA-33 at Sij-0.2.

Patel Avni *et al.* (2011) screened thirteen capsicum cultivars to assess the genetic relation using inter simple sequence repeat (ISSR) and microsatellite (SSR) markers. A total of 79 bands were produced by six SSR primers with an average frequency of 13.1 bands per primer. Amplified fragments varied in size from 97 bp, with primer CAMS-405, to 269 bp, with primer CAMS-142. Out of 79 fragments, 40 fragments were polymorphic resulting in 50 per cent polymorphism among the thirteen genotypes. The cluster analysis of SSR markers separated the chilli genotypes into two major clusters.

Troconis-Torres *et al.* (2012) conducted molecular analysis of some commercial samples of chilli peppers from Mexico and reported that *among* the oligonucleotides tested, OPE-18 was the most polymorphic RAPD oligonucleotide generating a total 10 bands. From the RAPD reactions carried out with a mixture of MFG-17 and MFG-18 oligonucleotides and C51 to C52 oligonucleotides mixture a total of 25 and 17 bands were obtained, respectively.

Uddin *et al.* (2012) performed Random Amplified Polymorphic DNA (RAPD) assay for estimation of polymorphism in 10 genotypes of chilli by using 12 primers. The highest percentage (85.71) polymorphic locus was found in OPB03 while the lowest was in OPA11 (66.67). Band size ranging from 110 to 400 bp of PCR amplification products scored for primers. It was revealed that the highest genetic identity (0.9524) remains between *Balujuri marich* and *Hajari marich*. On the other hand, the lowest (0.4728) genetic identity was observed between the *Balujuri marich* and *Matal marich*.

Bahurupe *et al.* (2013) studied molecular characterization of 23 chilli genotypes using 13 RAPD primers in order to assess genetic diversity. Largest cluster one was composed of thirteen chilli genotypes *viz.* GP-03-14, Agni Rekha, Fong. number 5, AVRDC-01-3, AKC-84-02-2-1, AKC-97-20, Guntur G-4, Byadagi kaddi, Tej-F5-01- 5, AKC-387, AKC-351 and AKC-393 which joined at 0.80 similarity index. The cluster two consisted of seven chilli genotypes *viz.* 6 AKC-98-27, Green harvest 5, AKC-N-86-1, PBC-161, Fong No-2, LCA-334, and GP-03-20 which also joined at 0.80 similarity index to form one distinct cluster. On the other hand, cluster 3 with three chilli genotypes *viz.* GP-03-21, Byadagi and Green harvest 1 appeared to be the most diverse of the total accessions, which had lowest of 58 per cent similarity value with rest of genotypes.

Rai *et al.* (2013) reported use of Genomic simple sequence repeats (SSRs) and random amplified microsatellite polymorphism (RAMPO) to analyse diversity and relationships among 48 pepper (*Capsicum spp.*) genotypes originated from nine countries. The size of the amplified

products ranged from ~150 to ~270 bp. Among the 25 SSR loci used, PIC ranged from 0.29 (CAMS-844) to 0.92 (CAMS-846) with an average of 0.69. Out of 20 RAMPO primer combinations, seventeen generated 106 scorable and reproducible fragments. The fragment size ranged from ~300 to ~2,500 bp. Among 48 genotypes, 87 fragments out of 106 were polymorphic. Dendrogram obtained by UPGMA-based cluster analysis using SSR markers revealed average GS of 0.58, which ranged between 0.26 and 0.89.

Tilahun *et al.* (2013) studied genetic diversity of thirteen chilli and paprika genotypes by using RAPD and SSR markers. The dendrogram generated based on RAPD data resulted in four major clusters. One genotype (CA 97) with erect fruit position was grouped in cluster I. It was also reported that the second and third clusters showed to form the largest clusters containing 84.6 per cent of the population studied. The second cluster contained four chilli genotypes (CCH, CO2, K1 and CA110) and two paprika varieties (KT PL 19 and KT PL 18). Five genotypes including one chilli variety (Kashi Anmol) and four paprika (Arka Abhir, Byadagi Kaddi, V1 and VSH) types were grouped in the third cluster. The accession CF1 with erect fruit position made the fourth cluster. SSR primer pairs, 8 (88.88 %) revealed polymorphism in cultivars of the chillies and paprika. The dendrogram generated based on SSR markers grouped the 13 genotypes into three main clusters. The first cluster further divided into two sub clusters. The first sub cluster contained four genotypes (CA 97, CO2, VSH and K1) and the second sub cluster consisted six genotypes (Arka Abhir, Byadagi Kaddi, Kashi Anmol, V1, CA110 and CCH). The two paprika varieties KT PL 19 and KT PL 18 were grouped in the second cluster while only one cultivar CF1 was found to make the third major cluster.

Aniel Kumar *et al.* (2014) investigated the genetic diversity of peroxidase and polyphenol oxidase isozyme profiles for understanding the intravarietal relationships among the 21 cultivars of *Capsicum annum* L. Peroxidase (PO) and Polyphenol oxidase (PPO) isozymes were

used to ascertain the genetic polymorphism in 21 cultivars of chilli pepper (*Capsicum annuum* L.). The degree of polymorphism in this isozyme was believed to be due to heterogeneity in its primary structure. Highest per cent similarity (100%) was recorded between Ca15 & Ca19. The dendrogram revealed low genetic diversity as most of the cultivars were in the same cluster.

Dhaliwal *et al.* (2014) carried out diversity analysis of 64 chilli accessions having low level of polymorphism by using 50 SSR markers. Out of 50 markers used, 23 did not express any polymorphism. The remaining 27 were used for diversity analysis based on scorable amplified bands. The cluster analysis showed that 64 genotypes were clustered in two main groups and 9 sub groups. The largest group comprised of 18 genotypes whereas smallest group comprised of two genotypes each. It was also revealed that 222 pairs of genotypes were having diversity coefficient more than 0.90 and only 12 genotypes were having diversity coefficient of less than 0.10. It was also experienced that most of the genotypes under study exhibited distinct characters however, it could not differentiate PLS-2 from PAU selection Long and Pepsi 81 from Tabasco.

Gor *et al.* (2016) characterized 20 chilli genotypes by using 13 RAPD and 10 EST-SSR markers. Based on RAPD analysis total 143 loci were produced out of which 104 loci were polymorphic and generated 72.22 per cent polymorphism. Molecular characterization based on RAPD and EST-SSR could find out precise genetic diversity among chilli genotypes and were not affected by environmental factors.

Toledo-Aguilar *et al.* (2016) characterized the genetic diversity of native Mexican *ancho* chilli populations using microsatellites to determine the relationship among the available populations. The values FIS (deviation of heterozygosity within each population) were negative, indicating a high number of heterozygotes within each population. The lowest values were found for the 'Mulato' hybrid (-0.497) and the green pepper variety (-0.462), while 'Guajillo' chilli had -0.018. It was also

concluded that there is broad genetic variability with a large number of heterozygotes in the native populations of *ancho* chillis of Mexico.

Sharmin *et al.* (2018) studied gene diversity of 20 chilli genotypes and among eleven SSR primer pairs were screened, five primer were reproducible and exhibited distinct polymorphic amplification. A total 10 alleles were detected with an average number of alleles per locus of 2.00. Polymorphic Information Content (PIC) value for the five markers ranged from 0.255 to 0.500 with a mean value of 0.371. Primer CAMS-117 and EPMS-418 were the least powerful markers. Genetic distance among 20 chilli genotypes ranged from 0.024 to 0.911. The highest genetic distance (0.911) was observed in Pop-1 vs Pop-7 vs Pop-18 genotype pairs, whereas lowest genetic distance (0.024) was estimated in Pop-19 vs Pop-20. Based on UPGMA dendrogram, 20 chilli were grouped into two main clusters. The first cluster further divided into two sub clusters.

Bianchi *et al.* (2020) tested eighteen ISSR primers and 17 SSR primers for molecular characterization of chilli accessions in Brazil. Fifteen ISSR primers detected polymorphisms among accessions. These primers produced 97 fragments, of which 46 were polymorphic, representing 47 % polymorphism. In case of SSR primers, nine primers out of the 17 detected polymorphisms among *C. chinense* accessions. The dendrogram obtained showed the distinction of six groups.

CHAPTER III

MATERIAL AND METHODS

The information regarding material used and methodology followed during the course of present investigation on “Evaluation of local chilli (*Capsicum annum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular markers” are described in this chapter under two set of experiments.

Experiment 1 – Performance of local chilli (*Capsicum annum* L.) genotypes for morphological, flowering and yield attributing characters under Konkan conditions and their stability.

3.1 Experimental Site-

The present experiment was conducted on demonstration field of Department of Vegetable Science, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist – Ratnagiri (M.S.) during four seasons *viz.* *kharif* - 2018 and 2019 as well as *rabi* during the years 2018-19 and 2019-20 respectively.

3.1.1 Topography of the plot

The selected experimental plot was uniform and properly leveled with excellent drainage. The proper arrangements for removal of excess water from the plot were done especially during rainy season.

3.1.2 Soil characteristics

The well drained fertile soil having uniform depth was selected. The pH of soil was 5.5 and EC was below 1 mS cm⁻¹. Similarly, the selected plot had uniform fertility.

3.1.3 Geographical location, climate and weather conditions

Dapoli Dist. – Ratnagiri is situated on the west coast of Maharashtra. The altitude of this place is about 280 m above MSL.

Geologically, it is located in subtropical region with 17°45' North Latitude and 73°12' East Latitude. It is high rainfall region with mean annual rainfall of 3500 mm which normally receives from June to September. The meteorological data recorded during the both the years of the experimentation *i.e.*, 2018-19 as well as 2019-20 are presented in Appendix-I.

3.1.4 Cropping history of the plot

The experimental plot utilized for experimentation was consistently under cultivation of various annual vegetable crops like leafy vegetables, water melon and okra. The soil analysis of the experimental plot was done for assessing its suitability for cultivation of chilli during both the seasons and are given in Appendix-III.

3.1.5 Source of planting material

There are several locations in entire Konkan region where local chilli genotypes are grown in both *kharif* and *rabi* season. Twenty eight genotypes were selected and collected from Ratnagiri, Sindhudurg and Thane district of Konkan region for investigation from farmers' field based on their phenotypic characters with respect to growth, flowering and yield performance and were given the accession numbers. These types were evaluated along with Konkan Kirti (Local Check) and Arka Lohit (National Check) under field conditions. The experiment was conducted during the *kharif* and *rabi*, 2018-19 and 2019-20 under 4 different environments.

Environments	Season
E ₁	<i>Kharif</i> , 2018
E ₂	<i>Rabi</i> , 2018-19
E ₃	<i>Kharif</i> , 2019
E ₄	<i>Rabi</i> , 2019-20

3.1.6 Treatment Details

These collected twenty eight genotypes and two release varieties as check were considered as thirty treatments and were evaluated in Randomized Block Design. The details of the treatments are given below:

Table 1 : Details of the various chilli genotypes studied during the investigation

S. N.	Treatment	Accession No.	Source Village, Tahasil and District and GPS Location
1	T ₁	DPL-CA-1	Marshel, Sattari, Goa 15.5958° N, 74.0593° E
2	T ₂	DPL-CA-2	Vetal Bambarde, Kudal, Sindhudurg 16.0506° N, 73.7101° E
3	T ₃	DPL-CA-3	Calangute, Bardez, Goa 15.5366° N, 73.7642° E
4	T ₄	DPL-CA-4	Bhedashi, Dodamarg, Sindhudurg 15.7272° N, 74.0271° E
5	T ₅	DPL-CA-5	Harmal, Pedne, Goa 15.6871° N, 73.7029° E
6	T ₆	DPL-CA-6	Hodawada, Vengurla, Sindhudurg 15.8888° N, 73.7184° E
7	T ₇	DPL-CA-7	Matond, Vengurla, Sindhudurg 15.8376° N, 73.7327° E
8	T ₈	DPL-CA-8	Gavdongari, Cancona, Goa 15.0251° N, 74.1079° E
9	T ₉	DPL-CA-9	Mervi, Ratnagiri 16.8391° N, 73.3031° E
10	T ₁₀	DPL-CA-10	Padel, Deogad, Sindhudurg 16.4666° N, 73.3886° E
11	T ₁₁	DPL-CA-11	Masure, Malvan, Sindhudurg 16.1710° N, 73.5035° E
12	T ₁₂	DPL-CA-12	Pendur, Malvan, Sindhudurg 16.0505° N, 73.6006° E
13	T ₁₃	DPL-CA-13	Vetore, Vengurla, Sindhudurg 15.9106° N, 73.6683° E
14	T ₁₄	DPL-CA-14	Vetal Bambarde Sindhudurg 16.0506° N, 73.7101° E

Contd. Table No.1

S. N.	Treatment	Accession No.	Source Village, Tahasil and District and GPS Location
15	T ₁₅	DPL-CA-15	Mervi Ratnagiri 16.8391° N, 73.3031° E
16	T ₁₆	DPL-CA-16	Gaorai, Kudal, Sindhudurg 16.1111° N, 73.6477° E
17	T ₁₇	DPL-CA-17	Tirlot, Deogad, Sindhudurg 16.4991° N, 73.3933° E
18	T ₁₈	DPL-CA-18	Kondye, Lanja, Ratnagiri 16.8425° N, 73.5182° E
19	T ₁₉	DPL-CA-19	Pawas, Ratnagiri 16.8727° N, 73.3296° E
20	T ₂₀	DPL-CA-20	Asond, Dapoli, Ratnagiri 17.6850° N, 73.2780° E
21	T ₂₁	DPL-CA-21	Talsure, Dapoli, Ratnagiri 17.7601° N, 73.2190° E
22	T ₂₂	DPL-CA-22	Shahapur, Thane 19.4521° N, 73.3280° E
23	T ₂₃	DPL-CA-23	Wada, Deogad, Sindhudurg 16.4148° N, 73.3827° E
24	T ₂₄	DPL-CA-24	Wadilimbu, Lanja, Ratnagiri 16.8521231° N, 73.5489938 ° E
25	T ₂₅	DPL-CA-25	Padel, Deogad, Sindhudurg 16.4666° N, 73.3886° E
26	T ₂₆	DPL-CA-26	Golvan, Malvan, Sindhudurg 16.1964° N, 73.6095° E
27	T ₂₇	DPL-CA-27	Banda, Sawantwadi, Sindhudurg 15.8208° N, 73.8713° E
28	T ₂₈	DPL-CA-28	Konalkatta, Dodamarg Sindhudurg 15.7522° N, 74.0537° E
29	T ₂₉	DPL-CA-29 (Arka Lohit)	Release variety by IIHR, Bangalore
30	T ₃₀	DPL-CA-30 (Konkan Kirti)	Release variety by DBKKV, Dapoli

3.1.7 Plot size

Experimental Design : Randomized Block Design
 Number of Treatments : 30
 Number of Replications : Three
 Plot Size : 2.7 m X 2.25 m
 Total area of experimental plot : 8.43 R
 Spacing : 45 cm X 45 cm
 Number of plants per plot : 30

3.1.8 Plan of layout

The field plan and layout of the present experiment along with the necessary details of the experiment is shown in Figure 1.

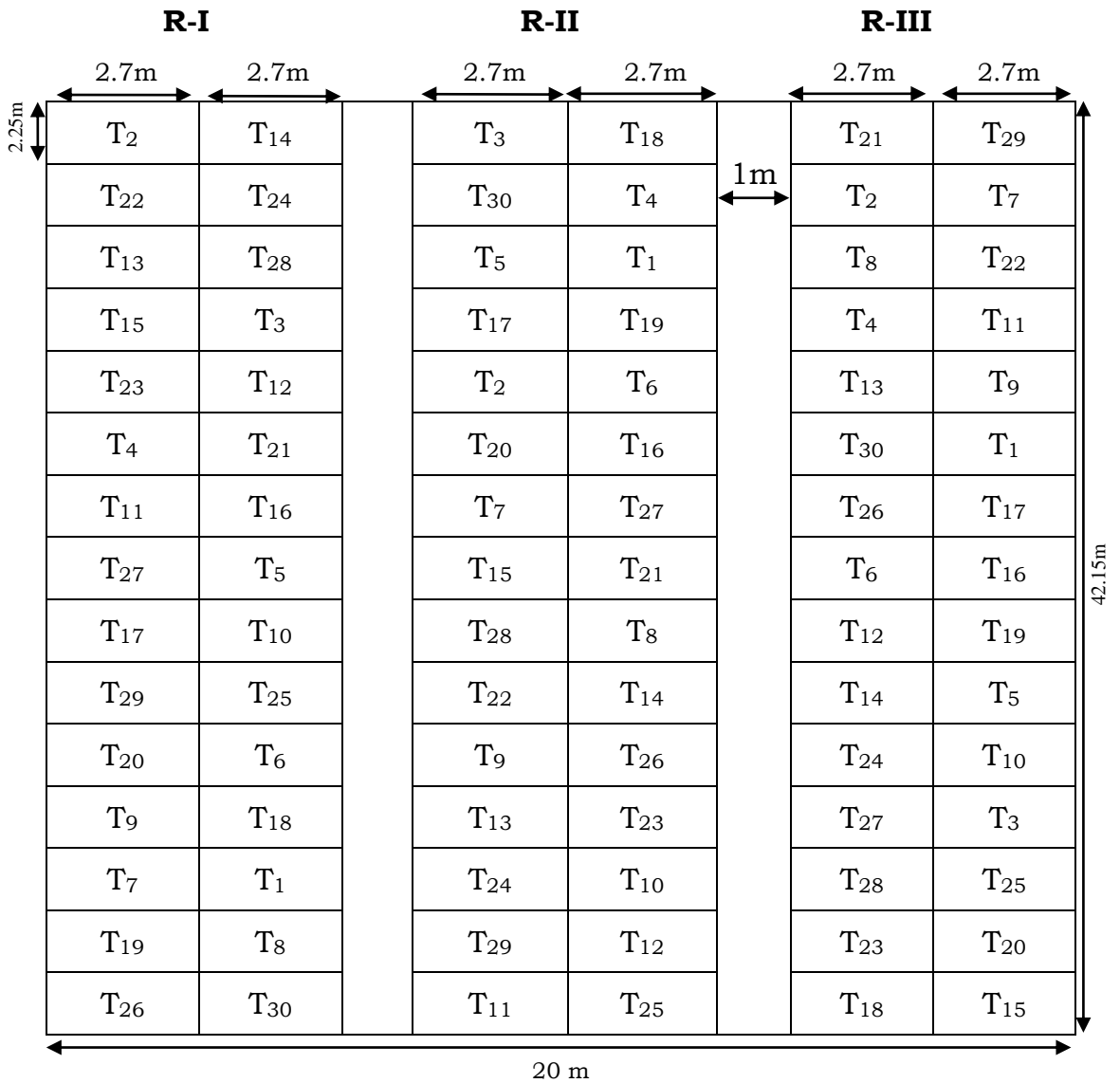


Figure 1 : Layout of experimental plot

3.1.9 Details of the cultivation of experimental plot

The details of various distinct cultural operations followed during the course of experimentation during both the season are described below.

Raising of seedlings

The seedlings of experimental genotypes and varieties were raised before transplanting in the main field. The protrays were filled with sterilized cocopeat having 6.6 pH. The seeds were treated with 0.1 per cent carbendazim prior to sowing to control the seed borne diseases. The seeds were placed in cavity at the depth of around 1 cm and covered with the cocopeat. The protrays were then watered and staked in upright position and were covered with polythene paper for 5 days for uniform germination. After initiation of germination the polythene paper was removed and the trays were arranged in a single layer on weed mat in 50 per cent shade net house. Need based light irrigation was given as per requirement for maintaining optimum moisture level in the protray. After production of two true leaves the water soluble fertilizer 19:19:19 was drenched @ 5 g per litre along with irrigation water. The drenching of mancozeb @ 3 g per litre was done at 10 and 20 days after germination for controlling the damping off disease in growing seedlings. After 30 days from sowing (15 to 20 cm height with 4 to 5 healthy leaves) the seedlings were transplanted in main field. Before transplanting, seedlings were hardened for 4 to 5 days under open sun with delayed irrigation for imparting stress.

Preparation of main field and transplanting

The main field was prepared by one deep ploughing followed by harrowing, so that the soil of the plot will become loose and friable. The well decomposed Farm Yard Manure was added @ 15 t per ha before last harrowing. The ridges and furrows were prepared at a distance of 45 cm during *kharif* season. During *rabi* season the flat beds were prepared for transplanting of the seedling. The spot application of recommended dose

of chemical fertilizer (150 kg N, 50 Kg P and 50 Kg K per ha) was given. Main field was irrigated on previous evening of transplanting. The selected healthy seedlings were transferred from protray to main field in the evening to minimize the mortality. After transplanting, immediate irrigation was given. Regular irrigation was given to maintaining optimum soil moisture in the field. Gap filling was done one week after transplanting for maintaining optimum plant population in the field (Plate 1).

Nutrient Management

A recommended dose of fertilizer *i.e.*, 15 t FYM and 150 kg N, 50 Kg P and 50 Kg K per ha was applied. Entire quantity of FYM along with 50 Kg N and full dose of phosphorous and potash was applied as a basal dose before transplanting whereas remaining dose of N was given in two equal split of 50 Kg each at 30 and 60 days after transplanting along with earthing up. Drenching and spraying of 19:19:19 @ 10 g per litre was also given at weekly interval up to 60 days from planting. Soil application of humic acid @ 1 ml per litre was also done at weekly interval up to 30 days after planting.

Intercultural Operations

Various intercultural operations *viz.* weeding and earthing up were carried out two to three times during every season depending upon the intensity of the weeds. The plot was kept weed free especially till initial 60 days after transplanting.

Plant Protection

The incidence of sucking pests *viz.* aphids, hoppers, white flies and thrips and infection of collar rot was observed. The sprayings of dimethoate @ 1.5 ml per litre, Quinalphos @ 2 ml per litre and Lambda cyhalothrin @ 1 ml per litre of water was done for the control of these pests. Two drenchings of Copper oxychloride were done at 20 and 40 days after transplanting.

3.1.10 Observations recorded

All growth and yield observations were recorded on ten plants per treatment per replication which were randomly selected for recording all growth and yield observations at thirty days interval after transplanting. The selected plants were tagged properly for identification. Following observations were recorded as per the procedures described by the International Plant Genetic Resources Institute (Anonymous, 1995).

Morphological Observations

1. Nodal anthocyanin (whole plant) – This observation was recorded on whole plant. It was recorded as green, light purple, purple or dark purple.

2. Stem shape – Stem shape of each genotype was recorded at maturity. It was recorded as cylindrical, angled or flattened.

3. Stem pubescence – This observation was recorded on mature plant excluding first two nodes before shoot. Stem pubescence was recorded as sparse, intermediate or dense (Figure 2).

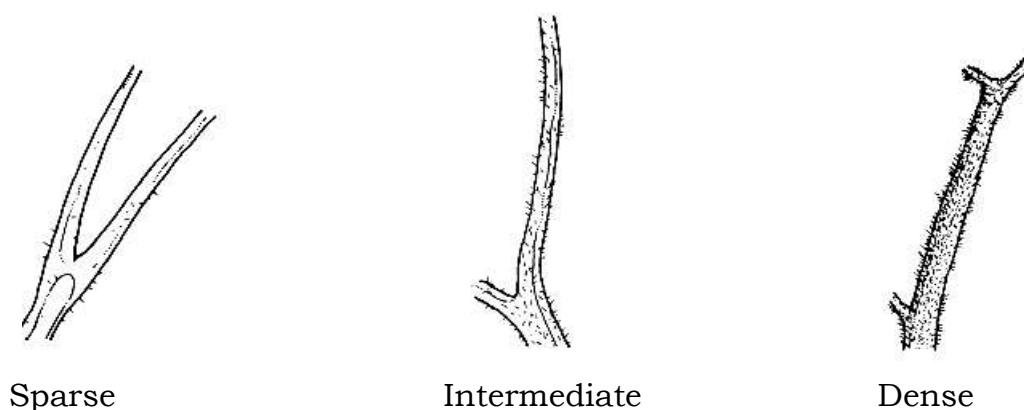


Figure 2 : Stem pubescence

Growth Parameters

1. Plant height (cm) – The plant height of selected plants was recorded at 30, 60, 90 and 120 days after transplanting with the help of meter scale in centimeters and the average of height at each stage was calculated.

2. Plant growth habit – Plant growth habit was recorded when 50 per cent of plants bear ripe fruit. The plant growth was described as Prostrate, Intermediate (compact) and Erect (Figure 3).

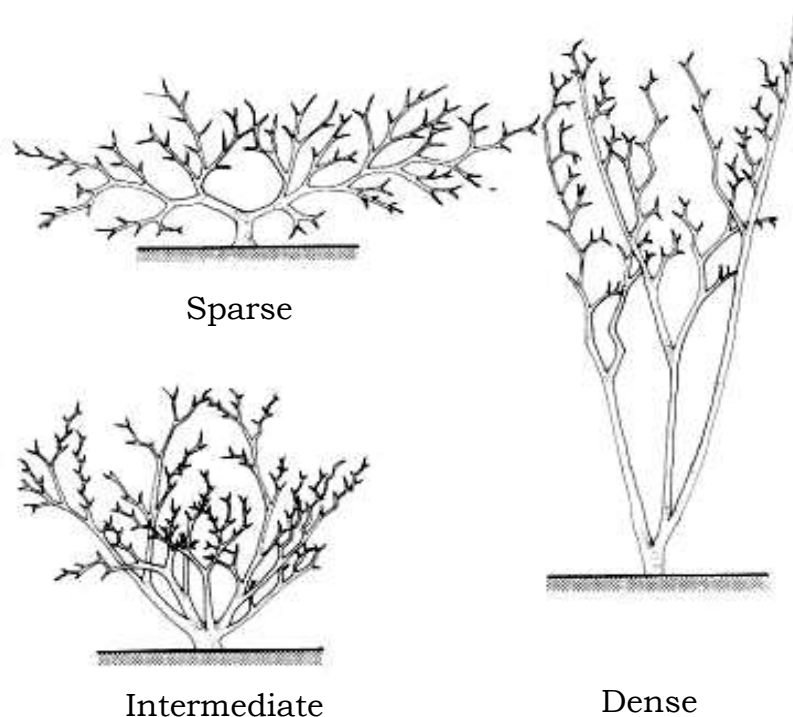


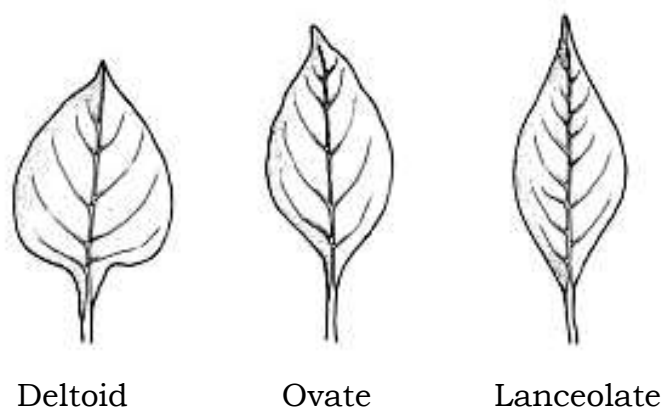
Figure 3 : Plant growth habit

3. Plant canopy width (cm) – The plant canopy width was measured at 30, 60 90 and 120 days after planting on selected plants with the help of meter scale in centimeters and then average was worked out. The plant canopy width was measured on widest point of the each plant.

4. Branching habit – The branching habit was observed when 50 per cent of the plants had ripe fruits and was recorded as sparse, intermediate or dense.

5. Leaf colour – The leaf colour was recorded when 50 per cent of the plants fruit begun to ripe. The average of 10 mature leaves from the main branch of the plant was considered.

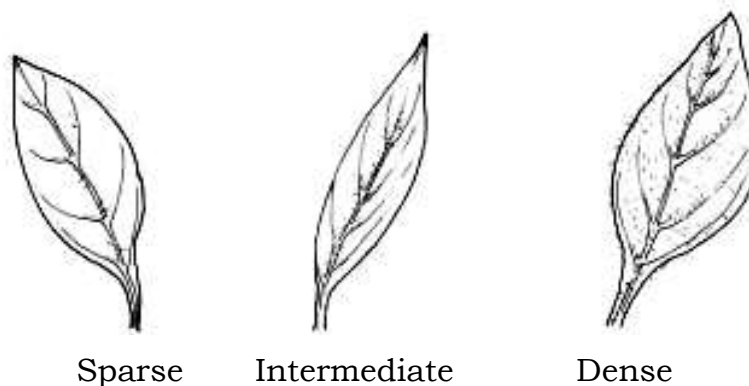
6. Leaf shape – Leaf shape was recorded when 50 per cent of the plant fruit begun to ripe. The average of 10 mature leaves from the main branch of the plant was considered. The leaf shape was recorded as Deltoid, Ovate or Lanceolate (Figure 4).



Deltoid Ovate Lanceolate

Figure 4 : Leaf Shape

7. Leaf pubescence – Leaf pubescence was observed on the youngest mature leaf and was recorded as sparse, intermediate or dense (Figure 5).



Sparse Intermediate Dense

Figure 5 : Leaf pubescence

8. Number of branches – Number of branches developed on the main axis was measured at 30, 60, 90 and at 120 days after transplanting on ten selected plants and average was calculated.

Inflorescence and fruit characters

1. Number of flower per axil – The observation was recorded on fully opened flowers in the first fresh flowering. The number of flowers per axil *viz.* one, two or three was recorded.

2. Flower position – The flower position of each genotype was observed at anthesis and recorded as pendant, intermediate and erect (Figure 6).



Figure 6 : Flower position

3. Number of flowers per plant – The number of flowers on each selected observational plant during the entire season was counted and average was worked out.

4. Corolla colour – The corolla colour was observed at anthesis and recorded as either white, light yellow, yellow, yellow green etc.

5. Corolla shape – The corolla shape was recorded critically by observing the opened flower at anthesis and was recorded as either rotate or campanulate.

6. Anther colour – The anther colour was recorded critically by observation immediately after blooming before anthesis and recorded as white, yellow, pale blue, blue or purple.

7. Filament colour – Filament colour was observed immediately at anthesis and recorded as white, yellow, green, blue, light purple and purple.

8. Calyx margin – Calyx margin of fruit was critically observed and recorded as entire, intermediate or dentate (Figure 7).

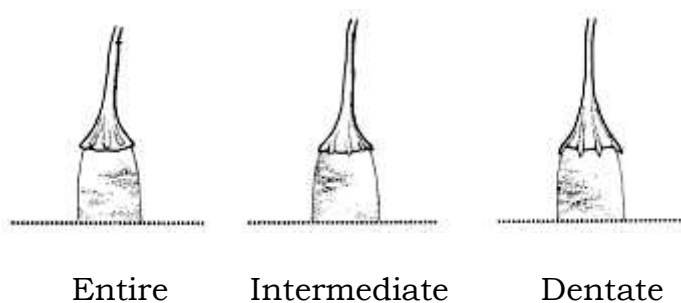


Figure 7 : Calyx margin

9. Calyx angular constriction – Presence or absence of calyx angular constriction was observed at junction of calyx and pedicel. The observation was recorded at mature stage (Figure 8).

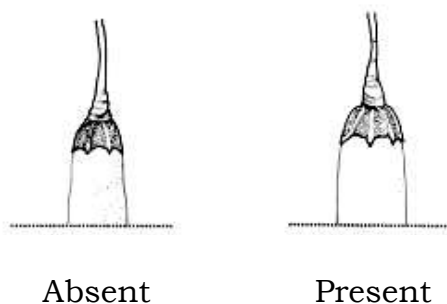


Figure 8 : Calyx angular constriction

Flowering Parameters

1. Days for commencement of flowering – Days required for commencement of flowering from date of transplanting were recorded and average days required for commencement of flowering were calculated.

2. Days to fifty per cent flowering – Days required for commencement of flowering in fifty per cent plants in each plot were recorded from date of transplanting and average days required for fifty per cent flowering were calculated.

Fruit Parameters

1. Days to fruiting – The number of days from transplanting to the first harvesting at horticultural maturity were recorded.

2. Fruit set – The fruit set was recorded before harvest and recorded as low, intermediate and high.

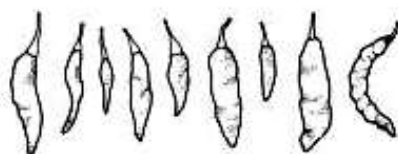
3. Days to horticulture maturity from anthesis – Ten fruits per treatment per replication were tagged after anthesis and total number of days required to harvest the fruit at horticulture maturity were counted.

4. Days to physiological maturity from anthesis – Ten fruits per treatment per replication were tagged after anthesis and total number of days required to harvest the fruit at physiological maturity were counted.

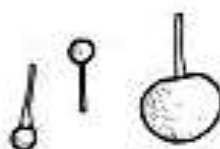
5. Fruit bearing period (days) – Number of days from first fruit set to last harvest was recorded.

6. Fruit colour at maturity stage – The colour of the fruit at physiological maturity was critically observed and recorded as pale orange, orange, light red, red or dark red.

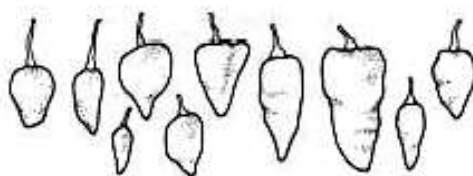
7. Fruit shape – The fruit shape at horticultural maturity was observed and recorded as elongate, almost round, triangular, campanulate or blocky (Figure 9).



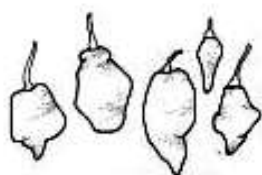
Elongate



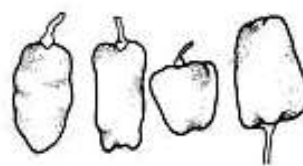
Round



Triangular



Campanulate



Blocky

Figure 9: Fruit shape

8. Fruit length (cm) – The length of the fruit from peduncle to pistillate end of the fruit was measured in centimeters with the automatic Vernier caliper in 10 fruits and average was worked out.

9. Fruit breadth (cm) – The fruit width was measured at widest point with automatic Vernier caliper in 10 fruits and average was worked out.

10. Fruit pedicel length (cm) – Length of ten pedicels was recorded per treatment per replication and average was worked out.

11. Fruit shape at pedicel attachment – Fruit shape at pedicel attachment was critically observed and was recorded as acute, obtuse, truncate, cordate or lobate (Figure 10).

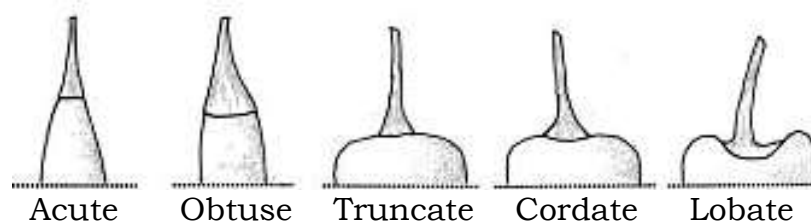


Figure 10 : Fruit shape at pedicel attachment

12. Neck at base of fruit – Presence of the neck at base of the fruit was critically observed and recorded as present or absent (Figure 11).



Figure 11 : Neck at base of fruit

13. Fruit shape at blossom end – Fruit shape at blossom end was observed in 10 mature fruits and recorded as pointed, blunt, sunken or sunken and pointed (Figure 12).

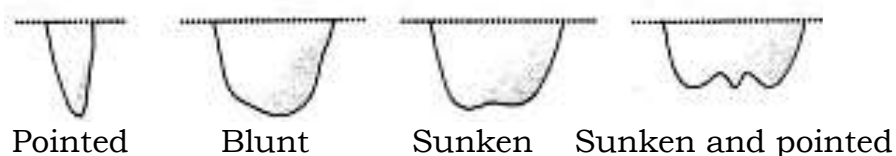


Figure 12 : Fruit shape at blossom end

Seed Parameters

1. 100 seed weight (mg) – The weight of 100 seeds was weighed on electronic balance and was recorded in milligrams.

2. Number of seeds per fruit – The seeds of 10 fruits were taken randomly from selected plants per treatment per replication, and were counted and average was worked out.

Yield Parameters

1. Number of fruits per plant – The number of fruits harvested on each selected observational plant during the entire season was counted and average was worked out.

2. Fruit yield per plant (g) – The fruit yield harvested from ten observational plants at each harvesting was recorded separately in grams and added after last harvesting. Then the average was worked out and considered as fruit yield per plant.

3. Fruit yield per hectare (t) – The fruit yield per plot was recorded at each harvesting separately and added after last harvest to get fruit yield per plot. Then by multiplying it with multiplication factor the fruit yield per hectare was calculated and expressed in tons per hectare.

Physicochemical properties

1. Fresh to dry fruit weight ratio – The ripe fruits were harvested at physiological maturity and weighed on weighing balance and considered as fresh weight and then were dried in cabinet drier at 45 – 50 °C until the constant weight is recorded and considered as dry weight and then fresh to dry weight ratio was calculated.

2. Ascorbic acid content (mg per 100 g) – The ascorbic acid content in each genotype was calculated by 2, 6 dichlorophenol indophenol dye method as described by Ranganna (1997). A known quantity of sample was blended with 3 per cent metaphosphoric acid (HPO₃) to make the final volume of 100 ml and then filtered. A known quantity of aliquot was

titrated against 0.025 per cent 2, 6 – dichlorophenol indophenol dye to a pink colour end point. The ascorbic acid content of the sample was calculated by considering the dye factor and expressed in unit mg per 100 g of fruit sample (Anonymous, 1966).

$$\text{Ascorbic acid} = \frac{\text{Burette reading} \times \text{Dye factor} \times \text{Volume made}}{\text{Volume of the filtrate taken} \times \text{Weight of the sample}} \times 100$$

3. Capsaicin content (%) – Capsaicin content in the samples of various genotypes was estimated by spectrophotometric measurement described by Sadasivam and Manikkam (1992). Weight of 0.5 g chilli powder was taken into a glass stoppered volumetric flask. Pipette out 10 ml of dry acetone into the flask and was centrifuged at 10000 rpm for 10 min. 1 ml of clear supernatant was pipetted out in a test tube and evaporated to dryness in a hot water bath, The residue was dissolved in 5 ml of 0.4 % sodium hydroxide solution. 3 ml of phosphomolybdic acid was added to it. It was shaken and allowed to stand down. The solution was filtered quickly into centrifuge tube to remove any debris. The solution was centrifuged at 500 ppm for 10 to 15 minutes. The clear blue coloured solution was transferred into cuvette and the absorbance reading was recorded at 650 nm. A standard graph was prepared by using 0-200 µg capsaicin simultaneously *i.e.*, 0.2, 0.4, 0.6, 0.8 and 1 ml of working standard solution and graph was prepared.

4. β – carotene (µg per 100 g) – Total carotenoid pigments (expressed as β – carotene) were determined as per the method described by Roy and Susantha (1973). The results were expressed in terms of β – carotene as µg/ 100 g.

3.1.11 Statistical Analysis – The statistical analysis of the data obtained on various parameters was done by using standard methods described by Panse and Sukhatme (1985). The standard error of means (S. E.) was worked out and critical difference (C. D.) at 5% was also worked out wherever the results were significant.

3.1.12 Analysis of variance

Thirty genotypes of chilli were grown in four environments in randomized block design with three replications. Analysis of variance was done by using technique outlined by Panse (1957)

ANOVA

Source	D. F.	M. S. S.	'F' value
Replications	(r-1)	Mr ₁₁	Mr ₁₁ /Me ₁₁
Treatments	(t-1)	Mt ₁₁	Mt ₁₁ /Me ₁₁
Error	(r-1) (t-1)	Me ₁₁	

Where,

r = Number of replications

t = Number of treatments (genotypes)

Mr₁₁, Me₁₁ and Mt₁₁ represents mean sum of squares due to replication, error and treatments, respectively.

3.1.13 Stability parameters

Stability analysis was carried out for growth and yield characters. Stability parameters were estimated by using procedure suggested by Eberhart and Russel (1966). The genotype x environment (linear) interaction and pooled deviation mean squares provide a test of genetic difference among treatments for their regression upon the environmental indices. The mean of a variety in each environment is regressed upon the environmental index and the regression coefficient together with the deviation from the regression was used as parameters for evaluating stability performance over different environments.

Eberhart and Russel (1966) proposed the following model.

$$Y_{ij} = \mu_i + b_i \times l_j + \delta_{ij}$$

Where,

Y_{ij} = Mean yield of the i^{th} variety in the j^{th} environments

μ_i = Average yield of the i^{th} variety over all environments

b_i = Regression coefficient that measures the response of i^{th} variety to varying environments.

l_j = Environmental index as the deviation of the mean of all varieties in the j^{th} environment from grand mean.

$$[l_j = (\sum_i Y_{ij}/t) - (\sum_i \sum_j Y_{ij}/ts)], \sum_j l_j = 0$$

δ_{ij} = The deviation from regression of the i^{th} variety at the j^{th} environment.

The first stability parameter is regression coefficient estimated as

$$b_i = \frac{\sum_j Y_{ij}}{\sum_j I^2_j}$$

The performance of each variety was predicted by using the estimate of the parameters where $\hat{Y}_{ij} = \bar{X}_i + b_i l_j$

Where,

\bar{X}_i is an estimate of the μ_i . The deviations ($\hat{\delta}_{ij} = Y_{ij} - \hat{Y}_{ij}$) can be square and summed to provide an estimate of another stability parameter (\bar{S}^2_{di})

$$(\bar{S}^2_{di} = [\sum_j \hat{\delta}^2_{ij} / (S - 2)] - (S^2_e / r))$$

Where,

S^2_e / r is the estimate of the pooled error (or the variance of a variety mean at the j^{th} location) and,

$$\sum_j \delta^2_{ij} = [\sum_j Y^2_{ij} - \frac{Y^2_i}{S}] - (\sum_j Y_{ij} \cdot l_j)^2 / \sum_j I^2_j$$

The analysis of variance was estimated after estimation of stability parameters as suggested by Eberhart and Russel (1966) as below.

Source	d. f.	S. S.	M. S.
Total	$St-1$	$\sum_i \sum_j Y^2_{ij} - C.F.$	MS_1
Genotypes	$t-1$	$(1/s) (\sum_i Y^2_{i.} - C.F.)$	
Environment + (G×E)	$t(s-1)$	$\sum_i \sum_j Y^2_{ij} - \sum_i Y^2_{i.}/S$	
Environment (Linear)	1	$(1/t) (\sum_j Y_{.j} l_j)^2 / \sum_j l_j^2$	
Genotypes × Env. (linear)	$(t-1)$	$[\sum_i (\sum_j Y_{ij} l_j) / \sum_l l_j^2]$ Env. (lin.) S.S.	MS_2
Pooled deviation	$t(s-2)$	$\sum_i \sum_j \delta^2_{ij}$	MS_3
Genotype-1	$(s-2)$	$\sum_j \delta^2_{1j}$	
Genotype-t	$(s-2)$	$\sum_j \delta^2_{sj}$	
		Pooled error $S(r-1) (t-1)$	

$F = MS_1/MS_3$ tests the significance of difference among variety means and,

$F = MS_2/MS_3$ approximately tests the hypothesis that there is no significant difference among variation for the regression on environmental lines.

$F = [\sum \delta^2_{ij} / (S - 2)] / \text{pooled error}$ tests individual deviation from linear regression.

Test of significance

The significance of the regression coefficient (b_i) was tested by 't' test.

1. Test of significance for b_i

$$l = \frac{1 - b_i}{S.E.(b_i)}$$

Standard error of 'bi' is calculated as:

$$S.E.(b_i) = \sqrt{\frac{(\sum \delta^2_{ij}/n - 2)}{\sum l^2_j}}$$

$$\sum l^2 = l_1^2 + l_2^2 + l_3^2 \dots + l_n^2 = 0$$

$$\sum l_j = \frac{\sum Y_{ij}}{t} \frac{\sum \sum Y_{ij}}{ts}$$

Where,

$$\sum l^2 = \text{Environmental index}$$

$$\delta^2_{ij}/n - 2 = \text{Mean square component of pooled deviation corresponding to } i^{\text{th}} \text{ genotype.}$$

$$\sum Y_{ij} = \text{Total of all at } j^{\text{th}} \text{ location}$$

$$\sum_t \sum_j Y_{ij} = \text{Grand total}$$

$$t = \text{Number of genotypes}$$

$$ts = \text{Number of observations}$$

Calculated value of "t" is tested against table t for (n-2) degrees of freedom for significance.

2. Test of significance for $\bar{S}^2 d_i$

The significance of the $\bar{S}^2 d_i$ is tested by using 'F' test.

$$F = [\sum d_i^2 / (s - 2)] / \text{Pooled error M.S.S.}$$

Where,

S = Number of environments under consideration

The calculated 'F' value was used with table 'F' value for respective (S-2) degrees of freedom.

If the value is significant at 1 per cent level, place two asterisks on $\bar{S}^2 d i$, whereas one asterisk at 5 per cent level of significance. This is same in 'bi' and ' $\bar{S}^2 d i$ ' value.

Experiment 2 - Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers

The information regarding the material used and methods followed during molecular profiling is mentioned in this chapter. The molecular profiling were carried out in the laboratory of Plant Biotechnology Centre, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) during the academic year 2019-2020.

3.2.1 Genetic Material

In the present investigation, 30 genotypes of chilli (*Capsicum annum* L.) evaluated in first experiment were used for genotypic evaluation by using molecular markers.

3.2.2 Laboratory Resources and Techniques

The entire laboratory work was done in the laboratory of Plant Biotechnology Centre, College of Agriculture, Dapoli, Dist. Ratnagiri.

3.2.3 Extraction of genomic DNA

3.2.3.1 Plant material

For the present experimental study 30 genotypes of chilli were grown in the field. The tender leaf samples were collected from 30 day old seedlings after transplanting.

3.2.3.2 Stock solutions prepared

a) Extraction buffer

1) Extraction buffer stock solutions:

S. N.	Chemicals	Quantity required for 100 ml. (g)
1.	200 mM Tris-HCL, (Hi-media Laboratories Pvt. Ltd.)	2.423
2.	25 mM EDTA (Hi-media Laboratories Pvt. Ltd.)	0.831
3.	250 mM NaCl (Hi-media Laboratories Pvt. Ltd.)	1.461

2) Extraction buffer

S. N.	Chemicals	Quantity required for 10 ml of EB
1.	0.5M Glucose (Hi-media Laboratories Pvt. Ltd.)	900 mg
2.	0.5% SDS (Hi-media Laboratories Pvt. Ltd.)	50 mg
3.	3% PVP (Hi-media Laboratories Pvt. Ltd.)	300 mg
4.	0.4% Sodium bisulphite (Hi-media Laboratories Pvt. Ltd.)	40 mg
5.	5% Sarcosyl (Hi-media Laboratories Pvt. Ltd.)	500 μ l

b) Chloroform Isoamyl alcohol mixture (24:1) (Hi-media)

c) 100% Isopropanol (chilled) (Merck Specialities Pvt. Ltd.)

d) 70% Ethyl alcohol (Hi-media Laboratories Pvt. Ltd.)

e) 1x TE Buffer (Hi-media Laboratories Pvt. Ltd.)

3.2.3.3 Procedure for extraction of genomic DNA

The DNA was isolated by following the protocol of Doyle and Doyle (1990) *i.e.*, Rapid method with the slight modifications of buffer

composition and concentration. The young newly flushing leaves were collected and sterilized with 70% ethanol to avoid the contamination. The extraction of genomic DNA was done using the following protocol.

- Leaf tissue (100 mg) was collected using 1.5 ml eppendorf tube which leads to ensure uniform size of sample.
- Collected tissue was macerated by micro pestle at room temperature without buffer for 15 sec.
- Extraction buffer (500 μ l) was added and leaf tissue macerated gently for few seconds and kept in hot water bath for 45 minutes at 65°C.
- The sample was cooled down at room temperature and centrifuged at 8000 rpm for 10 minutes.
- Aqueous layer was transferred to fresh eppendorf tube and 200 μ l of CIA (24:1) was added and mixed by gentle inversion for 5-6 times. The contents were then centrifuged at 8000 rpm for 10 minutes.
- Supernatant was mixed with double volume of chilled iso-propanol and incubated at -20°C for overnight.
- On the next day, the chilled eppendorf tubes brought into room temperature and the solution was centrifuged at 8000 rpm for 10 minutes and pellet was collected.
- Pellet was washed with 100 μ l of 70 per cent ethanol followed by centrifugation at 8000 rpm for 10 minutes.
- Pellet was dried and re-suspended in 50 μ l of 1x TE buffer.
- Incubated at 37°C in a water bath for 30 minutes and stored at -20°C till further use.

3.2.4 DNA Purification

Purification of DNA was done to remove RNA and proteins which were the major contaminants. RNA was removed by RNase treatment and proteins were removed by Proteinase K treatment.

3.2.5 DNA Quantification by using Agarose gel electrophoresis

Concentration of DNA in the sample was determined by agarose gel electrophoresis with standard DNA *i.e.*, DNA Ladder on 0.8 per cent agarose gel and by comparison of the intensity of band staining with Ethidium Bromide.

3.2.6 Dilution of Crude extracts of DNA

The extracted DNA from all the samples was in varying concentrations. While preparing the working DNA samples it was diluted in various proportions *viz.*, 1:1, 1:2 and 1:5 so that it maintains the DNA content in all the samples in similar concentration.

3.2.7 PCR Amplification

3.2.7.1 Requirements

- a) ISSR primers : Commercial kits were obtained from University of British Columbia.
- b) Template DNA : Crude extracts of DNA from chilli leaf sample.
- c) dNTPs : dNTPs mixture of 2.5 mM each were obtained from Genei Laboratories Pvt. Ltd., Bangalore.
- d) *Taq polymerase* : 3.0 U μl^{-1} *Taq* DNA polymerase each obtained from Genei Laboratories Pvt. Ltd., Bangalore.
- e) Thermal cycler : Eppendorf, Master cycler gradient supplied by Eppendorf gradient, 2231, Hamburg Germany was used for cyclic amplification of DNA.

For the purpose of ISSR amplification 21 arbitrary decamer primers were selected and are given in Table 2.

Table 2 : Sequences of the ISSR primers used for study

S. N.	Primer code	Primer Sequence	GC content	Tm Value
		(5' to 3')	(%)	(°C)
1.	UBC-811	GAG AGA GAG AGA GAG AC	52.9	43.3
2.	UBC-814	CTC TCT CTC TCT CTC TA	47.1	41.4
3.	UBC-815	CTC TCT CTC TCT CTC TG	52.9	45.0
4.	UBC-817	CAC ACA CAC ACA CAC AA	47.1	52.8
5.	UBC-818	CAC ACA CAC ACA CAC AG	52.9	52.1
6.	UBC-825	ACA CAC ACA CAC ACA CT	47.1	49.3
7.	UBC-834	AGA GAG AGA GAG AGA GT	50.0	49.8
8.	UBC-844	CTC TCT CTC TCT CTC TRC	55.5	39.4
9.	UBC-845	CTC TCT CTC TCT CTC TRG	55.5	43.4
10.	UBC-853	TCT CTC TCT CTC TCT CRT	50.0	54.0
11.	UBC-854	TCT CTC TCT CTC TCT CRG	55.5	51.1
12.	UBC-857	ACA CAC ACA CAC ACA CCG	55.5	57.1
13.	UBC-876	GAT AGA TAG ACA GAC A	37.5	36.4
14.	UBC-881	GGG TGG GGT GGG GTG	66.6	66.5
15.	UBC-884	HBH AGA GAG AGA GAG AG	47.1	35.0
16.	UBC-885	HBH AGA GAG AGA GAG AG	52.9	41.7
17.	UBC-886	VDV CTC TCT CTC TCT CT	52.9	36.9
18.	UBC-889	DBD ACA CAC ACA CAC AC	47.1	39.4
19.	UBC-891	AGA TGT GTG TGT GTG TG	47.1	51.8
20.	UBC-897	CCG ACT CGA GNN NNN NAT	-	56.2
21.	UBC-898	GAT CAA GCT TNN NNN NAT	-	47.3

3.2.7.2 Preparation of master mixture

Initially the PCR master mix was standardized by changing the quantity of each component (data not shown) and the optimum concentration of each component in master mix which gave better amplification was chosen for actual work (Table 3). The master mix was distributed to 30 tubes (18 µl tube⁻¹) and 2 µl of template DNA of the respective genotype was added to make the total reaction volume to 20 µl and the mixture was given a short spin to mix the content (Table 3).

Table 3 : Master mixture for PCR (20 μ l tube⁻¹)

S. N.	Components	Quantity (μl)
1.	10 x Taq assay buffer	2.5
2.	dNTPs (10 mM)	1.0
3.	MgCl ₂ (25 mM)	1.5
4.	Primer (5 pm μ l ⁻¹)	1.0
5.	Template DNA (25 ng μ l ⁻¹)	2.0
6.	Taq DNA polymerase (3.0 U μ l ⁻¹)	0.5
7.	Double distilled water	11.5
	Total	20.0

3.2.7.3 Thermal cycling

- Sterile micro centrifuge tubes were numbered from 1 to 30.
- 2.0 μ l of template DNA from individual genotypes was added to each tube.
- 18 μ l of master mix was added to all the tubes and was given short spin to mix the contents.
- The tubes were placed in the thermal cycler for 35 cycles of PCR.
- Samples were hold at 4^oC, in the thermal cycler, until the contents were loaded on to the gel for electrophoresis.

The PCR thermal cycling was performed at different annealing temperature based on T_m value of each ISSR primers.

3.2.7.4 Separation of amplified product by agarose gel electrophoresis**3.2.7.4.1 Requirement**

- a) Electrophoretic unit (Gel casting through, gel comb, power pack)
- b) Gel documentation system (UV trans illuminator)
- c) Agarose (Genei Laboratories Pvt. Ltd., Bangalore)

d) Tracking dye (Bromophenol blue) (Hi-media Laboratories Pvt. Ltd.)

e) Ethidium Bromide (1 $\mu\text{g ml}^{-1}$) (Hi-media Laboratories Pvt. Ltd.)

f) 50 x TAE buffer.

3.2.7.4.2 Procedure

The amplified products in PCR reaction were separated by electrophoresis in 1.5 per cent agarose gel, containing Ethidium Bromide in 1x TAE Buffer (pH 8.0) and separation was carried-out by applying constant voltage of 80 volts for 1 hour. The standard molecular marker used was Φ x174/Hae III digest. PCR and gel electrophoresis were carried-out two times and only reproducible patterns were used for data analysis.

3.2.7.5 Photography and Gel documentation

The gels were photographed under UV light using Pentax K 312 nm camera. The images of gels were also taken by the documentation systems (Uvi-Tech. Fire reader, Cambridge, England) and saved in computer for further analysis.

3.2.8 Fingerprinting of genotypes

The gels were carefully studied and amplicons which occurred only once for a particular genotype were marked which constituted the fingerprint for that particular genotype. Additionally, the band fragments present in two genotypes were also marked, which in combination with other bands generated with other primers would constitute the fingerprints.

3.2.9 Statistical analysis

ISSR markers across the 30 accessions were scored for their presence (1) or absence (0) of bands for each primer. By comparing the banding patterns of genotypes for a specific primer, genotype-specific bands were identified and faint or unclear bands were not considered. The binary data so generated was used to estimate the levels of

polymorphism by dividing the number of polymorphic bands by the total number of scored bands. Pair-wise similarity matrices were generated by Jaccard's coefficient of similarity by using MVSP-A Multivariate Statistical Package_5785 (Version 3.1). The cluster analysis was performed from the distance matrix using Jaccard's similarity coefficient.

Distance matrix and dendrogram was constructed based on diversity coefficient generated from pooled data by using unweighted pair group method of arithmetic means (UPGMA), a computer programme for distance estimation. Other parameters computed were,

$$\text{Discrimination power (\%)} = \frac{\text{Number of unique RAPD phenotypes}}{\text{Total number of RAPD phenotypes}} \times 100$$

$$\text{Per cent polymorphism} = \frac{\text{Total number of polymorphic bands}}{\text{Total number of band}} \times 100$$

CHAPTER IV

RESULTS AND DISCUSSION

The present investigation on “Evaluation of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular markers” was conducted during the period of 2018 – 2020 under two sets of experiment. The results obtained during the present investigation under various experiments are presented and discussed in this chapter under following appropriate subheads.

4.1 Performance of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters under Konkan conditions and their stability

4.1.1 Plant height (cm)

Plant height is an important growth parameter which has significance not only in accelerating growth of the plant but also in canopy spread which ultimately determines the production potential of the plant. Early peak up in plant height may accelerate early growth. The plant height of various genotypes was recorded at monthly interval up to 120 days after planting (*i.e.*, at 30, 60, 90 and 120 DAP) during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding plant height are presented in Table 4a (30 DAP), Table 4b (60 DAP), Table 4c (90 DAP) and Table 4d (120 DAP).

4.1.1.1 Plant height at 30 DAP

The difference in the plant height of various genotypes at 30 DAP (Table 4a) during *kharif* 2018 was non-significant. However, the plant height at 30 DAP was significant during *kharif* 2019 as well as in pooled analysis of both the *kharif* season. The highest plant height (42.07 cm) during *kharif* 2019 was recorded in DPL-CA-29 (Arka Lohit) whereas the lowest plant height (29.10 cm) was noticed in genotype DPL-CA-4. In pooled *kharif* data, it was observed that the maximum plant height

(44.37 cm) was recorded in DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-30 (40.53 cm), DPL-CA-2 (39.72 cm), DPL-CA-10 (39.10 cm), DPL-CA-23 (39.07 cm), and DPL-CA-20 (38.85 cm). The lowest plant height (31.38 cm) was observed in DPL-CA-4.

The plant height at 30 DAP was significant during both *rabi* seasons (2018-19 and 2019-20) during present investigation as well as in pooled *rabi* data. During 2018-19, the maximum plant height (46.65 cm) was observed in DPL- CA-29 *i.e.*, Arka Lohit which was at par with all other genotypes except DPL-CA-4, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-14, DPL-CA-22, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The minimum plant height (32.22 cm) was seen in DPL-CA-30 (Konkan Kirti). During 2019-20, the highest plant height (44.65 cm) was recorded in DPL-CA-19 which was at par with all other genotypes except DPL-CA-1, DPL-CA-3, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-20, DPL-CA-22 and DPL-CA-30 (Konkan Kirti). The lowest plant height (35.49 cm) was recorded by DPL-CA-30 (Konkan Kirti).

The pooled *rabi* data revealed that the genotype DPL CA-29 (Arka Lohit) produced maximum plant height of 45.43 cm which was at par with all other genotypes except DPL-CA-1, DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-9, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-20 and DPL-CA-22. The lowest plant height (33.86 cm) was recorded in DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-8.

The overall pooled data for plant height at 30 DAP indicated that the difference in various genotypes for plant height at 30 DAP was significant. The highest plant height (44.90 cm) was recorded in DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-23. The lowest plant height (34.97 cm) was recorded by DPL-CA-8 which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-22 and DPL-CA-30 (Konkan Kirti).

Table 4a : Variation in plant height among chilli genotypes during kharif and rabi seasons (30 DAP)

S.N.	Genotype	Plant height (cm) at 30 DAP						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	33.67	32.28	32.98	44.24	35.90	40.07	36.52
2	DPL CA-2	37.67	41.77	39.72	42.75	43.22	42.99	41.35
3	DPL CA-3	35.67	36.03	35.85	42.52	38.55	40.54	38.19
4	DPL CA-4	33.67	29.10	31.38	42.02	42.38	42.20	36.79
5	DPL CA-5	35.33	38.67	37.00	38.77	42.11	40.44	38.72
6	DPL CA-6	35.00	37.33	36.17	43.45	42.28	42.87	39.52
7	DPL CA-7	32.33	38.03	35.18	37.59	42.02	39.80	37.49
8	DPL CA-8	33.67	32.50	33.08	36.86	36.85	36.86	34.97
9	DPL CA-9	33.67	30.10	31.88	44.63	38.24	41.44	36.66
10	DPL CA-10	35.67	42.53	39.10	40.14	41.79	40.96	40.03
11	DPL CA-11	32.67	37.80	35.23	43.16	38.07	40.62	37.92
12	DPL CA-12	33.00	34.57	33.78	37.66	39.26	38.46	36.12
13	DPL CA-13	35.00	29.73	32.37	42.50	43.15	42.82	37.60
14	DPL CA-14	39.00	30.87	34.93	38.78	36.38	37.58	36.26
15	DPL CA-15	33.67	30.37	32.02	45.56	43.11	44.33	38.17
16	DPL CA-16	34.00	34.93	34.47	43.27	44.29	43.78	39.13
17	DPL CA-17	35.33	29.87	32.60	42.45	43.98	43.22	37.91
18	DPL CA-18	35.33	30.77	33.05	44.90	44.51	44.71	38.88
19	DPL CA-19	32.67	37.57	35.12	45.99	44.65	45.32	40.22
20	DPL CA-20	38.67	39.03	38.85	43.37	39.90	41.64	40.24
21	DPL CA-21	38.00	36.40	37.20	44.00	40.57	42.28	39.74
22	DPL CA-22	35.00	33.43	34.22	41.18	37.52	39.35	36.78
23	DPL CA-23	40.00	38.13	39.07	45.77	43.58	44.68	41.87
24	DPL CA-24	37.67	35.97	36.82	44.65	41.19	42.92	39.87
25	DPL CA-25	35.67	37.60	36.63	45.69	45.09	45.39	41.01
26	DPL CA-26	35.00	36.90	35.95	42.21	41.39	41.80	38.87
27	DPL CA-27	38.33	37.47	37.90	43.00	41.52	42.26	40.08
28	DPL CA-28	37.33	34.77	36.05	44.38	40.78	42.58	39.31
29	DPL CA-29 (Arka Lohit)	46.67	42.07	44.37	46.65	44.21	45.43	44.90
30	DPL CA-30 (KonkanKirti)	41.00	40.07	40.53	32.22	35.49	33.86	37.20
	S.E.m ±	2.97	2.10	2.06	1.56	1.47	1.15	1.17
	C.D.@ 5%	NS	5.96	5.85	4.42	4.17	3.26	3.33
	C.V.	14.29	10.24	9.97	6.37	6.19	4.77	5.24

4.1.1.2 Plant height at 60 DAP

The difference in the plant height of various genotypes at 60 DAP during *kharif* 2018 are presented in Table 4b which was non-significant. The highest plant height (93.82 cm) at 60 DAP was recorded in DPL-CA-30 (Konkan Kirti) whereas it was lowest in DPL-CA-12 (65.13 cm). However, the plant height at 60 DAP during *kharif* 2019 as well as in pooled data of both the *kharif* season was significant. During *kharif* 2019, the highest plant height (96.27 cm) was registered in DPL-CA-30 (Konkan Kirti) and DPL-CA-29 (Arka Lohit) was at par with it (92.50 cm). The lowest plant height (66.13 cm) was recorded in genotype DPL-CA-12 which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-6, DPL-CA-8, DPL-CA-9, DPL-CA-12, DPL-CA-16, DPL-CA-21, DPL-CA-22, DPL-CA-24, DPL-CA-26 and DPL-CA-27. In pooled *kharif* data, it was observed that the highest plant height (95.05 cm) was recorded DPL-CA-30 (Konkan Kirti) and DPL-CA-29 (Arka Lohit) was at par with it. The lowest plant height (65.63 cm) was observed in DPL-CA-12 which was at par with DPL-CA-3 (67.90 cm), DPL-CA-9 (69.62 cm), DPL-CA-16 (70.54 cm), DPL-CA-21 (70.60 cm) and DPL-CA-27 (68.63 cm).

The plant height at 60 DAP was significant during both the *rabi* seasons (2018-19 and 2019-20) during present investigation as well as in pooled *rabi* data (Table 4b). During 2018-19, the highest plant height (83.11 cm) was observed in DPL-CA-8 which was at par with the genotypes DPL-CA-3, DPL-CA-5, DPL-CA-10, DPL-CA-13, DPL-CA-15, DPL-CA-17, DPL-CA-21 and DPL-CA-24. The lowest plant height (50.31 cm) was seen in DPL-CA-30 (Konkan Kirti) which was observed to be the most dwarf genotype during *rabi* season. During 2019-20, the maximum plant height (80.23 cm) was registered in DPL-CA-13 which was at par with all other genotypes except DPL-CA-1, DPL-CA-3, DPL-CA-6, DPL-CA-7, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-18, DPL-CA-19, DPL-CA-23 and DPL-CA-30 (Konkan Kirti). The minimum plant height (49.86 cm) was recorded by DPL-CA-30 (Konkan Kirti).

Table 4b : Variation in plant height among chilli genotypes during kharif and rabi seasons (60 DAP)

S. N.	Genotype	Plant height at 60 DAP (cm)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	81.23	72.43	76.83	75.41	72.46	73.94	75.39
2	DPL CA-2	79.04	74.57	76.80	76.61	80.17	78.39	77.60
3	DPL CA-3	67.23	68.57	67.90	79.89	73.17	76.53	72.22
4	DPL CA-4	76.53	77.53	77.03	76.98	75.72	76.35	76.69
5	DPL CA-5	83.16	78.63	80.90	80.86	75.01	77.93	79.42
6	DPL CA-6	72.43	68.90	70.66	68.68	71.74	70.21	70.44
7	DPL CA-7	74.57	80.33	77.45	72.35	72.32	72.34	74.89
8	DPL CA-8	76.55	68.43	72.49	83.11	77.68	80.40	76.44
9	DPL CA-9	68.53	70.70	69.62	73.22	74.28	73.75	71.68
10	DPL CA-10	75.09	74.27	74.68	79.48	76.20	77.84	76.26
11	DPL CA-11	73.16	73.77	73.46	73.19	71.61	72.40	72.93
12	DPL CA-12	65.13	66.13	65.63	72.55	72.70	72.62	69.13
13	DPL CA-13	72.16	73.77	72.96	81.48	80.23	80.86	76.91
14	DPL CA-14	82.93	82.23	82.58	77.01	72.00	74.50	78.54
15	DPL CA-15	81.29	72.73	77.01	79.96	78.68	79.32	78.17
16	DPL CA-16	73.21	67.87	70.54	76.91	75.73	76.32	73.43
17	DPL CA-17	82.57	83.63	83.10	81.66	79.03	80.35	81.73
18	DPL CA-18	74.59	73.53	74.06	65.61	73.02	69.32	71.69
19	DPL CA-19	83.96	77.93	80.95	77.69	71.87	74.78	77.86
20	DPL CA-20	79.74	78.53	79.14	77.95	75.74	76.85	77.99
21	DPL CA-21	70.47	70.73	70.60	81.89	79.59	80.74	75.67
22	DPL CA-22	72.47	71.53	72.00	76.52	80.10	78.31	75.16
23	DPL CA-23	75.30	75.20	75.25	78.42	74.34	76.38	75.81
24	DPL CA-24	72.49	71.10	71.80	80.55	74.74	77.65	74.72
25	DPL CA-25	77.10	79.03	78.07	77.08	78.84	77.96	78.01
26	DPL CA-26	73.93	72.03	72.98	73.05	74.97	74.01	73.50
27	DPL CA-27	69.00	68.27	68.63	76.01	78.11	77.06	72.85
28	DPL CA-28	76.37	76.23	76.30	72.87	75.05	73.96	75.13
29	DPL CA-29 (Arka Lohit)	90.20	92.50	91.35	77.59	75.28	76.44	83.89
30	DPL CA-30 (Konkan Kirti)	93.82	96.27	95.05	50.31	49.40	49.86	72.45
	S.E.m ±	2.97	2.33	1.94	1.64	2.02	1.34	1.22
	C.D.@ 5%	NS	6.61	5.51	4.65	5.73	3.81	3.46
	C.V.	14.29	5.36	4.43	3.74	4.68	3.09	2.89

The *rabi* pooled data revealed that the genotype DPL-CA-13 produced highest plant height of 80.86 cm and the various genotypes DPL-CA-2, DPL-CA-5, DPL-CA-8, DPL-CA-10, DPL-CA-15, DPL-CA-17, DPL-CA-21, DPL-CA-22, DPL-CA-24, DPL-CA-25 and DPL-CA-27 were at par with it. The lowest plant height (49.86 cm) was recorded in DPL-CA-30 (Konkan Kirti).

The overall pooled data for plant height at 60 DAP indicated that the difference in various genotypes for plant height at 60 DAP was significant. The highest plant height (83.89 cm) was recorded in DPL-CA-29 (Arka Lohit) which was at par with genotypes DPL-CA-17. The lowest plant height (69.13 cm) was recorded in DPL-CA-12 which was at par with DPL-CA-3, DPL-CA-6, DPL-CA-9, DPL-CA-18 and DPL-CA-30 (Konkan Kirti).

4.1.1.3 Plant height at 90 DAP

The difference in plant height of various genotypes at 90 DAP during *kharif* (2018 and 2019) was significant (Table 4c). During 2018, the maximum plant height (128.32 cm) at 90 DAP was recorded in DPL-CA-30 (Konkan Kirti) which was at par (122.33 cm) with DPL-CA-29 (Arka Lohit). The minimum plant height was noticed in DPL-CA-3 (79.00 cm). During *kharif* 2019, the highest plant height (111.73 cm) was seen in DPL-CA-30 (Konkan Kirti) which was significantly superior over all other genotypes except DPL-CA-29 (Arka Lohit). The lowest plant height (78.77 cm) was observed in genotype DPL-CA-8 which was at par with DPL-CA-3, DPL-CA-6, DPL-CA-9, DPL-CA-12, DPL-CA-16, DPL-CA-21, DPL-CA-24, DPL-CA-26 and DPL-CA-27. In pooled *kharif* data at 90 DAP, it was indicated that the highest plant height (120.03 cm) was recorded in DPL-CA-30 (Konkan Kirti) and DPL-CA-29 (Arka Lohit) was at par with it whereas the lowest plant height (79.67 cm) was observed in DPL-CA-3 which was at par with DPL-CA-9 (84.60 cm).

The plant height at 90 DAP was significant during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data (Table 5c).

Table 4c : Variation in plant height among chilli genotypes during kharif and rabi seasons (90 DAP)

S. N.	Genotype	Plant height at 90 DAP (cm)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	90.86	90.50	90.68	85.23	82.05	83.64	87.16
2	DPL CA-2	94.63	92.83	93.73	92.16	88.37	90.26	92.00
3	DPL CA-3	79.00	80.33	79.67	85.19	81.61	83.40	81.53
4	DPL CA-4	96.76	92.00	94.38	84.15	81.80	82.98	88.68
5	DPL CA-5	113.30	90.50	101.90	85.38	87.91	86.65	94.27
6	DPL CA-6	89.35	85.37	87.36	75.96	83.31	79.63	83.50
7	DPL CA-7	93.97	93.20	93.58	81.43	83.83	82.63	88.11
8	DPL CA-8	102.73	78.77	90.75	90.54	90.56	90.55	90.65
9	DPL CA-9	88.80	80.40	84.60	86.94	88.91	87.93	86.26
10	DPL CA-10	93.43	87.23	90.33	88.83	88.54	88.68	89.51
11	DPL CA-11	91.67	93.03	92.35	79.62	84.43	82.03	87.19
12	DPL CA-12	89.43	84.97	87.20	85.17	87.77	86.47	86.84
13	DPL CA-13	89.87	91.23	90.55	92.60	88.51	90.56	90.55
14	DPL CA-14	95.50	96.13	95.82	82.56	80.18	81.37	88.59
15	DPL CA-15	97.97	88.03	93.00	86.10	90.17	88.13	90.57
16	DPL CA-16	95.73	81.10	88.42	88.86	86.50	87.68	88.05
17	DPL CA-17	103.40	103.33	103.37	92.98	88.59	90.78	97.08
18	DPL CA-18	93.55	89.20	91.38	78.70	87.52	83.11	87.24
19	DPL CA-19	94.97	92.87	93.92	88.15	84.18	86.16	90.04
20	DPL CA-20	98.47	93.90	96.18	91.66	90.43	91.05	93.61
21	DPL CA-21	90.10	86.90	88.50	94.35	90.33	92.34	90.42
22	DPL CA-22	93.73	92.63	93.18	89.07	90.08	89.58	91.38
23	DPL CA-23	97.13	88.87	93.00	91.16	84.12	87.64	90.32
24	DPL CA-24	93.80	85.00	89.40	89.23	85.22	87.22	88.31
25	DPL CA-25	100.03	97.90	98.97	88.21	88.52	88.36	93.67
26	DPL CA-26	87.70	86.23	86.97	82.49	85.76	84.13	85.55
27	DPL CA-27	90.87	85.53	88.20	87.32	86.44	86.88	87.54
28	DPL CA-28	94.23	93.87	94.05	83.93	85.26	84.59	89.32
29	DPL CA-29 (Arka Lohit)	122.33	106.13	114.23	93.87	83.60	88.73	101.48
30	DPL CA-30 (Konkan Kirti)	128.32	111.73	120.03	60.54	56.10	58.32	89.17
	S.E.m ±	3.38	2.90	2.54	1.39	1.55	1.07	1.34
	C.D.@ 5%	9.56	8.24	7.21	3.95	4.41	3.05	3.81
	C.V.	6.022	5.55	4.71	2.80	3.15	2.17	2.59

During 2018-19, the highest plant height (94.35 cm) was observed in DPL-CA-21 which was at par with the genotypes DPL-CA-2, DPL-CA-8, DPL-CA-13, DPL-CA-17, DPL-CA-20, DPL-CA-23 and DPL-CA-29 (Arka Lohit). The lowest plant height (60.54 cm) was noted in DPL-CA-30 (Konkan Kirti) and was identified to be the dwarfest genotype during *rabi* season. During 2019-20, the highest plant height (90.56 cm) was recorded in DPL-CA-8 which was at par with DPL-CA-2, DPL-CA-5, DPL-CA-9, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-25 and DPL-CA-27. The lowest plant height (56.10 cm) was noticed in DPL-CA-30 (Konkan Kirti).

The pooled *rabi* data revealed that the genotype DPL-CA-21 had highest plant height of 92.34 cm and the various genotypes DPL-CA-2, DPL-CA-8, DPL-CA-13, DPL-CA-17 and DPL-CA-22 were at par with it. The lowest plant height (58.32 cm) was seen in DPL-CA-30 (Konkan Kirti).

The overall pooled data for plant height at 90 DAP indicated that the difference in various genotypes for plant height at 90 DAP was significant. The highest plant height (101.48 cm) was recorded in DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes. The lowest plant height (81.53 cm) was registered in DPL-CA-3 which was at par DPL-CA-6.

4.1.1.4 Plant height at 120 DAP

The plant height of various genotypes at 120 DAP during *rabi* 2018-19, as well as *rabi* 2019-20 are presented in Table 4d. It was noticed that difference among various genotypes was significant. The maximum plant height (139.30 cm) during *kharif* 2018 was observed in DPL-CA-30 (Konkan Kirti) which was significantly superior over all other genotypes. The minimum plant height was seen in DPL-CA-3 (96.23 cm) which was at par with DPL-CA-1 (103.20 cm). During *kharif* 2019, the highest plant height (145.37 cm) was produced in DPL-CA-30

Table 4d : Variation in plant height among chilli genotypes during kharif and rabi seasons (120 DAP)

S. N.	Genotype	Plant height at 120 DAP (cm)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	103.20	103.97	103.58	95.30	89.84	92.57	98.08
2	DPL CA-2	111.65	112.77	112.21	101.87	104.03	102.95	107.58
3	DPL CA-3	96.23	98.70	97.47	96.31	91.47	93.89	95.68
4	DPL CA-4	109.63	114.33	111.98	91.81	90.37	91.09	101.54
5	DPL CA-5	122.33	121.47	121.90	97.65	93.67	95.66	108.78
6	DPL CA-6	109.80	112.77	111.28	92.54	90.03	91.28	101.28
7	DPL CA-7	114.12	117.13	115.63	97.65	89.42	93.53	104.58
8	DPL CA-8	115.46	115.43	115.45	109.56	107.03	108.30	111.87
9	DPL CA-9	107.90	106.73	107.32	97.13	93.77	95.45	101.39
10	DPL CA-10	116.06	114.30	115.18	98.41	96.48	97.45	106.31
11	DPL CA-11	108.93	105.20	107.07	90.07	93.05	91.56	99.31
12	DPL CA-12	113.66	110.67	112.17	94.82	96.30	95.56	103.86
13	DPL CA-13	113.91	116.83	115.37	102.77	97.80	100.28	107.83
14	DPL CA-14	114.31	109.23	111.77	87.26	92.15	89.71	100.74
15	DPL CA-15	113.94	116.47	115.20	97.26	97.42	97.34	106.27
16	DPL CA-16	115.79	113.67	114.73	100.28	94.85	97.56	106.15
17	DPL CA-17	123.46	128.03	125.75	104.77	98.90	101.84	113.79
18	DPL CA-18	114.98	114.57	114.77	91.38	100.97	96.17	105.47
19	DPL CA-19	115.75	114.47	115.11	98.36	97.03	97.70	106.40
20	DPL CA-20	119.20	119.53	119.37	102.96	100.22	101.59	110.48
21	DPL CA-21	106.04	107.33	106.69	105.72	97.07	101.40	104.04
22	DPL CA-22	108.03	108.73	108.38	100.66	97.48	99.07	103.73
23	DPL CA-23	106.64	109.77	108.20	99.77	95.00	97.38	102.79
24	DPL CA-24	124.16	125.03	124.60	98.41	92.50	95.46	110.03
25	DPL CA-25	114.37	116.30	115.34	100.26	98.12	99.19	107.27
26	DPL CA-26	115.77	115.73	115.75	95.02	94.08	94.55	105.15
27	DPL CA-27	112.67	115.23	113.95	102.05	96.94	99.50	106.72
28	DPL CA-28	113.47	114.07	113.77	94.71	93.64	94.18	103.97
29	DPL CA-29 (Arka Lohit)	127.70	142.57	135.13	115.74	106.17	110.96	123.05
30	DPL CA-30 (Konkan Kirti)	139.30	145.37	142.33	63.66	65.31	64.49	103.41
	S.E.m ±	3.44	3.36	2.63	1.71	1.90	1.31	1.43
	C.D.@ 5%	9.73	9.53	7.45	4.85	5.40	3.72	4.06
	C.V.	10.95	5.04	3.96	3.04	3.47	2.36	2.35

(Konkan Kirti) and was statistically at par with DPL-CA-29 (Arka Lohit) with height of 142.57 cm. The lowest plant height (98.70 cm) was recorded in genotype DPL-CA-3 and it was at par with DPL-CA-1, DPL-CA-11 and DPL-CA-21. In pooled *kharif* data, it was observed that the highest plant height (142.33 cm) was recorded in DPL-CA-30 (Konkan Kirti) and DPL-CA-29 (Arka Lohit) was at par (135.13 cm) with it. The lowest plant height (97.47 cm) was observed in DPL-CA-3 which was at par with DPL-CA-1 (103.58 cm).

The plant height at 120 DAP was significant during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data (Table 4d). During 2018-19, the maximum plant height (115.74 cm) was observed in DPL-CA-29 *i.e.*, Arka Lohit which was significantly superior over all other genotypes. The minimum plant height (63.66 cm) was recorded in DPL-CA-30 (Konkan Kirti). During 2019-20, the highest plant height (107.03 cm) was registered in DPL-CA-8 which was at par (106.17 cm) with DPL-CA-29 (Arka Lohit). The lowest plant height (65.31 cm) was seen in genotype DPL-CA-30 (Konkan Kirti).

The pooled *rabi* data pertaining to plant height at 120 DAP revealed that the genotype DPL-CA-29 (Arka Lohit) produced maximum plant height of 110.96 cm and the genotype DPL-CA-8 (108.30 cm) was at par with it. The minimum plant height (64.49 cm) was recorded in DPL-CA-30 (Konkan Kirti).

The overall pooled data regarding plant height at 120 DAP revealed that the difference among the genotypes was significant (Figure 13). The highest plant height (123.05 cm) was registered in DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes. The lowest plant height (95.68 cm) was recorded by DPL-CA-3 and was at par with DPL-CA-1 and DPL-CA-11.

Thus, the wide variation in the plant height was observed at various stages of plant growth (30, 60, 90 and 120 DAP). It was also observed that the magnitude of plant height increases with increase in

age of the plant. The variation in the plant height among the various chilli genotypes can be attributed to the different eco-geographical background to which these genotypes were exposed earlier followed by natural and human selections (Idowu *et al.*, 2012 and Sreelathakumary and Rajamony, 2003). Santhosha *et al.*, 2019 also reported wide range of variability in plant height of 31 genotypes and was in the range of 51 to 106.5 cm. Naganirmala and Mallikarjuna (2019) reported that plant height in chilli genotypes was influenced by season, cultivar as well as their interaction. The highest plant of 114.60 cm was recorded in G-4 whereas lowest plant height of 63.87 cm was recorded in G-5. The genotype with higher plant height may produce more productive canopy which leads to higher yield whereas the genotypes with dwarf canopy are usually suitable for high density planting. The similar results were also reported by Tembhurne *et al.* (2008), Smitha and Basavaraja (2006), Pawar *et al.* (2018) and Pragya Singh *et al.* (2019).

4.1.2 Number of branches

Chilli is having potential to produce varying number of branches. Number of branches produced by the plant is an important growth parameter deciding the canopy spread and in turn is an important parameter deciding the fruit bearing ability of the plant. The number of branches of various genotypes was recorded at monthly interval up to 120 days after planting (*i.e.*, at 30, 60, 90 and 120 DAP) during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding number of branches are presented in Table 5a (30 DAP), Table 5b (60 DAP), Table 5c (90 DAP) and Table 5d (120 DAP).

4.1.2.1 Number of branches at 30 DAP

The number of branches produced by various genotypes at 30 DAP during *kharif* 2018 as well as *kharif* 2019 are presented in Table 5a and the difference among various genotypes was non-significant. The maximum number of branches (4.56) at 30 DAP during *kharif* 2018 was

recorded in DPL-CA-29 (Arka Lohit) whereas the lowest number (3.48) was observed in DPL-CA-30 (Konkan Kirti). During *kharif* 2019, the highest number of branches (5.68) was observed in DPL-CA-14 whereas the number was lowest (3.95) in DPL CA-5 but the difference among them was non-significant. In pooled *kharif* data at 30 DAP, it was observed that the maximum number of branches (4.76) was noted in DPL-CA-19 whereas the minimum branches were registered in DPL-CA-10 (3.95). However, the difference among them was non-significant.

The number of branches at 30 DAP was significant during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data (Table 5a). During 2018-19, the greatest number of branches (5.02) was noticed in DPL-CA-30 (Konkan Kirti) which was significantly superior over all other genotypes. The smallest number of branches (2.56) was found in DPL-CA-17 and was at par with DPL-CA-15 (3.02). During 2019-20, the highest number of branches (4.57) was registered in DPL-CA-30 (Konkan Kirti) which was significantly superior over all other treatments. The lowest number of branches (2.63) was found in genotype DPL-CA-18 but was at par with genotypes DPL-CA-7, DPL-CA-8, DPL-CA-13 and DPL-CA-17.

The perusal of *rabi* pooled data revealed that the genotype DPL-CA-29 produced greatest number of branches of 4.80 and was statistically superior over all other genotypes. The smallest number of branches (2.75) was found in DPL-CA-18 and was at par with DPL-CA-8, DPL-CA-15 and DPL-CA-17.

The perusal of overall pooled data revealed that the difference in various genotypes for number of branches at 30 DAP was significant. The highest number of branches (4.56) was observed in DPL-CA-29 (Arka Lohit) and was at par with other genotypes *viz.* DPL-CA-12, DPL-CA-25, DPL-CA-27 and DPL-CA-28. The lowest number of branches (3.54) was noted in DPL-CA-5 which was at par with various genotypes DPL-CA-2, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-13, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-23 and DPL-CA-24.

Table 5a : Variation in number of branches among chilli genotypes during *kharif* and *rabi* seasons (30 DAP)

S. N.	Genotype	Number of branches at 30 DAP						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	3.95	4.80	4.38	3.58	4.05	3.81	4.09
2	DPL CA-2	3.76	4.50	4.13	3.35	3.54	3.44	3.79
3	DPL CA-3	3.55	4.77	4.16	3.43	3.97	3.70	3.93
4	DPL CA-4	3.89	4.84	4.36	3.58	3.54	3.56	3.96
5	DPL CA-5	3.71	3.95	3.83	3.10	3.38	3.24	3.54
6	DPL CA-6	4.16	4.57	4.37	3.46	3.85	3.66	4.01
7	DPL CA-7	3.67	4.57	4.12	3.54	3.00	3.27	3.70
8	DPL CA-8	3.85	4.77	4.31	3.23	2.79	3.01	3.66
9	DPL CA-9	4.03	4.20	4.12	3.03	3.27	3.15	3.63
10	DPL CA-10	3.86	4.05	3.95	3.56	3.75	3.66	3.80
11	DPL CA-11	4.73	4.68	4.71	3.20	3.43	3.31	4.01
12	DPL CA-12	3.44	5.22	4.33	4.30	4.03	4.17	4.25
13	DPL CA-13	3.97	5.15	4.56	3.38	3.03	3.21	3.88
14	DPL CA-14	3.80	5.68	4.74	3.69	3.44	3.56	4.15
15	DPL CA-15	3.75	5.04	4.40	3.02	3.19	3.10	3.75
16	DPL CA-16	3.76	4.87	4.32	3.33	3.43	3.38	3.85
17	DPL CA-17	4.25	4.42	4.33	2.56	3.09	2.82	3.58
18	DPL CA-18	4.00	5.14	4.57	2.86	2.63	2.75	3.66
19	DPL CA-19	4.52	5.01	4.76	3.62	3.29	3.46	4.11
20	DPL CA-20	4.01	4.83	4.42	3.75	3.75	3.75	4.08
21	DPL CA-21	3.66	4.64	4.15	4.12	3.43	3.77	3.96
22	DPL CA-22	3.94	4.77	4.36	4.01	3.45	3.73	4.04
23	DPL CA-23	3.73	4.49	4.11	3.77	3.28	3.53	3.82
24	DPL CA-24	3.55	4.46	4.01	3.94	3.23	3.59	3.80
25	DPL CA-25	4.09	5.04	4.56	4.19	4.06	4.13	4.34
26	DPL CA-26	3.91	4.52	4.21	4.23	3.78	4.00	4.11
27	DPL CA-27	4.10	5.33	4.72	4.18	4.03	4.11	4.41
28	DPL CA-28	3.98	5.51	4.74	4.01	3.99	4.00	4.37
29	DPL CA-29 (Arka Lohit)	4.56	4.81	4.68	3.94	4.06	4.00	4.34
30	DPL CA-30 (Konkan Kirti)	3.48	5.18	4.33	5.02	4.57	4.80	4.56
	S.E.m ±	0.32	0.36	0.24	0.17	0.18	0.13	0.13
	C.D.@ 5%	NS	NS	NS	0.47	0.50	0.37	0.38
	C.V.	13.97	10.14	9.68	7.88	8.64	6.21	5.77

4.1.2.2 Number of branches at 60 DAP

The number of branches registered by various genotypes at 60 DAP during *kharif* 2018 as well as *kharif* 2019 are presented in Table 5b. In *kharif* 2018, the maximum number of branches (7.01) at 60 DAP was recorded in DPL-CA-1 and the minimum number (5.20) was observed in DPL-CA-30 (Konkan Kirti). However, the difference between them was non-significant. During *kharif* 2019, the highest number of branches (8.55) was noted in DPL-CA-12 which was at par with different other genotypes *viz.* DPL-CA-4, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-23, DPL-CA-24, DPL-CA-27, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The number of branches was lowest (6.45) in DPL-CA-1 and was at par with DPL-CA-2, DPL-CA-3, DPL-CA-10 and DPL-CA-26. In pooled *kharif* data at 60 DAP it was observed that the greatest number of branches (7.55) was found in DPL-CA-12 whereas the minimum branches (6.18) were recorded in DPL-CA-3 however, the difference among them was non-significant.

During *rabi* season, the number of branches at 60 DAP was significant during both years (2018-19 and 2019-20) as well as in pooled *rabi* data (Table 5b). During 2018-19, the maximum number of branches (5.92) was produced in DPL-CA-30 (Konkan Kirti) which was at par with genotypes DPL-CA-1, DPL-CA-20, DPL-CA-22, DPL-CA-25 and DPL-CA-26. The minimum number of branches (3.89) was recorded in DPL-CA-17 which was at par with DPL-CA-8, DPL-CA-9 and DPL-CA-18. During 2019-20, highest number of branches (5.59) was recorded in DPL-CA-30 (Konkan Kirti) which was at par with the genotypes DPL-CA-4, DPL-CA-9, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-15, DPL-CA-27 and DPL-CA-28. The lowest number of branches (3.95) was recorded in genotype DPL-CA-13 but was at par with genotypes DPL-CA-2, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-18, DPL-CA-19, DPL-CA-23 and DPL-CA-24.

Table 5b : Variation number of branches among chilli genotypes during *kharif* and *rabi* seasons (60 DAP)

S. N.	Genotype	Number of branches at 60 DAP						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	7.01	6.45	6.73	5.72	4.84	5.28	6.01
2	DPL CA-2	6.31	6.59	6.45	4.77	4.26	4.52	5.48
3	DPL CA-3	5.34	7.01	6.18	4.82	4.98	4.90	5.54
4	DPL CA-4	5.82	7.82	6.82	4.93	5.40	5.17	5.99
5	DPL CA-5	6.58	7.42	7.00	4.58	4.38	4.48	5.74
6	DPL CA-6	6.23	7.37	6.80	4.82	5.02	4.92	5.86
7	DPL CA-7	6.75	7.53	7.14	4.97	4.25	4.61	5.87
8	DPL CA-8	6.16	7.81	6.99	4.49	4.47	4.48	5.73
9	DPL CA-9	6.78	8.04	7.41	4.20	5.27	4.74	6.07
10	DPL CA-10	6.21	7.07	6.64	4.52	5.16	4.84	5.74
11	DPL CA-11	6.02	8.24	7.13	4.90	5.13	5.02	6.07
12	DPL CA-12	6.54	8.55	7.55	5.01	5.33	5.17	6.36
13	DPL CA-13	6.70	7.74	7.22	4.67	3.95	4.31	5.77
14	DPL CA-14	6.02	7.97	7.00	5.14	5.05	5.09	6.04
15	DPL CA-15	6.82	7.51	7.17	4.65	5.10	4.88	6.02
16	DPL CA-16	6.62	8.16	7.39	4.63	4.74	4.69	6.04
17	DPL CA-17	6.69	7.84	7.27	3.89	4.80	4.34	5.81
18	DPL CA-18	5.91	8.20	7.06	4.20	3.97	4.09	5.57
19	DPL CA-19	6.56	7.23	6.89	4.85	4.12	4.49	5.69
20	DPL CA-20	6.39	8.51	7.45	5.33	5.02	5.17	6.31
21	DPL CA-21	6.12	8.03	7.07	4.92	4.80	4.86	5.97
22	DPL CA-22	6.68	7.50	7.09	5.28	4.83	5.05	6.07
23	DPL CA-23	6.21	8.09	7.15	4.81	4.39	4.60	5.87
24	DPL CA-24	6.03	8.39	7.21	5.02	4.47	4.75	5.98
25	DPL CA-25	6.06	7.43	6.74	5.32	5.05	5.19	5.96
26	DPL CA-26	6.41	7.03	6.72	5.51	4.67	5.09	5.91
27	DPL CA-27	6.07	7.92	7.00	4.95	5.25	5.10	6.05
28	DPL CA-28	6.31	7.74	7.02	5.03	5.38	5.21	6.12
29	DPL CA-29 (Arka Lohit)	5.76	7.90	6.83	5.09	5.14	5.11	5.97
30	DPL CA-30 (Konkan Kirti)	5.20	8.04	6.62	5.92	5.59	5.76	6.19
	S.E.m ±	0.40	0.27	0.24	0.24	0.18	0.16	0.14
	C.D.@ 5%	NS	0.77	NS	0.68	0.52	0.45	0.39
	C.V.	11.12	6.08	5.85	8.46	6.60	5.59	3.97

The perusal of pooled *rabi* revealed that the genotype DPL-CA-30 (Konkan Kirti) produced maximum number of branches (5.76) and was significantly superior over all other genotypes. The minimum number of branches (4.09) was noted in DPL-CA-18 which was at par with DPL-CA-2, DPL-CA-5, DPL-CA-8, DPL-CA-13, DPL-CA-17 and DPL-CA-19.

The perusal of overall pooled data revealed that the difference in various genotypes for number of branches at 60 DAP was significant. The highest number of branches (6.36) was recorded in DPL-CA-12 which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-4, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-24, DPL-CA-27, DPL-CA-28, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The lowest number of branches (5.48) was registered by DPL-CA-2 which was at par with various genotypes DPL-CA-3, DPL-CA-5, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-11, DPL-CA-13, DPL-CA-17, DPL-CA-18, DPL-CA-19 and DPL-CA-23.

4.1.2.3 Number of branches at 90 DAP

The number of branches produced by various genotypes at 90 DAP during *kharif* 2018 and *kharif* 2019 are presented in Table 5c. In *kharif* 2018, the greatest number of branches (8.97) at 90 DAP was found in DPL-CA-15 and the smallest number (7.40) was produced in DPL-CA-18 however, the difference between the various genotype was non-significant. During *kharif* 2019, the maximum number of branches (9.13) was produced in DPL-CA-20 and was at par with all other genotypes except DPL-CA-1, DPL-CA-2, DPL-CA-6, DPL-CA-7, DPL-CA-10, DPL-CA-15, DPL-CA-19, DPL-CA-22 and DPL-CA-26. The number of branches was minimum (7.49) in DPL-CA-1 which was at par with DPL-CA-2, DPL-CA-6, DPL-CA-7, DPL-CA-10, DPL-CA-15, DPL-CA-19, DPL-CA-22 and DPL-CA-26. In pooled *kharif* data at 90 DAP it was observed that the highest number of branches (8.90) was recorded in DPL-CA-12 whereas the lowest branches (7.76) were recorded in DPL-CA-2, however the difference among them was non-significant.

Table 5c : Variation in number of branches among chilli genotypes during *kharif* and *rabi* seasons (90 DAP)

S. N.	Genotype	Number of branches at 90 DAP (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	8.30	7.49	7.89	7.90	5.96	6.93	7.41
2	DPL CA-2	7.99	7.53	7.76	6.57	5.99	6.28	7.02
3	DPL CA-3	8.07	8.63	8.35	7.01	6.12	6.57	7.46
4	DPL CA-4	8.52	8.54	8.53	7.07	6.22	6.65	7.59
5	DPL CA-5	8.16	<u>8.30</u>	8.23	6.76	6.17	6.46	7.35
6	DPL CA-6	8.04	8.03	8.04	5.44	6.20	5.82	6.93
7	DPL CA-7	8.62	8.28	8.45	6.42	5.69	6.06	7.25
8	DPL CA-8	8.34	8.58	8.46	7.22	5.63	6.43	7.44
9	DPL CA-9	8.20	9.00	8.60	6.42	6.21	6.31	7.46
10	DPL CA-10	8.77	7.69	8.23	5.19	6.11	5.65	6.94
11	DPL CA-11	7.79	8.63	8.21	6.45	6.06	6.25	7.23
12	DPL CA-12	8.74	9.06	8.90	6.71	6.07	6.39	7.64
13	DPL CA-13	8.96	8.42	8.69	6.62	4.99	5.80	7.25
14	DPL CA-14	8.10	8.64	8.37	7.16	6.10	6.63	7.50
15	DPL CA-15	8.97	8.07	8.52	6.03	6.19	6.11	7.31
16	DPL CA-16	8.26	8.57	8.42	6.04	5.61	5.83	7.12
17	DPL CA-17	7.94	8.49	8.22	5.85	6.01	5.93	7.07
18	DPL CA-18	7.40	8.68	8.04	5.98	5.14	5.56	6.80
19	DPL CA-19	8.18	8.17	8.17	6.44	5.64	6.04	7.11
20	DPL CA-20	8.11	9.13	8.62	6.95	5.86	6.41	7.51
21	DPL CA-21	8.07	8.87	8.47	6.24	6.01	6.13	7.30
22	DPL CA-22	8.35	8.14	8.25	6.97	5.57	6.27	7.26
23	DPL CA-23	7.47	8.85	8.16	6.82	5.17	6.00	7.08
24	DPL CA-24	7.79	9.12	8.45	6.79	5.83	6.31	7.38
25	DPL CA-25	7.98	8.35	8.17	6.97	6.09	6.53	7.35
26	DPL CA-26	8.00	7.93	7.97	7.06	5.86	6.46	7.22
27	DPL CA-27	7.95	8.66	8.31	7.00	6.25	6.62	7.47
28	DPL CA-28	7.74	8.57	8.16	7.27	6.16	6.72	7.44
29	DPL CA-29 (Arka Lohit)	8.00	8.73	8.37	6.96	6.25	6.61	7.49
30	DPL CA-30 (Konkan Kirti)	7.97	8.88	8.43	7.57	6.73	7.15	7.79
	S.E.m ±	0.39	0.29	0.26	0.30	0.21	0.18	0.16
	C.D.@ 5%	NS	0.83	NS	0.85	0.59	0.51	0.45
	C.V.	7.37	5.97	5.34	7.74	6.09	4.93	3.75

During *rabi* season, the number of branches at 90 DAP was significant during both years (2018-19 and 2019-20) as well as in pooled *rabi* data (Table 5c). During 2018-19, the maximum number of branches (7.90) was produced in DPL-CA-1 which was at par with genotypes DPL-CA-4, DPL-CA-8, DPL-CA-14, DPL-CA-28 and DPL-CA-30 (Konkan Kirti). The minimum number of branches (5.19) was recorded in DPL-CA-10 and was at par with DPL-CA-6, DPL-CA-15, DPL-CA-16, DPL-CA-17 and DPL-CA-18. During 2019-20, the highest number of branches (6.73) was registered in DPL-CA-30 (Konkan Kirti) which was at par with the genotypes DPL-CA-4, DPL-CA-5, DPL-CA-6, DPL-CA-9, DPL-CA-15, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). The lowest number of branches (4.99) was recorded in genotype DPL-CA-13 but was at par with genotypes DPL-CA-18, DPL-CA-22 and DPL-CA-23.

The perusal of pooled *rabi* data regarding number of branches at 90 DAP revealed that the genotype DPL-CA-30 (Konkan Kirti) produced greatest number of branches (7.15) which was at par with DPL-CA-1, DPL-CA-4 and DPL-CA-28. The smallest number of branches (5.56) was recorded in DPL-CA-18 and was at par with DPL-CA-6, DPL-CA-7, DPL-CA-10, DPL-CA-13, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19 and DPL-CA-23.

The difference in various genotypes regarding number of branches at 90 DAP was significant in overall pooled data. The maximum number of branches (7.79) was registered in DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-4, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-12, DPL-CA-14, DPL-CA-20, DPL-CA-24, DPL-CA-25, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). The minimum number of branches (6.80) was recorded by DPL-CA-18 which was at par with various genotypes DPL-CA-2, DPL-CA-6, DPL-CA-7, DPL-CA-10, DPL-CA-11, DPL-CA-13, DPL-CA-16, DPL-CA-17, DPL-CA-19, DPL-CA-23 and DPL-CA-26.

4.1.2.3 Number of branches at 120 DAP

The number of branches produced by various genotypes during *kharif* 2018 and *kharif* 2019 at 120 DAP are presented in Table 5d. In

kharif 2018, the highest number of branches (9.70) at 120 DAP was recorded in DPL-CA-22 and the lowest number (8.70) was produced in DPL-CA-28 however, the difference between the various genotype was non-significant. During *kharif* 2019, the maximum number of branches (10.37) was registered in DPL-CA-7 and was at par with all other genotypes *viz.* DPL-CA-3, DPL-CA-4, DPL-CA-12, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-24 and DPL-CA-29 (Arka Lohit). The number of branches was minimum (8.88) in DPL-CA-2 which was at par with DPL-CA-1, DPL-CA-5, DPL-CA-6, DPL-CA-10, DPL-CA-15, DPL-CA-19, DPL-CA-22, DPL-CA-25, DPL-CA-26, DPL-CA-27 and DPL-CA-28. In pooled *kharif* data at 120 DAP, it was observed that the greatest number of branches (10.01) was found in DPL-CA-7 whereas the smallest number of branches (9.00) was noted in DPL-CA-6, however the difference among them was non-significant.

During *rabi* season of both the years (*i.e.*, 2018-19 and 2019-20) as well as in pooled *rabi* data, the number of branches at 120 DAP was significant (Table 5d). During 2018-19, the maximum number of branches (8.93) was observed in DPL-CA-14 which was at par with DPL-CA-8, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-28 DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The minimum number of branches (6.98) was found in DPL-CA-10 and was at par with DPL-CA-9, DPL-CA-15 and DPL-CA-16. During 2019-20, the highest number of branches (8.07) was produced in DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-3, DPL-CA-4, DPL-CA-9, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-20, DPL-CA-21, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). The lowest number of branches (6.82) was noted in genotype DPL-CA-1 which was at par with genotypes DPL-CA-2, DPL-CA-5, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-16, DPL-CA-18, DPL-CA-19, DPL-CA-22 and DPL-CA-23.

Table 5d : Variation in number of branches among chilli genotypes during *kharif* and *rabi* seasons (120 DAP)

S. N.	Genotype	Number of branches at 120 DAP (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	9.60	9.27	9.44	8.17	6.82	7.49	8.47
2	DPL CA-2	9.62	8.88	9.25	8.03	6.95	7.49	8.37
3	DPL CA-3	9.61	10.00	9.81	8.15	7.48	7.81	8.81
4	DPL CA-4	9.35	9.91	9.63	8.23	7.62	7.93	8.78
5	DPL CA-5	9.24	9.15	9.20	7.98	7.39	7.69	8.44
6	DPL CA-6	9.02	8.97	9.00	7.73	7.42	7.58	8.29
7	DPL CA-7	9.64	10.37	10.01	7.87	7.08	7.48	8.74
8	DPL CA-8	9.40	9.78	9.59	8.67	6.88	7.78	8.68
9	DPL CA-9	9.55	9.59	9.57	7.51	7.52	7.52	8.54
10	DPL CA-10	9.43	9.00	9.22	6.98	7.27	7.13	8.17
11	DPL CA-11	9.29	9.64	9.47	8.06	7.43	7.74	8.61
12	DPL CA-12	9.35	10.03	9.69	8.12	7.31	7.72	8.71
13	DPL CA-13	9.61	9.75	9.68	8.27	6.83	7.55	8.62
14	DPL CA-14	9.09	9.78	9.44	8.93	7.49	8.21	8.82
15	DPL CA-15	9.51	9.17	9.34	7.32	7.54	7.43	8.39
16	DPL CA-16	8.84	9.83	9.34	7.39	7.31	7.35	8.34
17	DPL CA-17	9.26	9.85	9.55	7.87	7.81	7.84	8.70
18	DPL CA-18	9.48	9.82	9.65	8.31	7.04	7.68	8.66
19	DPL CA-19	9.39	8.97	9.18	8.50	7.26	7.88	8.53
20	DPL CA-20	9.08	10.03	9.56	8.36	7.55	7.95	8.75
21	DPL CA-21	9.45	9.98	9.71	8.13	7.64	7.89	8.80
22	DPL CA-22	9.70	9.03	9.37	8.45	7.09	7.77	8.57
23	DPL CA-23	9.11	9.67	9.39	7.94	7.17	7.56	8.47
24	DPL CA-24	8.71	9.99	9.35	8.21	7.47	7.84	8.60
25	DPL CA-25	9.18	9.39	9.29	8.44	7.95	8.20	8.74
26	DPL CA-26	8.98	9.31	9.15	8.38	7.60	7.99	8.57
27	DPL CA-27	8.71	9.39	9.05	8.54	8.00	8.27	8.66
28	DPL CA-28	8.70	9.44	9.07	8.39	7.88	8.14	8.60
29	DPL CA-29 (Arka Lohit)	8.96	10.00	9.48	8.67	7.89	8.28	8.88
30	DPL CA-30 (Konkan Kirti)	9.42	9.66	9.54	8.83	8.07	8.45	9.00
	S.E.m ±	0.31	0.21	0.19	0.22	0.22	0.17	0.12
	C.D.@ 5%	NS	0.60	NS	0.62	0.62	0.48	0.34
	C.V.	6.40	3.81	3.46	4.63	5.10	3.75	2.39

The perusal of pooled *rabi* data regarding number of branches at 90 DAP revealed that genotype DPL-CA-30 (Konkan Kirti) registered greatest number of branches (8.45) which was at par with DPL-CA-14, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). The smallest number of branches (7.13) was recorded in DPL-CA-10 and was at par with DPL-CA-1, DPL-CA-2, DPL-CA-6, DPL-CA-7, DPL-CA-13, DPL-CA-15, DPL-CA-16 and DPL-CA-23.

The difference in various genotypes regarding number of branches at 120 DAP was significant in overall pooled data. The highest number of branches (9.00) was registered in DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-12, DPL-CA-14, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-25, DPL-CA-27 and DPL-CA-29 (Arka Lohit). The lowest number of branches (8.17) was recorded by DPL-CA-10 and was at par with various genotypes DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-6, DPL-CA-15, DPL-CA-16 and DPL-CA-23.

The variation in number of branches is dependent on the plant architecture which is in turn dependent on genetic constituent as well as the edaphic factors under which the crop is being grown. The increase in the number of branches as varietal response is due to accumulation of assimilates in the growing plant which initiates more number of branches (Nagullie and Biswis, 2019). Ritu Rani *et al.* (2017) also reported variation in number of branches from 13.87 (HC-50) to 28.27 (12CHIV AR-1). The similar trend in number of branches was also reported by Pragya Singh *et al.* (2019). Ukkund *et al.* (2007), Kumar *et al.* (2014), Kerketta *et al.* (2018) and Pawar *et al.* (2018).

4.1.3 Plant canopy width (cm)

Plant canopy width decides the plant architecture and also contribute to the yield potential of the plant. It is also considered important as it also decides the spacing to be maintained in between rows and plants which ultimately decides the plant population per unit

area. The plant canopy width of various genotypes was recorded at monthly interval up to 120 days after planting (*i.e.*, at 30, 60, 90 and 120 DAP) during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding plant height are presented in Table 6a (30 DAP), Table 6b (60 DAP), Table 6c (90 DAP) and Table 6d (120 DAP).

4.1.3.1 Plant canopy width at 30 DAP

The plant canopy width recorded in various genotypes at 30 DAP during *kharif* 2018 as well as *kharif* 2019 are presented in Table 6a. No significant difference among various genotypes was observed. The maximum plant canopy width (24.08 cm) at 30 DAP during *kharif* 2018 was registered in DPL-CA-17, it was minimum (18.44 cm) in DPL-CA-20. During *kharif* 2019, the greatest plant canopy width (21.90 cm) was found in DPL-CA-21 whereas it was smallest (18.13 cm) in DPL-CA-4 but the difference among them was non-significant. In pooled *kharif* data at 30 DAP it was observed that the highest plant canopy width (22.44 cm) was in DPL-CA-21 which was at par with DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-22, DPL-CA-24, DPL-CA-26, DPL-CA-29 and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width was recorded in DPL-CA-20 (18.40 cm) and the genotypes DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-5, DPL-CA-6, DPL-CA-9, DPL-CA-15, DPL-CA-23, DPL-CA-25 and DPL-CA-27 were at par with it.

The plant canopy width at 30 DAP during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data was significant (Table 6a). During 2018-19, the greatest plant canopy width (24.29 cm) was observed in DPL-CA-9 which was at par with other genotypes *viz.* DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-14, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-26, and DPL-CA-30 (Konkan Kirti). The smallest plant canopy width (17.22 cm) was recorded in DPL-CA-21 which was at par with DPL-CA-1, DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-5, DPL-CA-6, DPL-CA-11, DPL-CA-12, DPL-CA-13,

Table 6a : Variation in plant canopy width among chilli genotypes during *kharif* and *rabi* seasons (30 DAP)

S. N.	Genotype	Plant canopy width at 30 DAP (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	20.85	21.04	20.95	20.03	24.06	22.05	21.50
2	DPL CA-2	19.71	18.30	19.01	17.29	19.72	18.51	18.76
3	DPL CA-3	18.54	18.95	18.75	20.58	22.64	21.61	20.18
4	DPL CA-4	23.30	18.13	20.72	18.97	20.65	19.81	20.26
5	DPL CA-5	20.62	20.04	20.33	20.25	23.58	21.92	21.12
6	DPL CA-6	20.35	19.56	19.96	17.89	20.76	19.33	19.64
7	DPL CA-7	23.12	20.83	21.98	21.06	22.98	22.02	22.00
8	DPL CA-8	20.57	20.92	20.74	24.03	26.12	25.07	22.91
9	DPL CA-9	20.35	20.67	20.51	24.29	24.48	24.39	22.45
10	DPL CA-10	22.22	21.80	22.01	23.22	22.35	22.79	22.40
11	DPL CA-11	22.19	21.82	22.00	19.08	20.65	19.86	20.93
12	DPL CA-12	23.43	21.38	22.41	19.64	22.15	20.89	21.65
13	DPL CA-13	21.92	19.32	20.62	19.51	24.51	22.01	21.31
14	DPL CA-14	22.08	20.05	21.07	23.76	24.82	24.29	22.68
15	DPL CA-15	20.00	18.82	19.41	19.24	20.26	19.75	19.58
16	DPL CA-16	20.97	20.59	20.78	20.33	22.36	21.35	21.06
17	DPL CA-17	24.08	20.50	22.29	19.25	20.91	20.08	21.19
18	DPL CA-18	22.12	20.62	21.37	20.48	22.60	21.54	21.45
19	DPL CA-19	22.00	20.48	21.24	20.67	21.75	21.21	21.22
20	DPL CA-20	18.44	18.35	18.40	23.43	23.30	23.37	20.88
21	DPL CA-21	22.98	21.90	22.44	17.22	19.71	18.47	20.45
22	DPL CA-22	22.27	21.05	21.66	21.59	23.60	22.60	22.13
23	DPL CA-23	19.45	19.00	19.23	21.57	22.16	21.86	20.54
24	DPL CA-24	22.97	21.50	22.23	21.46	23.13	22.29	22.26
25	DPL CA-25	20.24	18.27	19.25	19.12	20.33	19.73	19.49
26	DPL CA-26	21.07	19.93	20.50	24.04	24.05	24.05	22.27
27	DPL CA-27	20.77	19.27	20.02	18.35	19.85	19.10	19.56
28	DPL CA-28	22.00	20.12	21.06	18.84	20.76	19.80	20.43
29	DPL CA-29 (Arka Lohit)	20.70	20.88	20.79	20.40	23.31	21.86	21.33
30	DPL CA-30 (Konkan Kirti)	22.80	21.33	22.07	21.87	25.44	23.66	22.86
	S.E.m ±	1.34	1.08	0.82	1.31	1.12	0.86	0.62
	C.D.@ 5%	NS	NS	2.34	3.70	3.18	2.44	1.77
	C.V.	5.72	9.28	6.86	10.98	8.65	6.94	5.10

DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-25, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). During 2019-20, the maximum plant canopy width (26.12 cm) was found in DPL-CA-8 which was statistically at par with DPL-CA-1, DPL-CA-5, DPL-CA-7, DPL-CA-9, DPL-CA-13, DPL-CA-14, DPL-CA-20, DPL-CA-22, DPL-CA-24, DPL-CA-26, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The minimum canopy width (19.71 cm) was noted in genotype DPL-CA-21 but was at par with genotypes DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-23 and DPL-CA-25.

The perusal of pooled *rabi* data pertaining to plant canopy width at 30 DAP revealed that the genotype DPL-CA-8 produced highest canopy width of 25.07 cm and was statistically at par with genotypes DPL-CA-9, DPL-CA-10, DPL-CA-14, DPL-CA-20, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width (18.47 cm) was recorded in DPL-CA-21 which was at par with DPL-CA-2, DPL-CA-4, DPL-CA-6, DPL-CA-11, DPL-CA-12, DPL-CA-15 and DPL-CA-25.

The perusal of overall pooled data revealed that the difference in various genotypes with respect to plant canopy width at 30 DAP was significant. The maximum plant canopy width (22.86 cm) was registered in DPL-CA-30 (Konkan Kirti) and was significantly at par with DPL-CA-1, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-22, DPL-CA-24, DPL-CA-26 and DPL-CA-29 (Arka Lohit). The minimum plant canopy width (18.76 cm) was produced by DPL-CA-2 and was at par with various genotypes DPL-CA-3, DPL-CA-4, DPL-CA-15, DPL-CA-21, DPL-CA-25, DPL-CA-27 and DPL-CA-28.

4.1.3.2 Plant canopy width at 60 DAP

The plant canopy width recorded in various genotypes at 60 DAP during *kharif* 2018 as well as *kharif* 2019 are presented in Table 6b. Plant canopy width in various genotypes exhibited non-significant difference. The highest plant canopy width (44.57 cm) at 60 DAP during

kharif 2018 was recorded in DPL-CA-19 whereas it was lowest (37.09 cm) in DPL-CA-22. During *kharif* 2019, the greatest plant canopy width (42.25 cm) was noted in DPL-CA-15 which was at par with DPL-CA-4, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-12, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA- 21, DPL-CA-23, DPL-CA-25, DPL-CA-27, DPL-CA- 28, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The smallest (37.42 cm) plant canopy width was noted in DPL-CA-2 which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-16, DPL-CA-19, DPL-CA- 22, DPL-CA-24 and DPL-CA-26. The perusal of pooled *kharif* data revealed that the highest plant canopy width (43.20 cm) was recorded in DPL-CA-15 which was at par with DPL-CA-2, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA- 10, DPL-CA-14, DPL-CA-18, DPL-CA-19, DPL-CA-21, DPL-CA-23, DPL-CA-25, DPL-CA-27, DPL-CA- 28, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width was found in DPL-CA-22 (37.41 cm) and the genotypes DPL-CA-1, DPL-CA-3, DPL-CA-11, DPL-CA-13, DPL-CA-24 and DPL-CA-26 were at par with it.

The plant canopy width at 60 DAP during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data was significant (Table 6b). During 2018-19, it was observed that the maximum plant canopy width (43.80 cm) was recorded in DPL-CA-14 which was at par with DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA- 22, DPL-CA-24, DPL-CA-26, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). The minimum plant canopy width was recorded in DPL-CA-2 (29.57 cm) and the genotypes DPL-CA-1 and DPL-CA-27 were at par with it.

During 2019-20, the highest plant canopy width (41.60 cm) was registered in DPL-CA-20 which was statistically at par with DPL-CA-1, DPL-CA-5, DPL-CA-8, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-25 and DPL-CA-26. The lowest plant canopy width (34.84 cm) was recorded in genotype DPL-CA-4 which was at par with all the remaining genotypes which were not at par with DPL-CA-20 which produced maximum plant canopy width.

Table 6b : Variation in plant canopy width among chilli genotypes during *kharif* and *rabi* seasons (60 DAP)

S. N.	Genotype	Plant canopy width at 60 DAP (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	40.12	38.53	39.33	33.13	40.35	36.74	38.03
2	DPL CA-2	44.33	37.42	40.88	29.57	36.65	33.11	36.99
3	DPL CA-3	37.97	38.60	38.28	36.04	35.12	35.58	36.93
4	DPL CA-4	40.53	40.85	40.69	37.24	34.84	36.04	38.37
5	DPL CA-5	44.01	41.03	42.52	37.64	39.04	38.34	40.43
6	DPL CA-6	39.70	39.33	39.52	33.62	35.59	34.61	37.06
7	DPL CA-7	41.57	39.47	40.52	38.54	37.72	38.13	39.32
8	DPL CA-8	41.53	40.70	41.12	38.17	41.48	39.83	40.47
9	DPL CA-9	44.03	40.77	42.40	39.19	37.42	38.30	40.35
10	DPL CA-10	42.09	42.07	42.08	39.52	37.07	38.29	40.19
11	DPL CA-11	39.54	38.63	39.08	37.09	37.45	37.27	38.18
12	DPL CA-12	40.77	40.57	40.67	38.37	40.44	39.41	40.04
13	DPL CA-13	38.63	38.06	38.35	39.10	37.43	38.27	38.31
14	DPL CA-14	43.10	39.00	41.05	43.80	40.99	42.40	41.72
15	DPL CA-15	44.14	42.25	43.20	36.83	40.03	38.43	40.81
16	DPL CA-16	41.07	39.22	40.14	41.15	40.95	41.05	40.60
17	DPL CA-17	40.75	39.81	40.28	40.87	39.27	40.07	40.18
18	DPL CA-18	43.37	41.63	42.50	42.53	40.45	41.49	42.00
19	DPL CA-19	44.57	39.43	42.00	39.96	36.91	38.43	40.22
20	DPL CA-20	40.40	40.53	40.47	39.24	41.60	40.42	40.44
21	DPL CA-21	43.30	40.64	41.97	35.28	37.52	36.40	39.19
22	DPL CA-22	37.09	37.73	37.41	41.75	35.42	38.59	38.00
23	DPL CA-23	41.67	41.60	41.63	37.41	37.79	37.60	39.62
24	DPL CA-24	40.30	38.22	39.26	43.34	36.84	40.09	39.68
25	DPL CA-25	42.62	41.38	42.00	37.78	39.11	38.44	40.22
26	DPL CA-26	39.00	38.21	38.60	42.82	40.23	41.52	40.06
27	DPL CA-27	44.17	41.15	42.66	32.56	37.16	34.86	38.76
28	DPL CA-28	43.50	40.58	42.04	35.92	36.87	36.39	39.22
29	DPL CA-29 (Arka Lohit)	40.63	41.24	40.94	42.84	36.68	39.76	40.35
30	DPL CA-30 (Konkan Kirti)	41.60	41.35	41.48	42.43	38.09	40.26	40.87
	S.E.m ±	1.61	0.88	0.87	1.36	1.18	0.87	0.56
	C.D.@ 5%	NS	2.50	2.46	3.87	3.36	2.46	1.59
	C.V.	6.72	3.81	3.68	6.14	5.37	3.92	2.46

The perusal of pooled *rabi* data pertaining to plant canopy width at 60 DAP revealed that the genotype DPL-CA-14 produced greatest canopy width of 42.40 cm and was statistically at par with DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-20, DPL-CA-24, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The smallest plant canopy width (33.11 cm) was recorded in DPL-CA-2 which was at par with DPL-CA-6 and DPL-CA-27.

The perusal of overall pooled data revealed that the difference in various genotypes with respect to plant canopy width at 60 DAP was significant. The highest plant canopy width (42.00 cm) was recorded in DPL-CA-18 which was at par with DPL-CA-5, DPL-CA-8, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-20 and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width (36.93 cm) was recorded by DPL-CA-3 which was at par with various genotypes DPL-CA-1, DPL-CA-2, DPL-CA-4, DPL-CA-6, DPL-CA-11, DPL-CA-13, DPL-CA-22 and DPL-CA-27.

4.1.3.3 Plant canopy width at 90 DAP

The plant canopy width recorded in various genotypes at 90 DAP during *kharif* 2018 as well as *kharif* 2019 are presented in Table 6c. Plant canopy width in various genotypes exhibited non-significant difference during *kharif* 2018. The maximum plant canopy width (64.92 cm) during *kharif* 2018 was registered in DPL-CA-20 whereas it was minimum (51.30 cm) in DPL-CA-2. During *kharif* 2019, the highest plant canopy width (58.12 cm) was produced in DPL-CA-18 which was at par with DPL-CA-1, DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-15, DPL-CA-23 and DPL-CA-27. The lowest (49.68 cm) plant canopy width was observed in DPL-CA-22 which was at par with DPL-CA-5, DPL-CA-6, DPL-CA-9, DPL-CA-14, DPL-CA-19, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-28 and DPL-CA-30 (Konkan Kirti). The perusal of pooled *kharif* data at 90 DAP exhibited maximum plant canopy width (60.03 cm) in DPL-CA-4 which was at par with DPL-CA-1, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-18, DPL-CA-20, DPL-CA-25, DPL-CA-27 and DPL-CA-28. The minimum plant canopy width (53.34 cm) was recorded in DPL-CA-11.

Table 6c : Variation in plant canopy width among chilli genotypes during kharif and rabi seasons (90 DAP)

S.N.	Genotype	Plant width width at 90 DAP (cm)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	58.82	55.83	57.33	40.28	43.76	42.02	49.67
2	DPL CA-2	51.30	55.82	53.56	37.57	40.50	39.03	46.30
3	DPL CA-3	52.33	56.40	54.37	43.05	41.63	42.34	48.35
4	DPL CA-4	62.43	57.62	60.03	43.18	42.79	42.99	51.51
5	DPL CA-5	59.07	52.07	55.57	43.71	45.55	44.63	50.10
6	DPL CA-6	56.30	52.63	54.47	38.88	41.59	40.24	47.35
7	DPL CA-7	59.07	54.42	56.74	43.36	43.80	43.58	50.16
8	DPL CA-8	59.20	55.28	57.24	42.37	46.21	44.29	50.77
9	DPL CA-9	54.60	52.78	53.69	44.21	43.58	43.89	48.79
10	DPL CA-10	60.60	56.17	58.38	42.66	45.30	43.98	51.18
11	DPL CA-11	52.70	53.97	53.34	45.60	43.26	44.43	48.88
12	DPL CA-12	63.25	54.52	58.89	45.12	45.43	45.28	52.08
13	DPL CA-13	57.53	54.65	56.09	44.94	45.09	45.01	50.55
14	DPL CA-14	60.10	52.57	56.34	47.79	45.60	46.69	51.51
15	DPL CA-15	57.40	55.73	56.56	40.79	43.41	42.10	49.33
16	DPL CA-16	56.50	53.49	54.99	45.10	46.23	45.67	50.33
17	DPL CA-17	55.43	54.12	54.78	48.20	43.36	45.78	50.28
18	DPL CA-18	59.13	58.12	58.63	47.98	46.35	47.17	52.90
19	DPL CA-19	54.97	52.53	53.75	46.23	45.83	46.03	49.89
20	DPL CA-20	64.92	54.00	59.46	47.33	47.88	47.61	53.53
21	DPL CA-21	53.93	53.95	53.94	41.85	45.68	43.76	48.85
22	DPL CA-22	60.02	49.68	54.85	44.97	46.66	45.81	50.33
23	DPL CA-23	56.10	55.06	55.58	42.07	41.48	41.78	48.68
24	DPL CA-24	56.65	50.89	53.77	47.70	43.69	45.70	49.73
25	DPL CA-25	62.97	53.07	58.02	42.21	43.31	42.76	50.39
26	DPL CA-26	55.53	50.61	53.07	47.86	45.03	46.45	49.76
27	DPL CA-27	56.77	55.30	56.03	42.20	43.76	42.98	49.51
28	DPL CA-28	59.40	52.65	56.02	41.76	42.22	41.99	49.01
29	DPL CA-29 Arka Lohit)	55.53	54.17	54.85	46.46	45.39	45.93	50.39
30	DPL CA-30 (Konkan Kirti)	59.90	50.75	55.32	50.46	47.45	48.96	52.14
	S.E.m ±	2.18	1.34	1.43	1.57	0.79	0.91	0.92
	C.D.@ 5%	NS	3.79	4.06	4.45	2.25	2.58	2.62
	C.V.	7.29	4.29	4.43	6.14	3.09	3.55	3.19

The plant canopy width at 90 DAP during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data was significant (Table 6c). During 2018-19, it was observed that the highest plant canopy width (50.46 cm) was recorded in DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-14, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-24, DPL-CA-26 and DPL-CA-29 (Arka Lohit) whereas the lowest plant canopy width was found in DPL-CA-2 (37.57 cm) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-15, DPL-CA-21 and DPL-CA-28.

During 2019-20, the greatest plant canopy width (47.88 cm) was registered in DPL-CA-20 which was statistically at par with DPL-CA-8, DPL-CA-16, DPL-CA-18, DPL-CA-19, DPL-CA-21, DPL-CA-22 and DPL-CA-30 (Konkan Kirti). The smallest canopy width (40.50 cm) was exhibited by genotype DPL-CA-2 which was at par with DPL-CA-3, DPL-CA-6, DPL-CA-23 and DPL-CA-28.

The perusal of pooled *rabi* data pertaining to plant canopy width at 90 DAP revealed that the genotype DPL-CA-30 (Konkan Kirti) produced maximum canopy width of 48.96 cm and was statistically at par with DPL-CA-14, DPL-CA-18, DPL-CA-20 and DPL-CA-26. The minimum plant canopy width (39.03 cm) was registered in DPL-CA-2 which was at par with DPL-CA-6 (40.24 cm).

The overall pooled data regarding plant canopy width at 90 DAP are presented in Table 6c. The perusal of data revealed that the significant difference exists in various genotypes with respect to plant canopy width at 90 DAP. The highest plant canopy width (53.53 cm) was noted in DPL-CA-20 which was at par with DPL-CA-4, DPL-CA-10, DPL-CA-12, DPL-CA-14, DPL-CA-18 and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width (46.30 cm) was recorded by DPL-CA-2 which was at par with DPL-CA-3, DPL-CA-6, DPL-CA-9, DPL-CA-11, DPL-CA-21 and DPL-CA-23.

4.1.3.4 Plant canopy width at 120 DAP

The plant canopy width registered during *kharif* 2018 as well as *kharif* 2019 in various genotypes at 120 DAP is presented in Table 6d. Plant canopy width in various genotypes exhibited non-significant difference during *kharif* 2018 as well as in *kharif* pooled analysis. The greatest plant canopy width (66.22 cm) during *kharif* 2018 was exhibited in DPL-CA-23 whereas it was minimum (58.45 cm) in DPL-CA-30 (Konkan Kirti). During *kharif* 2019, the difference in the genotype with respect to plant canopy width at 120 DAP was significant. The highest plant canopy width (60.17 cm) was registered in DPL-CA-18 which was at par with DPL-CA-1, DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-16, DPL-CA-17, DPL-CA-20, DPL-CA-21, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-27 and DPL-CA-29 (Arka Lohit). The lowest (54.49 cm) plant canopy width was observed in DPL-CA-26 and it was at par with DPL-CA-5, DPL-CA-6, DPL-CA-9, DPL-CA-11, DPL-CA-14, DPL-CA-19, DPL-CA-22, DPL-CA-26, DPL-CA-28 and DPL-CA-30 (Konkan Kirti). The perusal of pooled *kharif* data at 120 DAP noted non-significant difference among various genotypes. However, it was maximum (62.77 cm) in DPL-CA-8 and minimum (57.45 cm) in DPL-CA-30 (Konkan Kirti).

The plant canopy width at 120 DAP during both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data was significant (Table 6d). During 2018-19, it was observed that the highest plant canopy width (52.36 cm) was recorded in DPL-CA-30 (Konkan Kirti) and was at par with DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-23, DPL-CA-24, DPL-CA-26 and DPL-CA-29 (Arka Lohit). The lowest plant canopy width was registered in DPL-CA-6 (42.35 cm) which was at par with DPL-CA-1, DPL-CA-2 and DPL-CA-8.

During 2019-20, the greatest plant canopy width (52.48 cm) was produced in DPL-CA-30 (Konkan Kirti) which was statistically at par with DPL-CA-5, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-19, DPL-

Table 6d : Variation plant canopy width among chilli genotypes during *kharif* and *rabi* seasons (120 DAP)

S. N.	Genotype	Plant canopy width at 120 DAP (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	59.57	59.34	59.46	44.80	48.42	46.61	53.04
2	DPL CA-2	64.01	58.67	61.37	42.77	46.01	44.39	52.88
3	DPL CA-3	58.03	59.34	59.02	47.44	48.32	47.88	53.45
4	DPL CA-4	64.40	59.77	62.42	47.55	49.54	48.55	55.48
5	DPL CA-5	63.50	54.69	60.76	46.77	51.21	48.99	54.87
6	DPL CA-6	66.10	56.53	61.31	42.35	47.81	45.08	53.20
7	DPL CA-7	62.58	58.91	60.92	47.60	49.07	48.34	54.63
8	DPL CA-8	66.20	59.18	62.77	45.28	52.47	48.87	55.82
9	DPL CA-9	63.40	56.51	59.96	48.07	49.35	48.71	54.33
10	DPL CA-10	62.05	59.31	62.35	46.92	50.72	48.82	55.58
11	DPL CA-11	65.95	57.11	61.53	49.30	47.99	48.65	55.09
12	DPL CA-12	62.66	58.35	61.34	49.63	50.95	50.29	55.82
13	DPL CA-13	65.03	59.83	62.43	48.83	49.51	49.17	55.80
14	DPL CA-14	64.50	55.95	60.59	49.03	49.22	49.13	54.86
15	DPL CA-15	60.23	58.30	59.27	46.55	48.93	47.74	53.50
16	DPL CA-16	64.07	57.57	60.82	50.70	49.80	50.25	55.54
17	DPL CA-17	64.73	58.73	61.73	50.55	48.45	49.50	55.62
18	DPL CA-18	64.17	60.17	62.17	50.55	49.91	50.23	56.20
19	DPL CA-19	61.77	56.47	59.45	49.41	50.59	50.00	54.73
20	DPL CA-20	64.40	58.93	61.83	49.70	51.65	50.68	56.26
21	DPL CA-21	63.23	58.82	61.02	48.07	50.03	49.05	55.04
22	DPL CA-22	63.33	54.54	60.10	48.20	50.75	49.48	54.79
23	DPL CA-23	66.22	58.47	62.34	49.54	48.50	49.02	55.68
24	DPL CA-24	64.19	<u>57.39</u>	60.79	51.19	48.39	49.79	55.29
25	DPL CA-25	63.74	58.17	61.29	47.76	49.35	48.55	54.92
26	DPL CA-26	65.92	54.49	60.21	51.33	50.44	50.89	55.55
27	DPL CA-27	62.83	59.57	61.20	48.30	47.43	47.87	54.54
28	DPL CA-28	64.28	56.74	60.51	47.09	45.93	46.51	53.51
29	DPL CA-29 (Arka Lohit)	61.77	58.07	59.92	49.66	48.32	48.99	54.45
30	DPL CA-30 (Konkan Kirti)	58.45	56.45	57.45	52.36	52.48	52.42	55.27
	S.E.m ±	1.68	1.05	0.99	1.29	0.87	0.77	0.66
	C.D.@ 5%	NS	2.99	NS	3.66	2.47	2.17	1.86
	C.V.	4.58	3.15	2.81	4.63	3.05	2.71	2.07

CA-20, DPL-CA-21, DPL-CA-22 and DPL-CA-26. The smallest canopy width (45.93 cm) was recorded in genotype DPL-CA-28 which was at par with DPL-CA-2, DPL-CA-3, DPL-CA-6, DPL-CA-11, DPL-CA-24, DPL-CA-27 and DPL-CA-29 (Arka Lohit).

The perusal of pooled *rabi* data pertaining to plant canopy width at 120 DAP revealed that the genotype DPL-CA-30 (Konkan Kirti) produced maximum canopy width of 52.42 cm and was statistically at par with DPL-CA-12, DPL-CA-16, DPL-CA-20 and DPL-CA-26. The minimum plant canopy width (44.39 cm) was recorded in DPL-CA-2 which was at par with DPL-CA-6 and DPL-CA-28.

The perusal of overall pooled data revealed that the significant difference exists in various genotypes with respect to plant canopy width at 120 DAP (Figure 14). The highest plant canopy width (56.26 cm) was recorded in DPL-CA-20 which was at par with DPL-CA-4, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-21, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The lowest plant canopy width (52.88 cm) was noted by DPL-CA-2 which was at par with various genotypes DPL-CA-1, DPL-CA-3, DPL-CA-6, DPL-CA-7, DPL-CA-9, DPL-CA-15, DPL-CA-19, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit).

Plant canopy width along with plant height and number of branches is responsible for formation of productive area of a particular genotype. It also influences the plant population per hectare and ultimately the yield. Large canopy width usually provides more leaf surface which enhances the interception of solar radiation and thus increases the photosynthetic activity which correspondingly elevates the assimilatory ability of the plant. Ritu Rani *et al.* (2017) also reported plant canopy spread in the range of 50.58 cm (12CHIV AR-1) to 39.98 cm (12CHIV AR-3) with the average mean of 42.34 cm. Similar variations in the magnitude of plant canopy width of chilli was also reported by Nehru *et al.* (2003), Smitha and Basavaraja (2006), Mahantesh *et al.* (2013), Vijaya *et al.* (2014), Sharma *et al.* (2009) and Pawar *et al.* (2018).

4.1.4 Days for commencement of flowering

Commencement of flowering is one of the most important characters which decide the earliness of the variety. Number of days required for commencement of flowering is usually governed by the genetic makeup of the plant as well as the prevailing environmental conditions under which the crop is being grown. During present investigation the number of days required for commencement of flowering after transplanting were counted in the observational plant during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding days required for commencement of flowering are presented in Table 7.

The critical observation of the data presented in Table 7 revealed that there was significant difference among the different genotypes under study during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif* pooled, *rabi* pooled and overall pooled). During *kharif* 2018, the earliest commencement of flowering (46.39 DAP) was noticed in DPL-CA-1 which was at par with DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-17, DPL-CA-19, DPL-CA-21 and DPL-CA-27. The genotype DPL-CA-30 (Konkan Kirti) took maximum (64.07) days for commencement of flowering. During *kharif* 2019, the earliest commencement of flowering (44.45 DAP) was recorded in DPL-CA-1 which was at par with DPL-CA-18 and DPL CA-20 whereas DPL-CA-30 (Konkan Kirti) took maximum (64.59) days for commencement of flowering. In pooled *kharif* data the difference between various genotypes for commencement of flowering was non-significant. The genotype DPL-CA-1 produced earliest flowering (45.42 DAP) whereas DPL-CA-30 (Konkan Kirti) exhibited late flowering (64.33 DAP) as compared to other genotype under study.

During both the *rabi* seasons (2018-19 and 2019-20) as well as in pooled *rabi* data the difference between various genotypes for commencement of flowering was significant (Table 8). During 2018-19, the genotype DPL-CA-1 registered earliest (39.20 DAP) flowering which

Table 7 : Variation in days for commencement of flowering among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Days for commencement of flowering						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	46.39	44.45	45.42	39.20	41.20	40.20	42.81
2	DPL CA-2	51.08	47.61	49.35	41.47	42.79	42.13	45.74
3	DPL CA-3	51.46	49.22	50.34	43.38	43.67	43.53	46.93
4	DPL CA-4	49.98	47.39	48.68	42.17	42.24	42.20	45.44
5	DPL CA-5	52.53	48.86	50.70	43.80	43.62	43.71	47.20
6	DPL CA-6	48.20	47.30	47.75	42.58	43.54	43.06	45.41
7	DPL CA-7	48.33	48.57	48.45	40.39	39.11	39.75	44.10
8	DPL CA-8	50.80	49.17	49.98	41.78	42.39	42.08	46.03
9	DPL CA-9	49.45	49.23	49.34	43.07	42.46	42.76	46.05
10	DPL CA-10	50.70	48.48	49.59	42.76	43.44	43.10	46.34
11	DPL CA-11	48.15	48.18	48.17	43.83	41.42	42.62	45.39
12	DPL CA-12	49.73	48.33	49.03	42.89	43.56	43.23	46.13
13	DPL CA-13	48.97	48.17	48.57	43.41	44.05	43.73	46.15
14	DPL CA-14	51.67	47.90	49.78	43.43	43.15	43.29	46.54
15	DPL CA-15	49.20	48.96	49.08	46.79	43.94	45.37	47.22
16	DPL CA-16	51.70	47.53	49.62	40.75	38.91	39.83	44.72
17	DPL CA-17	47.47	47.95	47.71	45.07	43.89	44.48	46.09
18	DPL CA-18	51.62	46.02	48.82	41.20	43.04	42.12	45.47
19	DPL CA-19	47.42	46.52	46.97	43.39	41.32	42.36	44.66
20	DPL CA-20	51.67	46.35	49.01	41.83	41.18	41.50	45.26
21	DPL CA-21	48.20	46.61	47.40	42.44	43.65	43.04	45.22
22	DPL CA-22	51.12	48.46	49.79	42.32	43.23	42.78	46.28
23	DPL CA-23	51.18	46.97	49.08	44.80	43.91	44.36	46.72
24	DPL CA-24	48.47	47.82	48.14	44.45	44.12	44.29	46.22
25	DPL CA-25	51.50	47.68	49.59	43.20	44.81	44.00	46.80
26	DPL CA-26	51.50	48.10	49.80	43.68	44.69	44.19	46.99
27	DPL CA-27	48.37	48.15	48.26	42.47	43.75	43.11	45.69
28	DPL CA-28	51.32	47.39	49.35	44.67	45.75	45.21	47.28
29	DPL CA-29 (Arka Lohit)	58.78	57.95	58.37	45.61	45.91	45.76	52.06
30	DPL CA-30 (Konkan Kirti)	64.07	64.59	64.33	44.04	43.65	43.85	54.09
	S.E.m ±	0.72	0.67	0.49	1.12	0.63	0.55	0.42
	C.D.@ 5%	2.04	1.91	1.39	3.17	1.78	1.55	1.19
	C.V.	3.10	2.40	1.71	4.5	2.53	2.20	1.57

was at par with DPL-CA-2, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-16, DPL-CA-18, DPL-CA-20 and DPL-CA-22. The genotype DPL-CA-29 (Arka Lohit) produced delayed (45.61 DAP) flowering which was at par with DPL-CA-5, DPL-CA-11, DPL-CA-15, DPL-CA-17, DPL-CA-23, DPL-CA-24, DPL-CA-26, DPL-CA-28 and DPL-CA-30 (Konkan Kirti). During 2019-20, the genotype DPL-CA-7 exhibited earliest (39.11 DAP) flowering which was significantly superior over all other genotypes under study whereas late (45.91 DAP) flowering was noticed in DPL-CA-29 (Arka Lohit) but the genotypes *viz.* DPL-CA-25, DPL-CA-26, and DPL-CA-28 were at par with it.

The perusal of pooled *rabi* data pertaining to number of days required for flowering revealed that the genotype DPL-CA-7 recorded earliest (39.75 DAP) flowering which was at par with other genotype DPL-CA-1 and DPL-CA-16 whereas late (45.76 DAP) flowering was produced in DPL-CA-29 (Arka Lohit) but the genotypes *viz.* DPL -CA-15, DPL-CA-17, DPL-CA-23, DPL-CA-24, and DPL-CA-28 were at par with it.

The overall pooled data regarding number of days required for flowering are presented in Table 8. It was evident from the data that the difference in various genotypes with respect to number of days required for commencement of flowering was significant. The genotype DPL-CA-1 registered earliest flowering (42.81 DAP) as compared to others and was significantly superior to all other genotypes whereas the delayed (54.09 DAP) commencement of flowering was recorded in DPL-CA-30 (Konkan Kirti) and no other genotype was at par with it in respect of this character.

Commencement of early flowering is desirable trait in chilli. It usually starts early harvesting as well as may increase the harvesting span of the particular variety. Commencement of flowering is affected by genetic makeup of the genotype, weather condition, edaphic factors, etc. During present investigation the seasonal variation in commencement of flowering was also depicted. The flowering was initiated early during *rabi* season as compared to *kharif* which can be attributed to the availability

of more sunshine during *rabi* season which might have accelerated photosynthetic activity and manufactured more assimilates in plant. The highest days for commencement of flowering (45.28) were reported in G₁₄ whereas lowest (25.56) in G₃ (Kerkatta *et al.*, 2018). The similar results were as reported by Pragya Singh (2019), Yattung *et al.* (2014), Ritu Rani *et al.* (2016), Bharadwaza *et al.* (2018), Datta and Jana (2012), Anu *et al.* (2002), Amit *et al.* (2014) and Gupta *et al.* (2009).

4.1.5 Days to fifty per cent flowering

Days to fifty per cent flowering is also considered as one of the most important characters deciding precociousness and synchronizing potential of the genotype. It is usually governed by the genetic makeup of the plant as well as the prevailing environmental conditions under which the crop is being grown. During present investigation the number of days required for flowering of fifty per cent plants in plot after transplanting were counted during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding days required for fifty per cent of flowering are presented in Table 8.

The data revealed that there was significant difference among the different genotypes for number of days required fifty per cent flowering during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*rabi* pooled and overall pooled) except *kharif* pooled data. The earliest (49.47 DAP) fifty per cent flowering during *kharif* 2018 was noted in DPL-CA-1 which was at par with DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL CA-27 whereas DPL-CA-30 (Konkan Kirti) took maximum (68.30) days for fifty per cent flowering. During *kharif* 2019, the earliest fifty per cent flowering (47.88 DAP) was registered in DPL-CA-1 which was at par with other genotypes *viz.* DPL-CA-2, DPL-CA-5, DPL-CA-14, DPL-CA-18, DPL-CA-19, DPL-CA-20 and DPL-CA-23 whereas DPL-CA-30 (Konkan Kirti) exhibited highest number of days (67.80) for fifty per cent flowering. In pooled *kharif* data, the days to fifty per cent flowering were minimum (48.67 DAP) in genotype DPL-CA-1

which was at par with DPL-CA-19 (49.50 DAP) whereas DPL-CA-30 (Konkan Kirti) recorded late fifty per cent flowering (68.05 DAP) and no other genotype was comparable with it.

During *rabi* season of 2018-19, the genotype DPL-CA-1 recorded lowest days (42.49) for fifty per cent flowering which was at par with DPL-CA-2, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-12, DPL-CA-14, DPL-CA-16, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-22 and DPL-CA-27. The genotype DPL-CA-30 (Konkan Kirti) noted highest days (49.81) for fifty per cent flowering which was at par with DPL-CA-5, DPL-CA-15, DPL-CA-29 (Arka Lohit). During 2019-20, the genotype DPL-CA-16 exhibited earliest fifty per cent flowering (41.07 DAP) which was at par with DPL-CA-7 (42.12 DAP) and significantly superior over all other genotypes under study. Late fifty per cent flowering (47.21 DAP) was recorded in DPL-CA-28 but the genotypes *viz.* DPL-CA-15, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-29 (Arka Lohit) were at par with it.

The perusal of pooled *rabi* data pertaining to days required for fifty per cent flowering revealed that the genotype DPL-CA-16 registered earliest (42.37 DAP) fifty per cent flowering which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-7 and DPL-CA-20 whereas fifty per cent flowering was found late (47.57 DAP) in DPL-CA-29 (Arka Lohit) and the genotypes *viz.* DPL-CA-5, DPL-CA-15, DPL-CA-23, DPL-CA-24, DPL-CA-28 and DPL-CA-30 (Konkan Kirti) were at par with it.

The overall pooled data regarding number of days required for fifty per cent flowering are presented in Table 9 and depicted in Figure 15. The perusal of data revealed that the difference in various genotypes with respect number of days required for fifty per cent flowering was significant. The genotype DPL-CA-1 produced earliest fifty per cent flowering (45.71 DAP) as compared to others but was at par with DPL-CA-7 (46.46 DAP) and significantly superior to all other genotypes whereas the delayed (57.72 DAP) fifty per cent flowering was noticed in DPL-CA-30 (Konkan Kirti) and no other genotype was at par with it in respect of this character.

Table 8 : Variation in days to fifty per cent flowering among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Days to fifty per cent flowering						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	49.47	47.88	48.67	42.49	43.02	42.76	45.71
2	DPL CA-2	51.60	49.33	50.46	44.66	45.09	44.87	47.67
3	DPL CA-3	53.10	50.83	51.96	46.33	45.46	45.90	48.93
4	DPL CA-4	51.53	49.50	50.52	44.86	44.10	44.48	47.50
5	DPL CA-5	54.58	49.05	51.82	47.11	46.23	46.67	49.25
6	DPL CA-6	50.07	49.57	49.82	46.86	45.42	46.14	47.98
7	DPL CA-7	50.58	49.62	50.10	43.53	42.12	42.83	46.46
8	DPL CA-8	52.58	50.24	51.41	44.91	44.04	44.48	47.95
9	DPL CA-9	51.90	51.23	51.57	46.37	44.35	45.36	48.46
10	DPL CA-10	52.55	50.05	51.30	44.77	45.12	44.95	48.12
11	DPL CA-11	50.25	49.97	50.11	46.19	43.19	44.69	47.40
12	DPL CA-12	52.47	50.43	51.45	44.73	45.21	44.97	48.21
13	DPL CA-13	52.23	50.75	51.49	45.65	45.67	45.66	48.58
14	DPL CA-14	53.13	48.99	51.06	45.00	45.23	45.12	48.09
15	DPL CA-15	51.27	51.60	51.43	48.12	45.95	47.04	49.24
16	DPL CA-16	53.69	50.27	51.98	43.66	41.07	42.37	47.17
17	DPL CA-17	49.85	50.08	49.97	46.83	45.33	46.08	48.02
18	DPL CA-18	53.80	49.29	51.55	44.47	44.50	44.48	48.02
19	DPL CA-19	50.00	49.01	49.50	45.74	43.38	44.56	47.03
20	DPL CA-20	52.67	48.97	50.82	44.21	43.38	43.79	47.31
21	DPL CA-21	50.30	50.01	50.16	45.25	45.25	45.25	47.71
22	DPL CA-22	53.27	50.11	51.69	44.74	45.08	44.91	48.30
23	DPL CA-23	53.20	49.32	51.26	46.63	45.80	46.22	48.74
24	DPL CA-24	50.20	50.63	50.41	46.74	46.01	46.38	48.39
25	DPL CA-25	53.02	50.80	51.91	45.76	46.37	46.07	48.99
26	DPL CA-26	53.67	49.93	51.80	46.00	46.36	46.18	48.99
27	DPL CA-27	50.32	50.23	50.28	44.26	45.49	44.87	47.57
28	DPL CA-28	53.67	50.07	51.87	46.69	47.21	46.95	49.41
29	DPL CA-29 (Arka Lohit)	61.07	60.80	60.93	48.01	47.13	47.57	54.25
30	DPL CA-30 (Konkan Kirti)	68.30	67.80	68.05	49.81	44.96	47.38	57.72
	S.E.m ±	0.62	0.55	0.40	0.98	0.48	0.50	0.31
	C.D.@ 5%	1.76	1.55	1.12	2.77	1.36	1.42	0.88
	C.V.	11.53	1.86	1.32	3.71	1.85	1.92	1.11

Precociousness in bearing is governed by earliness in flowering which is a desirable character in multiple harvest crops to get continuous yield throughout the life cycle of the plant. Days to fifty per cent flowering indicates the earliness of the variety and it is usually governed by genetic constituent of the plant as well as soil and climatic factors prevailing at the site of cultivation.

During present investigation, it was observed that just like commencement of flowering, 50 % flowering during *rabi* season was earlier as compared to *kharif* season. The days required for fifty per cent flowering were in the range of 45.71 to 57.72. Veerapa (1980) recorded range of 27 to 43 days for flowering in capsicum cultivars. A range of 25 (Rabbi) to 40 days (Vajra) was recorded for fifty per cent flowering in chilli cultivars under Andhra Pradesh conditions. The similar range for 50% flowering was reported by Chattopadhyay *et al.* (2011), Phulari (2012), Shiva *et al.* (2013) and Rohini and Lakshmanan (2014) and Kerketta *et al.* (2018).

4.1.6 Days to fruiting

Days to fruiting is an important yield attributing character which enable the early harvest of the crop. This character is usually governed by genotypic constituent of the variety but can be altered to some extent due to the environmental conditions in which the crop is being grown. During present investigation, days to fruiting were counted from the date of transplanting till the first harvest of green chillies for *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20. The data pertaining to this character are presented in Table 9.

It is evident from the data that the days to fruiting varied significantly during *kharif* as well as *rabi* seasons of both the years of experimentation as well as in pooled data also (*kharif* pooled, *rabi* pooled as well as overall pooled). During *kharif* 2018, the minimum days to fruiting were recorded by DPL-CA-1 (63.59) and it was at par with DPL-CA-6, DPL-CA-7, DPL-CA-9, DPL-CA-11, DPL-CA-19 and DPL-CA-21

Table 9 : Variation in days to fruiting among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Days to fruiting						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	63.59	60.27	61.93	54.53	56.83	55.68	58.80
2	DPL CA-2	69.82	65.76	67.79	57.35	58.66	58.01	62.90
3	DPL CA-3	68.43	65.00	66.72	58.41	59.71	59.06	62.89
4	DPL CA-4	66.69	63.15	64.92	57.23	58.13	57.68	61.30
5	DPL CA-5	70.10	65.13	67.61	58.67	59.07	58.87	63.24
6	DPL CA-6	65.07	64.95	65.01	58.53	59.68	59.11	62.06
7	DPL CA-7	65.58	64.51	65.05	54.58	54.03	54.31	59.68
8	DPL CA-8	68.23	65.20	66.72	56.38	57.36	56.87	61.79
9	DPL CA-9	65.38	64.38	64.88	57.06	58.06	57.56	61.22
10	DPL CA-10	68.57	65.76	67.16	58.11	59.60	58.86	63.01
11	DPL CA-11	64.93	64.45	64.69	58.73	57.36	58.04	61.37
12	DPL CA-12	67.93	66.16	67.05	58.67	60.25	59.46	63.25
13	DPL CA-13	65.78	64.89	65.34	58.82	60.27	59.54	62.44
14	DPL CA-14	68.88	64.63	66.76	58.76	60.03	59.40	63.08
15	DPL CA-15	66.28	65.64	65.96	61.62	59.01	60.31	63.14
16	DPL CA-16	68.60	63.74	66.17	55.69	54.53	55.11	60.64
17	DPL CA-17	65.50	65.64	65.57	60.64	60.39	60.51	63.04
18	DPL CA-18	68.47	62.72	65.59	56.14	59.29	57.72	61.66
19	DPL CA-19	65.20	64.64	64.92	59.33	58.40	58.87	61.89
20	DPL CA-20	69.85	63.60	66.72	57.56	58.08	57.82	62.27
21	DPL CA-21	64.63	62.84	63.74	56.73	59.71	58.22	60.98
22	DPL CA-22	68.93	66.03	67.48	58.20	60.05	59.13	63.30
23	DPL CA-23	69.05	64.80	66.93	60.62	60.84	60.73	63.83
24	DPL CA-24	66.17	65.49	65.83	60.43	60.67	60.55	63.19
25	DPL CA-25	69.43	65.33	67.38	58.76	61.55	60.15	63.77
26	DPL CA-26	69.57	65.59	67.58	59.12	61.14	60.13	63.86
27	DPL CA-27	66.80	65.33	66.07	57.70	59.35	58.53	62.30
28	DPL CA-28	68.83	64.64	66.74	59.95	61.12	60.54	63.64
29	DPL CA-29 (Arka Lohit)	76.60	75.43	76.02	60.90	61.56	61.23	68.62
30	DPL CA-30 (Konkan Kirti)	81.32	81.90	81.61	58.96	58.29	58.63	70.12
	S.E.m ±	0.86	0.75	0.55	1.18	0.66	0.61	0.47
	C.D.@ 5%	2.44	2.14	1.56	3.36	1.88	1.74	1.35
	C.V.	2.18	1.99	1.42	3.52	1.94	1.81	1.31

whereas the maximum number of days to fruiting were noted in DPL-CA-30 (81.32) and no other genotype was at par with it. During *kharif* 2019, the lowest number of days to fruiting was registered in DPL-CA-1 (60.27) as no other genotype was statistically comparable with it. The highest number of days (81.90) was observed in DPL-CA-30 (Konkan Kirti). The pooled *kharif* data followed same trend was *kharif* 2019 where DPL-CA-1 registered minimum days to fruiting (61.93) whereas the maximum days (81.61) to fruiting were noted in DPL-CA-30 (Konkan Kirti).

During *rabi* 2018-19, the lowest number of days to fruiting were observed in DPL-CA-1 (54.53) however, the genotypes DPL-CA-2, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-16, DPL-CA-18, DPL-CA-20, DPL-CA-21 and DPL-CA-27 were at par with it. The highest number of days to fruiting were registered in DPL-CA-15 (61.62) and many other genotypes *viz.* DPL-CA-3, DPL-CA-5, DPL-CA-6, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-17, DPL-CA-19, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-28, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti). During *rabi* 2019-20, the minimum days to fruiting were exhibited by DPL-CA-7 (54.03) and was at par with DPL-CA-16 (54.53). The maximum number of days (61.56) to fruiting were observed in DPL-CA-29 (Arka Lohit) and several other genotypes *viz.* DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-28 were at par with it. In pooled *rabi* data, the lowest days to fruiting were exhibited by DPL-CA-7 (54.31) and the genotypes DPL-CA-1 and DPL-CA-16 were at par with DPL-CA-7. The highest number of days to fruiting (61.23) were observed in DPL-CA-29 (Arka Lohit) however, various genotypes *viz.* DPL-CA-13, DPL-CA-15, DPL-CA-17, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-28 were at par.

The overall pooled data, it was observed that the minimum days to fruiting were exhibited by DPL-CA-1 (58.80) however, it was at par with DPL-CA-7. The maximum number of days (70.12) were recorded in DPL-CA-30 (Konkan Kirti).

Thus, it is evident from the data presented in Table 10 that there was influence of the season on days to fruiting and it was observed that slightly more number of days are required for fruiting during both the *kharif* season as compared to *rabi* season. It might be due to the availability of more sunlight during *rabi* season as compared to *kharif* season which might have accumulated more carbohydrates in comparatively lesser number of days during *rabi* season. It was also observed from the pooled data of *kharif* and *rabi* season that there was huge difference in the number of days required for fruiting in DPL-CA-30 (Konkan Kirti) during *kharif* and *rabi* season. It might be due to more pronounced response of this particular variety to the availability of sunshine hours. Kerkatta et al., 2018 reported a range of 52.42 days to 75.26 days for first harvest with mean of 63.43 days. The results obtained in present investigation are also in close conformity with the findings reported Anu et al. (2002), Amit et al. (2014) and Gupta et al. (2009).

4.1.7 Fruit set (%)

Despite of early and profuse flowering many times the plant produce shy bearing. The important reason is the less fruit set. There are many factors which affect the per cent fruit set in the plant. The most important is the genetic makeup of the plant. Many other factors also contribute in the fruit set. During present investigation the per cent fruit set was recorded during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding fruit set (%) are presented in Table 10.

The data presented in Table 11 revealed that there was significant difference among the different genotypes for per cent fruit set during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif* pooled, *rabi* pooled and overall pooled). The highest (58.55 fruit set during *kharif* 2018 was noted in DPL-CA-14 which was at par with DPL-CA-4, DPL-CA-8, DPL-CA-23 and DPL-CA-25 whereas DPL-CA-5 exhibited lowest fruit set (37.74 %) and

Table 10 : Variation in fruit set (%) of chilli genotypes during *kharif* and *rabi* season

S. N.	Genotype	Fruit set (%)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	40.61	40.85	40.73	44.13	44.08	44.10	42.42
2	DPL CA-2	44.98	48.33	46.65	51.77	52.46	52.12	49.38
3	DPL CA-3	38.57	38.57	38.57	43.05	41.95	42.50	40.54
4	DPL CA-4	54.02	53.94	53.98	56.29	56.28	56.29	55.13
5	DPL CA-5	37.74	44.54	41.14	47.99	44.54	46.27	43.70
6	DPL CA-6	43.38	45.18	44.28	48.65	48.05	48.35	46.31
7	DPL CA-7	44.59	46.41	45.50	48.58	47.51	48.05	46.78
8	DPL CA-8	56.96	56.13	56.55	55.16	50.73	52.95	54.75
9	DPL CA-9	52.05	48.94	50.50	53.17	51.10	52.13	51.31
10	DPL CA-10	50.10	53.90	52.00	55.06	54.59	54.82	53.41
11	DPL CA-11	43.88	47.35	45.62	50.80	51.40	51.1	48.36
12	DPL CA-12	40.26	41.15	40.70	46.37	44.90	45.64	43.17
13	DPL CA-13	45.20	45.22	45.21	48.15	49.76	48.96	47.08
14	DPL CA-14	58.55	59.09	58.81	60.01	58.46	59.23	59.02
15	DPL CA-15	50.11	49.77	49.94	53.22	53.30	53.26	51.60
16	DPL CA-16	47.91	47.71	47.81	50.92	52.07	51.49	49.65
17	DPL CA-17	43.83	43.35	43.59	47.90	47.55	47.73	45.66
18	DPL CA-18	48.68	50.99	49.84	54.44	53.37	53.91	51.87
19	DPL CA-19	42.80	43.79	43.30	48.06	45.91	46.98	45.14
20	DPL CA-20	48.33	50.72	49.52	51.96	52.97	52.47	50.99
21	DPL CA-21	45.64	49.84	47.74	51.85	52.19	52.02	49.88
22	DPL CA-22	52.49	51.39	51.94	54.84	52.97	53.91	52.92
23	DPL CA-23	55.86	56.32	56.09	58.55	54.79	56.67	56.38
24	DPL CA-24	52.26	54.03	53.14	56.48	56.10	56.29	54.72
25	DPL CA-25	54.63	54.45	54.54	56.34	55.78	56.06	55.30
26	DPL CA-26	39.87	45.59	42.73	48.54	47.95	48.25	45.49
27	DPL CA-27	43.44	45.22	44.33	48.08	44.59	46.33	45.33
28	DPL CA-28	49.89	49.00	49.44	52.45	50.77	51.61	50.53
29	DPL CA-29 (Arka Lohit)	50.78	53.60	52.19	53.12	54.77	53.95	53.07
30	DPL CA-30 (Konkan Kirti)	43.00	44.56	43.78	52.21	52.91	52.56	48.17
	S.E.m ±	1.84	1.72	1.53	1.59	1.45	0.87	0.72
	C.D.@ 5%	5.23	4.88	4.35	4.52	4.12	2.46	2.04
	C.V.	6.74	6.12	5.53	5.34	4.94	2.93	2.51

was at par with DPL-CA-1, DPL-CA-3, DPL-CA-12, DPL-CA-19 and DPL-CA-26. During *kharif* 2019, the maximum (59.09 %) fruit set was noted in DPL-CA-14 which was at par with DPL-CA-8, DPL-CA-23 and DPL-CA-25 whereas DPL-CA-3 exhibited lowest fruit set (38.57 %) and was at par with DPL-CA-1, DPL-CA-12 and DPL-CA-17.

The data regarding pooled *kharif* revealed that, the highest (58.81 %) fruit set was noted in DPL-CA-14 which was at par with DPL-CA-8, DPL-CA-23 and DPL-CA-25 whereas it was lowest in DPL-CA-3 (38.57 %) was at par with DPL-CA-1, DPL-CA-5, DPL-CA-12 and DPL-CA-26.

In *rabi* 2018-19, the highest (60.01 %) fruit set was observed in DPL-CA-14 which was at par with DPL-CA-4, DPL-CA-23, DPL-CA-24 and DPL-CA-25 whereas DPL-CA-3 exhibited lowest fruit set (43.05 %) and was at par with DPL-CA-1 and DPL-CA-12. During *rabi* 2019-2020, the maximum (58.46 %) fruit set was noted in DPL-CA-14 which was at par with DPL-CA-4, DPL-CA-10, DPL-CA-23, DPL-CA-24 and DPL-CA-25. The minimum fruit set was recorded in DPL-CA-3 exhibited lowest fruit set (41.95 %) and was at par with DPL-CA-1, DPL-CA-5, DPL-CA-12, DPL-CA-19 and DPL-CA-27.

The perusal of data regarding pooled *rabi* revealed that, the highest (59.23 %) fruit set was noted in DPL-CA-14 and was significantly superior to all other genotypes under study. The lowest fruit set was in DPL-CA-3 (42.50 %).

The overall pooled data revealed that the highest fruit set (59.02 %) was exhibited by DPL-CA-14 and was significantly superior to all the genotypes under study, whereas the lowest fruit set (40.54 %) was recorded in DPL-CA-3 and was at par with DPL-CA-1 (42.42 %).

The significant variation in fruit set of various chilli genotypes was observed during present investigation. It might be due to the genetic constituent of the plant whereas it was also observed that the overall fruit set during *kharif* season was less as compared to *rabi* season. The reason might be the occurrence of heavy rainfall during *kharif* season

which decreased the per cent fruit set. Dahal *et al.*, (2015) recorded fruit set under hot and dry conditions which was in the range of 6.66 % to 41.33 % with mean of 18.81 %. Anand *et al.*, (1992) also reported lesser fruit set with average of 30.3 % during summer season and was higher with average of 40.2 % during main season. The higher fruit set in some of the genotypes (DPL-CA-14, DPL-CA-4) may be probably due to apical dominance of endogenous auxin which is necessary for fruit set (Dahal *et al.*, 2015). Naganirmala and Mallikarjuna (2019) also observed fruit set ranged in between 18 (G-3) to 80 (LCA-625) % with a mean of 51.40%.

4.1.8 Days to horticulture maturity from anthesis

Days required for attaining horticulture maturity from anthesis also contributes in early harvest of the crop. During present investigation the number of days required for flowering of horticulture maturity from anthesis were counted for four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding same are presented in Table 11.

The critical examination of the data revealed that there was significant difference among the different genotypes for days required for horticulture maturity from anthesis during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif* pooled, *rabi* pooled and overall pooled). During *kharif* 2018, the genotype DPL-CA-9 attained horticulture maturity in minimum days (15.93) which was at par with DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-11, DPL-CA-13, DPL-CA-16, DPL-CA-18 and DPL-CA-21 whereas DPL-CA-2 took maximum days (18.73) for horticulture maturity which was at par with DPL-CA-5, DPL-CA-10, DPL-CA-12, DPL-CA-17, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). During *kharif* 2019, the lowest number of days (15.15) for harvesting at green stage was registered in DPL-CA-9 which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-3, DPL-CA-4 and DPL-CA-7. The genotype DPL-CA-2

Table 11 : Variation in days to horticulture maturity from anthesis among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Days to horticulture maturity from anthesis						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	17.20	15.82	16.51	15.32	15.63	15.48	15.99
2	DPL CA-2	18.73	18.15	18.44	15.88	15.87	15.88	17.16
3	DPL CA-3	16.97	15.78	16.38	15.04	16.04	15.54	15.96
4	DPL CA-4	16.72	15.76	16.27	15.07	15.89	15.48	15.87
5	DPL CA-5	17.57	16.27	16.92	14.87	15.46	15.17	16.04
6	DPL CA-6	16.87	17.65	17.59	15.94	16.14	16.04	16.82
7	DPL CA-7	17.25	15.93	16.59	14.20	14.92	14.56	15.58
8	DPL CA-8	17.43	16.03	16.73	14.60	14.98	14.79	15.76
9	DPL CA-9	15.93	15.15	15.88	13.99	15.60	14.80	15.34
10	DPL CA-10	17.87	17.28	17.61	15.35	16.16	15.76	16.68
11	DPL CA-11	16.78	16.27	16.53	14.90	15.94	15.42	15.97
12	DPL CA-12	18.20	17.83	17.68	15.78	16.69	16.24	16.96
13	DPL CA-13	16.82	16.72	16.77	15.41	16.21	15.81	16.29
14	DPL CA-14	17.22	16.73	16.98	15.33	16.88	16.11	16.54
15	DPL CA-15	17.42	16.68	16.88	14.83	15.07	14.95	15.91
16	DPL CA-16	16.90	16.21	16.56	14.93	15.62	15.28	15.92
17	DPL CA-17	18.03	17.68	17.86	15.57	16.50	16.04	16.95
18	DPL CA-18	16.85	16.70	17.11	14.94	16.26	15.60	16.35
19	DPL CA-19	17.78	18.12	17.95	15.94	17.08	16.51	17.23
20	DPL CA-20	18.18	17.25	17.72	15.74	16.90	16.32	17.02
21	DPL CA-21	16.43	16.23	16.33	14.29	16.07	15.18	15.76
22	DPL CA-22	17.82	17.57	17.69	15.87	16.82	16.35	17.02
23	DPL CA-23	17.87	17.83	17.85	15.82	16.93	16.38	17.11
24	DPL CA-24	17.70	17.67	17.68	15.98	16.55	16.26	16.97
25	DPL CA-25	17.93	17.65	17.79	15.56	16.74	16.15	16.97
26	DPL CA-26	18.07	17.49	17.78	15.44	16.45	15.95	16.86
27	DPL CA-27	18.43	17.18	17.81	15.23	15.61	15.42	16.61
28	DPL CA-28	17.52	17.25	17.38	15.29	15.37	15.33	16.36
29	DPL CA-29 (Arka Lohit)	17.82	17.48	17.73	15.29	15.66	15.48	16.60
30	DPL CA-30 (Konkan Kirti)	17.25	17.31	17.28	14.92	14.64	14.78	16.03
	S.E.m ±	0.44	0.29	0.31	0.30	0.21	0.22	0.23
	C.D.@ 5%	1.25	0.82	0.89	0.86	0.60	0.62	0.65
	C.V.	4.36	2.97	3.016	3.43	2.28	2.43	2.42

noted highest number of days (18.15) for reaching horticulture maturity from anthesis which was at par with DPL-CA-6, DPL-CA-12, DPL-CA-17, DPL-CA-19, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, and DPL-CA-29 (Arka Lohit). In pooled *kharif* data, the days for horticulture maturity were earliest (15.88 days) in genotype DPL-CA-9 which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-11, DPL-CA-13, DPL-CA-16, and DPL-CA-21 whereas DPL-CA-2 recorded late horticulture maturity (18.44 days) which was at par with genotypes, DPL-CA-6, DPL-CA-10, DPL-CA-12, DPL-CA-17, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27 and DPL-CA-29 (Arka Lohit).

During *rabi* season of 2018-19, the genotype DPL-CA-9 recorded minimum days (13.99) for horticulture maturity which was par with DPL-CA-7, DPL-CA-8, DPL-CA-15 and DPL-CA-21. The genotype DPL-CA-24 registered maximum (15.98) days for horticulture maturity which was at par with DPL-CA-1, DPL-CA-2, DPL-CA-6, DPL-CA-10, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-17, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-28 and DPL-CA-29 (Arka Lohit). During 2019-20, the genotype DPL-CA-7 exhibited lowest number of days (14.92) to horticulture maturity from anthesis which was at par with DPL-CA-8, DPL-CA-15, DPL-CA-30 (Konkan Kirti) whereas the highest number of days to horticulture maturity (17.08) were recorded in DPL-CA-19 and the genotypes DPL-CA-12, DPL-CA-14, DPL-CA-17, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24 and DPL-CA-25 were at par with it.

The perusal of pooled *rabi* data pertaining to days required for horticulture maturity revealed that the genotype DPL-CA-7 exhibited smallest number of days (14.56) for horticulture maturity which was at par with DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-15 and DPL-CA-21 whereas greatest number of days (16.51) to horticulture maturity were noted in DPL-CA-19 and DPL-CA-6, DPL-CA-12, DPL-CA-14, DPL-CA-17, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25 and DPL-CA-26 were at par with it.

The overall pooled data regarding number of days for attaining horticulture maturity are presented in Table 12. The perusal of data revealed that the genotype DPL-CA-9 registered minimum days for horticulture maturity (15.34) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-4, DPL-CA-7, DPL-CA-8, DPL-CA-11, DPL-CA-15, DPL-CA-16 and DPL-CA-21 whereas maximum days for horticulture maturity (17.23) were noted in DPL-CA-19 which was at par with DPL-CA-2, DPL-CA-6, DPL-CA-10, DPL-CA-12, DPL-CA-17, DPL-CA-20, DPL-CA-22, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27 and DPL-CA-29 (Arka Lohit).

Chilli is consumed both as vegetable as well as spice. For green chilli purpose the fruits are harvested at tender stage before attaining physiological maturity. The days required for horticulture maturity were in the range of 15.34 (DPL-CA-9) to 17.23 (DPL-CA-19) irrespective of genotype and season. The horticulture maturity was attained in lesser number of days during *rabi* season as compared to *kharif*. This might be due to exposure of the developing fruits to more sunlight during *rabi* season as compared to *kharif*. The similar results were also reported by Pawar *et al.* (2018). The variation among the genotypes for this character may be attributed to the genetic constituent of the plant and its interaction with the exposed environmental conditions under which it is planted.

4.1.9 Days to physiological maturity from anthesis

Chilli is consumed as both vegetable and spice. When it is consumed as spice the harvesting is done at physiological maturity. Similarly, for seed purpose the fruits are harvested at physiological maturity. Days required for physiological maturity were counted during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 12.

The critical examination of the data presented in Table 12 revealed that there was significant difference among the different genotypes for

Table 12 : Variation in days to physiological maturity from anthesis among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Days to physiological maturity from anthesis						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	30.23	32.20	31.22	30.57	31.35	30.96	31.09
2	DPL CA-2	30.80	32.37	31.58	30.80	32.82	31.81	31.70
3	DPL CA-3	30.13	31.58	30.86	29.19	29.86	29.53	30.19
4	DPL CA-4	31.03	33.52	32.28	29.51	30.13	29.82	31.05
5	DPL CA-5	32.07	32.36	32.21	31.63	32.11	31.87	32.04
6	DPL CA-6	31.53	32.44	31.99	29.85	29.94	29.90	30.94
7	DPL CA-7	29.63	32.23	30.93	30.21	32.39	31.30	31.11
8	DPL CA-8	30.58	30.61	30.60	28.64	30.63	29.64	30.12
9	DPL CA-9	31.10	31.62	31.36	30.90	31.85	31.38	31.37
10	DPL CA-10	28.98	31.07	30.03	28.86	29.90	29.38	29.70
11	DPL CA-11	30.85	32.12	31.48	29.55	31.43	30.49	30.99
12	DPL CA-12	31.23	31.89	31.56	30.32	30.73	30.53	31.04
13	DPL CA-13	30.37	31.18	30.78	27.88	29.55	28.72	29.75
14	DPL CA-14	32.40	31.46	31.93	28.79	30.66	29.73	30.83
15	DPL CA-15	31.90	31.28	31.59	28.14	29.18	28.66	30.13
16	DPL CA-16	29.23	30.04	29.64	27.91	28.95	28.43	29.03
17	DPL CA-17	29.63	31.12	30.38	28.25	28.83	28.54	29.46
18	DPL CA-18	31.10	31.80	31.45	28.44	28.80	28.62	30.04
19	DPL CA-19	30.47	31.11	30.79	28.52	29.53	29.03	29.91
20	DPL CA-20	31.20	31.17	31.18	28.45	29.68	29.07	30.13
21	DPL CA-21	30.00	31.37	30.69	28.51	29.36	28.93	29.81
22	DPL CA-22	28.07	30.82	29.44	28.56	29.45	29.00	29.22
23	DPL CA-23	31.02	30.99	31.00	28.75	30.50	29.62	30.31
24	DPL CA-24	32.03	32.70	32.37	30.76	31.53	31.15	31.76
25	DPL CA-25	37.65	35.44	36.55	32.48	32.79	32.64	34.59
26	DPL CA-26	29.20	31.33	30.26	30.20	30.71	30.46	30.36
27	DPL CA-27	31.30	32.09	31.69	30.26	30.73	30.50	31.10
28	DPL CA-28	33.23	35.10	34.17	32.14	32.38	32.26	33.21
29	DPL CA-29 (Arka Lohit)	32.16	35.59	33.88	34.55	34.17	34.36	34.12
30	DPL CA-30 (Konkan Kirti)	33.12	36.59	34.85	32.01	33.35	32.68	33.77
	S.E.m ±	0.79	0.63	0.54	0.72	0.49	0.42	0.39
	C.D.@ 5%	2.24	1.79	1.53	2.03	1.38	1.20	1.10
	C.V.	4.40	3.39	2.95	4.16	2.74	2.41	2.17

days required for physiological maturity from anthesis during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif* pooled, *rabi* pooled and overall pooled). During *kharif* 2018, the genotype DPL-CA-22 attained physiological maturity in lowest days (28.07) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-7, DPL-CA-10, DPL-CA-16, DPL-CA-17, DPL-CA-21 and DPL-CA-26 whereas DPL-CA-25 took highest days (37.65) for physiological maturity and was significantly higher than all other genotypes. During *kharif* 2019, the minimum days (30.04) for harvesting at red ripe stage was recorded in DPL-CA-16 which was at par with DPL-CA-3, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-23 and DPL-CA-26. The genotype DPL-CA-30 (Konkan Kirti) noticed maximum (36.59) days for attaining physiological maturity from anthesis which was at par with DPL-CA-25, DPL-CA-28 and DPL-CA-29 (Arka Lohit). In pooled *kharif* data; the days for physiological maturity were lowest (29.44 days) in genotype DPL-CA-22 which was at par with DPL-CA-3, DPL-CA-7, DPL-CA-10, DPL-CA-13, DPL-CA-16, DPL-CA-17, DPL-CA-19 and DPL-CA-21 whereas DPL-CA-25 recorded highest number of days for physiological maturity (36.55 days) and the difference was significantly superior over all other genotypes.

During *rabi* 2018-19, the genotype DPL-CA-13 registered minimum days (27.88) for physiological maturity which was par with DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-8, DPL-CA-10, DPL-CA-11, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22 and DPL-CA-23. The genotype DPL-CA-29 (Arka Lohit) recorded maximum (34.55) days for physiological maturity and it was significantly superior over all other genotypes. During 2019-20, the genotype DPL-CA-18 exhibited lowest days (28.80) to physiological maturity from anthesis which was at par with DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-10, DPL-CA-13, DPL-CA-

15, DPL-CA-16, DPL-CA-17, DPL-CA-19, DPL-CA-20, DPL-CA-21 and DPL-CA-22 whereas the highest days to physiological maturity (34.17 days) were found in DPL-CA-29 (Arka Lohit) but the genotypes *viz.* DPL-CA-2, DPL-CA-25 and DPL-CA-30 (Konkan Kirti) were at par with it.

The perusal of pooled *rabi* data pertaining to days required for physiological maturity revealed that the genotype DPL-CA-16 exhibited minimum days (28.43) for physiological maturity which was at par with DPL-CA-3, DPL-CA-10, DPL-CA-13, DPL-CA-15, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22 and DPL-CA-23 whereas maximum days (34.36) to physiological maturity were noted in DPL-CA-29 (Arka Lohit) and the difference was significant among all other genotypes.

The perusal of overall pooled data revealed that the genotype DPL-CA-16 registered lowest days for physiological maturity (29.03 days) and was at par with genotypes DPL-CA-3, DPL-CA-8, DPL-CA-10, DPL-CA-13, DPL-CA-15, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21 and DPL-CA-22. The highest days for physiological maturity (34.59 days) were produced in DPL-CA-25 and was at par with DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti).

The variation in the days required for physiological maturity may be due to genetic influence, effect of low concentration of hormones and environmental effects (Yatagiri *et al.*, 2017). The results recorded regarding days to physiological maturity from anthesis are also in conformity with those reported by Manju and Sreelathakumary (2002), Sharma *et al.* (2010), Shiva *et al.* (2013) and Mena *et al.* (2019).

4.1.10 Number of flowers per plant

After commencement of flowering the flowers are produced in continuous successions for considerable period if the soil and climatic conditions are favourable. Large number of flowers are produced in entire fruit bearing period. It is important character having direct relation with the productivity. The number of flowers produced during

the entire lifecycle on observations plants was recorded during all the seasons of experimentation. The data regarding number of flowers produced per plant are presented in Table 13.

The perusal of data revealed that the difference in number of flowers produced per plant in different genotypes under study was significant during all the seasons (*kharif* 2018, *kharif* 2019, *rabi* 2018-19, *rabi* 2019-20) and overall pooled data (*kharif* pooled, *rabi* pooled and overall pooled). During *kharif* 2018, the highest number of flowers were produced by genotype DPL-CA-6 (254.71) which was at par with DPL-CA-5, DPL-CA-13, DPL-CA-17, DPL-CA-21, DPL-CA-28 and DPL-CA-29 (Arka Lohit) whereas lowest number of flowers were exhibited by DPL-CA-14 (93.37) and it was at par with DPL-CA-10 and DPL-CA-27. During *kharif* 2019, the maximum number of flowers were recorded in DPL-CA-17 (289.05) and it was at par with DPL-CA-5 (248.36). The minimum number of flowers per plant were noted in DPL-CA-14 (84.12). In *kharif* pooled data, DPL-CA-5 produced maximum flowers per plant (252.21) but the genotypes DPL-CA-6, DPL-CA-12, DPL-CA-13 and DPL-CA-17 were at par with it. The genotype DPL-CA-14 produced minimum number of flowers (89.16) and no other genotype was statistically comparable to it.

During *rabi* 2018-19, DPL-CA-13 exhibited production of highest flowers per plant (262.70) and DPL-CA-6, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti) were statistically comparable to it. The lowest number of flowers per plant was exhibited by DPL-CA-15 (108.65) and was at par with DPL-CA-14 (117.13). During *rabi* 2019-20, the maximum number of flowers per plant (323.11) were noted in DPL-CA-13 and it was significantly superior over all other genotypes. The minimum number of flowers were recorded by DPL-CA-20 (135.91) but it was at par with many other genotypes *viz.* DPL-CA-1, DPL-CA-4, DPL-CA-7, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-19, DPL-CA-20, DPL-CA-22, DPL-CA-24 and DPL-CA-26. The pooled *rabi* data revealed that highest number of flowers per

Table 13 : Variation in number of flowers per plant among chilli genotypes during *kharif* and *rabi* seasons

S.N.	Genotype	Number of flowers per plant						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	141.90	175.04	155.44	131.91	178.55	155.23	155.33
2	DPL CA-2	209.57	211.80	210.21	180.64	218.14	199.39	204.80
3	DPL CA-3	186.25	273.27	214.39	176.99	221.61	199.30	206.85
4	DPL CA-4	175.21	200.94	181.74	170.85	171.54	171.20	176.47
5	DPL CA-5	245.28	248.36	252.21	172.16	250.07	211.12	231.66
6	DPL CA-6	254.71	243.40	250.84	235.09	228.06	231.57	241.21
7	DPL CA-7	170.31	168.35	172.82	159.58	154.52	157.05	164.93
8	DPL CA-8	157.60	183.52	167.94	164.53	208.30	186.42	177.18
9	DPL CA-9	192.31	234.03	198.94	201.76	216.05	208.91	203.93
10	DPL CA-10	137.93	162.18	148.53	130.33	160.26	145.29	146.91
11	DPL CA-11	156.70	163.44	160.88	135.81	139.68	137.75	149.31
12	DPL CA-12	207.38	234.12	218.08	181.58	176.68	179.13	198.61
13	DPL CA-13	222.91	204.17	221.43	262.70	323.11	292.90	257.17
14	DPL CA-14	93.37	84.12	89.16	117.13	147.86	132.49	110.83
15	DPL CA-15	150.52	155.62	154.23	108.65	153.10	130.88	142.56
16	DPL CA-16	192.12	203.41	196.47	180.97	147.89	164.43	180.45
17	DPL CA-17	228.57	289.05	248.73	215.81	242.23	229.02	238.88
18	DPL CA-18	205.13	193.76	200.60	187.33	206.94	197.14	198.87
19	DPL CA-19	163.65	161.80	171.83	153.60	164.50	159.05	165.44
20	DPL CA-20	190.15	170.76	177.77	183.91	135.91	159.90	168.84
21	DPL CA-21	211.61	230.25	216.12	166.50	194.11	180.30	198.21
22	DPL CA-22	193.14	199.17	193.38	183.89	161.00	172.44	182.91
23	DPL CA-23	197.60	215.48	198.47	180.22	216.09	198.16	198.31
24	DPL CA-24	197.06	190.11	197.99	188.53	151.15	169.84	183.92
25	DPL CA-25	167.11	178.62	172.86	162.12	209.89	186.01	179.43
26	DPL CA-26	201.60	142.54	190.41	153.83	140.52	147.18	168.79
27	DPL CA-27	138.36	156.40	155.16	138.01	150.34	144.18	149.67
28	DPL CA-28	218.92	220.66	213.96	192.49	187.22	189.86	201.91
29	DPL CA-29 (Arka Lohit)	232.96	187.24	214.38	223.70	194.60	209.15	211.76
30	DPL CA-30 (Konkan Kirti)	181.19	216.35	198.22	244.96	239.93	242.44	220.33
	S.E.m ±	16.61	15.54	12.97	15.31	16.53	12.71	8.66
	C.D.@ 5%	47.14	44.10	36.81	43.44	46.91	36.08	24.57
	C.V.	15.35	13.69	11.74	15.05	15.09	12.04	8.01

plant were observed in DPL-CA-13 (292.90) and it was significantly superior over all other genotypes. The lowest number of flowers per plant (130.88) was registered in DPL-CA-15 and various genotypes *viz.* DPL-CA-1, DPL-CA-7, DPL-CA-10, DPL-CA-11, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-19, DPL-CA-20, DPL-CA-26 and DPL-CA-27 were statistically comparable with each other for this character.

The overall pooled data regarding number of flowers per plant exhibited that the genotype DPL-CA-13 (257.17) produced highest number of flowers and genotype DPL-CA-6 and DPL-CA-17 were at par with it. The lowest number of flowers per plant was noted in DPL-CA-14 (110.83).

During present investigation, it was observed that wide range of flowers were produced in various genotypes however, the genotype producing higher number of flowers necessarily did not produce more number of fruits per plant. It might be due to the varying rate of fruit set in different genotypes. Flower drop in chilli is a major problem, which can be attributed to many reasons like production of imperfect flowers, hormonal imbalance, prevailing stress condition in the field etc. Hasan *et al.*, 2014 reported the number of flowers per plant in the range of 22.3 to 49.8 in chilli under Bangladesh conditions which are comparatively less than those reported in present study.

4.1.11 Fruit bearing period (days)

Chilli is used at both green as well as dry stage. In case of green chillies, it is always considered better to have long harvesting period for prolonged consistent supply. In present investigation the fruit bearing period was calculated considering the difference in first and last harvest and was counted during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20). The data regarding fruit bearing period are presented in Table 14.

The data revealed that the difference among the different genotypes was significant for fruit bearing period during all the seasons

Table 14 : Variation in fruit bearing period of chilli genotypes during kharif and rabi season

S.N.	Genotype	Fruit bearing period (days)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	53.24	53.79	53.52	56.49	57.54	57.02	55.27
2	DPL CA-2	47.90	48.45	48.18	51.14	52.20	51.67	49.92
3	DPL CA-3	50.45	51.00	50.73	53.69	54.75	54.22	52.47
4	DPL CA-4	50.93	51.48	51.21	54.17	55.23	54.70	52.95
5	DPL CA-5	50.09	50.64	50.37	53.33	54.39	53.86	52.11
6	DPL CA-6	52.85	53.40	53.12	56.09	57.15	56.62	54.87
7	DPL CA-7	53.58	54.13	53.85	56.82	57.88	57.35	55.60
8	DPL CA-8	53.13	53.68	53.41	56.38	57.43	56.91	55.16
9	DPL CA-9	53.03	53.58	53.30	56.27	57.33	56.80	55.05
10	DPL CA-10	50.87	51.42	51.15	54.12	55.17	54.65	52.90
11	DPL CA-11	53.50	54.05	53.77	56.74	57.80	57.27	55.52
12	DPL CA-12	54.31	54.86	54.59	57.55	58.61	58.08	56.33
13	DPL CA-13	52.53	53.08	52.80	55.77	56.83	56.30	54.55
14	DPL CA-14	54.15	54.70	54.42	57.39	58.45	57.92	56.17
15	DPL CA-15	52.40	52.81	52.61	55.50	56.70	56.10	54.35
16	DPL CA-16	48.22	48.77	48.49	51.63	52.52	52.07	50.28
17	DPL CA-17	53.46	54.01	53.74	56.70	57.76	57.23	55.48
18	DPL CA-18	46.80	47.35	47.08	50.05	51.10	50.58	48.83
19	DPL CA-19	53.71	54.26	53.99	56.96	58.01	57.49	55.74
20	DPL CA-20	49.57	50.12	49.84	52.81	53.87	53.34	51.59
21	DPL CA-21	53.14	53.69	53.42	56.39	57.44	56.92	55.17
22	DPL CA-22	48.92	49.47	49.19	52.16	53.22	52.69	50.94
23	DPL CA-23	49.10	49.65	49.38	52.34	53.40	52.87	51.12
24	DPL CA-24	52.30	52.85	52.58	55.54	56.60	56.07	54.32
25	DPL CA-25	51.26	51.81	51.54	54.51	55.56	55.04	53.29
26	DPL CA-26	50.04	50.59	50.32	53.28	54.34	53.81	52.06
27	DPL CA-27	53.37	53.92	53.64	56.61	57.67	57.14	55.39
28	DPL CA-28	50.24	50.79	50.52	53.48	54.54	54.01	52.26
29	DPL CA-29 (Arka Lohit)	45.27	45.82	45.54	55.11	54.80	54.95	50.25
30	DPL CA-30 (Konkan Kirti)	41.27	41.82	41.54	54.85	54.90	54.88	48.21
	S.E.m ±	1.00	1.00	1.00	1.00	1.01	0.66	0.75
	C.D.@ 5%	2.82	2.82	2.82	2.84	2.86	1.88	2.13
	C.V.	3.38	3.35	3.36	3.17	3.13	2.07	2.44

(i.e., *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif* pooled, *rabi* pooled and overall pooled). The longest (54.13 days) fruit bearing period during *kharif* 2018 was noted in DPL-CA-12 which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27 whereas DPL-CA-30 (Konkan Kirti) recorded shortest fruit bearing period (41.27 days). During *kharif* 2019, DPL-CA-12 recorded highest fruit bearing period (54.86 days) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27 whereas DPL-CA-30 (Konkan Kirti) exhibited lowest fruit bearing period of 41.82 days. In pooled *kharif* data, DPL-CA-12 registered maximum fruit bearing period (54.59 days) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27 whereas minimum fruit bearing period of 41.54 days was exhibited by DPL-CA-30 (Konkan Kirti).

During *rabi* season of 2018-19, the highest (57.55 days) fruit bearing period was noticed in DPL-CA-12 which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27, DPL-CA-29 and DPL-CA-30 (Konkan Kirti). The genotype DPL-CA-18 recorded lowest fruit bearing period (50.05 days) which was at par with DPL-CA-2, DPL-CA-16, DPL-CA-20, DPL-CA-22 and DPL-CA-23. During *rabi* 2019-20, DPL-CA-12 recorded maximum fruit bearing period (58.61 days) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27 whereas DPL-CA-18 exhibited minimum fruit bearing period of 51.10 days and genotypes DPL-CA-2, DPL-CA-16, DPL-CA-20, DPL-CA-22 and DPL-CA-17 were at par with it.

In pooled *rabi* data, DPL-CA-12 registered longest fruit bearing period (58.08 days) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-17, DPL-CA-19, DPL-CA-21 and DPL-CA-27 whereas shortest fruit bearing period of 50.58 days was exhibited by DPL-CA-18 however it was at par with genotypes DPL-CA-2 and DPL-CA-16.

The overall pooled data regarding fruit bearing period are presented in Table 15. The perusal of data revealed that the difference in various genotypes with respect to fruit bearing period was significant. The genotype DPL-CA-12 registered maximum fruit bearing period (56.33 days) which was at par with DPL-CA-1, DPL-CA-6, DPL-CA-7, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-24 and DPL-CA-27 whereas minimum fruit bearing period of 48.21 days was exhibited by DPL-CA-30 (Konkan Kirti), however it was at par with genotypes DPL-CA-2, DPL-CA-16, DPL-CA-18 and DPL-CA-29 in respect of this character.

The significant variation was observed in the fruit bearing period of various genotypes which might be due to difference in the days for flowering commencement and fifty per cent flowering. The interaction of environment with the genotype is also responsible for the variation (Pawar *et al.*, 2019). Pawar (2016) reported significant variation in fruit bearing period in 13 genotypes of chilli under Konkan agro-climatic condition. Such variations in fruit bearing period was also reported by Pramila *et al.* (2009), Amit *et al.* (2014) and Yatagiri *et al.* (2017).

4.1.12 Fruit breadth (mm)

The local chilli genotypes which are being grown in different pockets of Konkan region are specifically used for pickle and other chilli delicacies for which the fruits having more breadth (*gundu types*) are preferred. Accordingly, the genotypes having more fruit breadth carry economic value. Hence, the fruit breadth was measured during four

successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 15.

The critical examination of the data revealed that the difference among the different genotypes for fruit breadth during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled) was significant. During *kharif* 2018, the maximum fruit breadth (20.85 mm) was recorded in genotype DPL-CA-14 and was significantly superior over all other genotypes under study whereas genotype DPL-CA-29 (Arka Lohit) noted the minimum fruit breadth (8.04 mm) and was at par with DPL-CA-30 (Konkan Kirti). During *kharif* 2019 also the highest fruit breadth (21.12 mm) was registered in genotype DPL-CA-14 which was significantly superior over all other genotypes under study whereas genotype DPL-CA-30 (Konkan Kirti) produced the fruits with lowest fruit breadth (8.78 mm) which was at par with DPL-CA-5, DPL-CA-19, DPL-CA-21 and DPL-CA-29 (Arka Lohit). In pooled *kharif* data, the greatest fruit breadth (20.99 mm) was recorded in genotype DPL-CA-14 and was significantly superior over all other genotypes whereas genotype DPL-CA-29 (Arka Lohit) noticed smallest fruit breadth (8.46 mm) which was at par with DPL-CA-5, DPL-CA-19 and DPL-CA-30 (Konkan Kirti).

During *rabi* 2018-19, the highest fruit breadth (20.85 mm) was found in genotype DPL-CA-14 which was significantly superior over all other genotypes whereas genotype DPL-CA-29 (Arka Lohit) noted lowest fruit breadth (8.09 mm) which was at par with DPL-CA-5, DPL-CA-19 and DPL-CA-30 (Konkan Kirti). During 2019-20, the maximum fruit breadth (20.59 mm) was seen in genotype DPL-CA-14 which was significantly superior over all other genotypes whereas genotype DPL-CA-29 (Arka Lohit) fruits were having minimum fruit breadth (8.05 mm) which was at par with DPL-CA-5 and DPL-CA-30 (Konkan Kirti).

The perusal of pooled *rabi* data pertaining to fruit breadth revealed that the greatest fruit breadth (20.72 mm) was recorded in genotype

Table 15 : Variation in fruit breadth among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Fruit breadth (mm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	14.60	14.72	14.66	14.18	14.40	14.29	14.48
2	DPL CA-2	12.12	12.27	12.19	12.35	12.87	12.61	12.40
3	DPL CA-3	14.82	14.40	14.61	14.88	14.92	14.90	14.76
4	DPL CA-4	13.37	13.69	13.53	13.23	13.53	13.38	13.45
5	DPL CA-5	8.62	8.80	8.71	8.64	8.45	8.54	8.63
6	DPL CA-6	10.44	10.85	10.65	10.41	10.40	10.40	10.53
7	DPL CA-7	10.81	10.91	10.86	10.43	10.65	10.54	10.70
8	DPL CA-8	15.36	15.82	15.59	15.38	15.71	15.54	15.57
9	DPL CA-9	17.50	17.81	17.65	17.55	17.87	17.71	17.68
10	DPL CA-10	14.39	14.85	14.62	14.55	14.45	14.50	14.56
11	DPL CA-11	13.41	13.74	13.58	13.52	13.70	13.61	13.59
12	DPL CA-12	13.56	12.95	13.26	13.96	14.79	14.37	13.82
13	DPL CA-13	12.47	12.72	12.60	12.23	12.66	12.45	12.52
14	DPL CA-14	20.85	21.12	20.99	20.85	20.59	20.72	20.85
15	DPL CA-15	13.94	13.99	13.96	13.36	13.07	13.21	13.59
16	DPL CA-16	14.64	15.04	14.84	14.47	14.96	14.72	14.78
17	DPL CA-17	10.64	10.80	10.72	10.42	11.10	10.76	10.74
18	DPL CA-18	11.44	11.79	11.61	11.47	11.67	11.57	11.59
19	DPL CA-19	8.56	8.80	8.68	8.58	8.98	8.78	8.73
20	DPL CA-20	12.73	11.77	12.25	12.77	13.12	12.94	12.60
21	DPL CA-21	9.04	9.02	9.03	9.09	8.98	9.03	9.03
22	DPL CA-22	12.37	13.12	12.75	12.45	12.79	12.62	12.68
23	DPL CA-23	12.47	12.89	12.68	12.53	12.58	12.56	12.62
24	DPL CA-24	11.50	11.85	11.67	11.41	11.51	11.46	11.57
25	DPL CA-25	12.57	12.98	12.78	12.49	12.47	12.48	12.63
26	DPL CA-26	12.87	13.18	13.03	12.45	12.68	12.56	12.79
27	DPL CA-27	12.81	12.85	12.83	12.10	12.31	12.20	12.52
28	DPL CA-28	11.77	11.98	11.87	11.20	11.14	11.17	11.52
29	DPL CA-29 (Arka Lohit)	8.04	8.88	8.46	8.09	8.05	8.07	8.27
30	DPL CA-30 (Konkan Kirti)	8.26	8.78	8.52	8.20	8.25	8.23	8.37
	S.E.m ±	0.12	0.20	0.11	0.30	0.29	0.21	0.12
	C.D.@ 5%	0.34	0.56	0.31	0.85	0.81	0.59	0.33
	C.V.	1.65	2.67	1.51	4.17	3.93	2.86	1.62

DPL-CA-14 and was significantly superior over all other genotypes under study whereas genotype DPL-CA-29 (Arka Lohit) exhibited the fruits with smallest fruit breadth (8.07 mm) which was at par with DPL-CA-5 and DPL-CA-30 (Konkan Kirti).

The perusal of overall pooled data presented in Table 15 and illustrated in Figure 16 revealed that the highest fruit breadth (20.85 mm) was recorded in genotype DPL-CA-14 which was significantly superior over all other genotypes under study whereas genotype DPL-CA-29 (Arka Lohit) registered the fruits with minimum fruit breadth (8.27 mm) and DPL-CA-30 (Konkan Kirti) was at par with DPL-CA-29 (Arka Lohit).

During present investigation, genotypes having more fruit breadth were selected for evaluation as breadth of the fruit is an important factor which decides the preference of fruit for pickle purpose and many other value-added products. The wide range of variation in diameter of the fruits of various genotypes was recorded. It might be due to the genetic variation in the genotypes. The present genotypes were collected from various locations depending upon their consumer acceptability in the specific region. The genotypic variation along with their interaction with the environment might be responsible for the variation in the diameter of the fruit. Priyanka Bijalwan and Naidu Madhvi (2016) reported range of fruit breadth or fruit diameter (cm) from 0.88 to 2.03 whereas Naganirmala and Mallikarjuna (2019) observed range of 0.82 cm to 2.55 cm with mean value of 1.32 cm. The similar magnitudes were reported by Rohini and Lakshmanan (2014), Dhaliwal (2014), Chattopadhyay *et al.* (2011), Yatagiri *et al.* (2017) and Pawar *et al.* (2019).

4.1.13 Fruit length (cm)

Fruit length is considered as important parameter deciding quality and marketability of the chilli. Fruits having more fruit length are preferred for vegetable purpose. But in *gundu* chillies, the fruits with medium fruit length and more fruit breadth are preferred. Fruit length

was measured during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 16.

The critical examination of the data revealed that the difference among the various genotypes under study for fruit length during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled) was significant. During *kharif* 2018, the highest length (6.86 mm) was recorded in genotype DPL-CA-29 (Arka Lohit) which was significantly superior over all other genotypes under study whereas genotype DPL-CA-1 registered the fruits with minimum fruit length (2.79 cm) which was at par with DPL-CA-3, DPL-CA-13, DPL-CA-16, DPL-CA-20, and DPL-CA-26. During *kharif* 2019 also the maximum length (6.41 mm) was recorded in genotype DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes whereas genotype DPL-CA-1 produced the fruits with minimum fruit length (2.82 cm) which was at par with other genotypes *viz.* DPL-CA-3, DPL-CA-13, DPL-CA-16, DPL-CA-20 and DPL-CA-26. In *kharif* pooled data the greatest length (6.63 mm) was found in genotype DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes whereas genotype DPL-CA-1 exhibited the fruits with smallest fruit length (2.81 cm) which was at par with other genotypes *viz.* DPL-CA-16, DPL-CA-20 and DPL-CA-26.

During *rabi* 2018-19, the highest length (6.65 mm) was observed in genotype DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes tested during the investigation whereas genotype DPL-CA-1 produced the fruits with lowest fruit length (2.81 cm) which was at par with DPL-CA-3, DPL-CA-13, DPL-CA-16, DPL-CA-20 and DPL-CA-26. During *rabi* 2019-20, the greatest length (6.54 mm) was observed in genotype DPL-CA-29 (Arka Lohit) which was significantly superior over all other genotypes. The genotype DPL-CA-1 produced the fruits with minimum fruit length (2.77 cm) which was at par with DPL-CA-13, DPL-CA-16, DPL-CA-20, and DPL-CA-26.

Table 16 : Variation in fruit length among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Fruit length (cm)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	2.79	2.82	2.81	2.81	2.77	2.79	2.80
2	DPL CA-2	4.35	4.36	4.36	4.31	4.13	4.22	4.29
3	DPL CA-3	3.03	3.05	3.04	3.10	3.17	3.13	3.09
4	DPL CA-4	4.43	4.46	4.44	4.50	4.03	4.27	4.36
5	DPL CA-5	4.81	4.91	4.86	4.84	4.87	4.85	4.86
6	DPL CA-6	3.52	3.53	3.53	3.49	3.53	3.51	3.52
7	DPL CA-7	4.71	4.72	4.71	4.24	4.38	4.31	4.51
8	DPL CA-8	5.46	5.57	5.51	5.37	5.17	5.27	5.39
9	DPL CA-9	3.62	3.49	3.55	3.62	3.63	3.63	3.59
10	DPL CA-10	4.86	4.77	4.81	4.90	4.68	4.79	4.80
11	DPL CA-11	4.90	4.90	4.90	4.83	4.79	4.81	4.85
12	DPL CA-12	3.71	3.42	3.57	3.77	3.83	3.80	3.68
13	DPL CA-13	3.03	3.05	3.04	2.98	3.03	3.01	3.02
14	DPL CA-14	4.84	4.96	4.90	4.88	4.86	4.87	4.89
15	DPL CA-15	3.32	3.29	3.30	3.36	3.31	3.34	3.32
16	DPL CA-16	2.89	2.86	2.87	2.85	2.88	2.87	2.87
17	DPL CA-17	4.75	4.88	4.82	4.81	4.80	4.80	4.81
18	DPL CA-18	4.45	4.43	4.44	4.51	4.49	4.50	4.47
19	DPL CA-19	4.37	4.39	4.38	4.30	4.35	4.33	4.35
20	DPL CA-20	3.05	2.94	2.99	3.00	3.03	3.01	3.00
21	DPL CA-21	4.16	4.24	4.20	4.13	4.05	4.09	4.14
22	DPL CA-22	3.71	3.69	3.70	3.76	3.65	3.71	3.70
23	DPL CA-23	4.19	4.17	4.18	4.06	4.12	4.09	4.13
24	DPL CA-24	4.10	3.99	4.04	3.94	3.99	3.97	4.01
25	DPL CA-25	5.58	5.61	5.60	5.39	5.44	5.41	5.51
26	DPL CA-26	2.95	2.90	2.92	2.88	2.86	2.87	2.90
27	DPL CA-27	5.19	5.18	5.19	5.09	5.05	5.07	5.13
28	DPL CA-28	5.42	5.38	5.40	5.16	5.78	5.47	5.44
29	DPL CA-29 (Arka Lohit)	6.86	6.41	6.63	6.65	6.54	6.60	6.61
30	DPL CA-30 (Konkan Kirti)	5.06	5.15	5.10	5.15	5.02	5.09	5.09
	S.E.m ±	0.10	0.09	0.08	0.15	0.13	0.10	0.07
	C.D.@ 5%	0.27	0.27	0.21	0.43	0.36	0.30	0.19
	C.V.	3.91	3.80	3.07	6.23	5.14	4.27	2.76

The perusal of pooled *rabi* data pertaining to fruit length revealed that the highest fruit length (6.60 mm) was observed in genotype DPL-CA-29 (Arka Lohit) and was significantly superior over all other genotypes whereas genotype DPL-CA-1 produced the fruits with lowest fruit length (2.79 cm) which was at par with other genotypes DPL-CA-13, DPL-CA-16, DPL-CA-20 and DPL-CA-26.

The overall pooled data presented in Table 16 and depicted in Figure 17 revealed that the maximum fruit length (6.61 cm) was observed in genotype DPL-CA-29 (Arka Lohit) which was significantly superior over all other genotypes whereas genotype DPL-CA-1 produced short fruits with minimum fruit length (2.80 cm) and genotypes DPL-CA-16 and DPL-CA-26 were at par with DPL-CA-1.

Fruit length is governed by number of factors including genotype of the plant, environmental conditions and their interaction. Usually higher fruit length is acceptable for commercial purpose, however for value addition and pickle lesser fruit length with higher breadth is supposed to be more ideal. During investigation, the variation in the fruit length was quite considerable indicating ample scope for selection of the genotypes for various purposes. Kerketta *et al.* (2018) reported the range of 5.17 cm to 12.80 cm with general mean of 8.49 cm in various chilli genotypes grown under Allahabad climatic conditions, whereas Pawar *et al.* (2019) registered a range of 3.84 cm to 7.93 cm with mean of 5.71 cm. Similar variation in chilli genotypes was also reported by Cheema *et al.* (2010), Saravaiya *et al.* (2011), Shiva *et al.* (2013), Rohini and Lakshmanan (2014) and Yatagiri *et al.* (2017).

4.1.14 Capsaicin content (%)

Chilli is known for its pungency which imparts pungent flavor to the food. The pungency in chilli is due to capsaicin content in the fruit. The capsaicin content in the fruit is governed by the genetic makeup of the plant as well as the environmental conditions under which the crop is grown. The capsaicin content was estimated from mature green chilli

fruits during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 17.

The perusal of the data revealed significant difference among the various chilli genotypes under study for capsaicin content during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the maximum capsaicin content (0.963 %) was observed in genotype DPL-CA-27 which was at par DPL-CA-19 (0.857 %) but significantly superior over all other genotypes. DPL-CA-1 estimated minimum capsaicin content (0.377 %) which was at par with other genotypes *viz.* DPL-CA-3, DPL-CA-9, DPL-CA-11, DPL-CA-14, DPL-CA-16, DPL-CA-17, DPL-CA-25 and DPL-CA-30 (Konkan Kirti). During *kharif* 2019 also the highest capsaicin content (0.933 %) was analysed in genotype DPL-CA-27 which was at par DPL-CA-19 (0.820 %) but significantly superior over all other genotypes under study. The genotype DPL-CA-9 found having lowest capsaicin content (0.397 %) which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-3, DPL-CA-11, DPL-CA-14, DPL-CA-17, DPL-CA-25 and DPL-CA-30 (Konkan Kirti). In *kharif* pooled data the greatest capsaicin content (0.948 %) was recorded in genotype DPL-CA-27 which was significantly superior over all other genotypes whereas genotype DPL-CA-1 and DPL-CA-9 noted smallest capsaicin content (0.397 %) which were at par with other genotypes *viz.* DPL-CA-3, DPL-CA-11, DPL-CA-14, DPL-CA-17, DPL-CA-25 and DPL-CA-30 (Konkan Kirti).

During *rabi* 2018-19, the maximum capsaicin content (0.995 %) was analysed in genotype DPL-CA-27 which was at par with DPL-CA-4 (0.950 %) but significantly superior over all other genotypes. Genotype DPL-CA-9 noted minimum capsaicin content (0.460 %) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-11, DPL-CA-14, DPL-CA-17, DPL-CA-25, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). During *rabi* 2019-20, the highest capsaicin content (0.987 %) was registered in genotype DPL-

Table 17 : Variation in capsaicin content among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Capsaicin content (%)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	0.377	0.417	0.397	0.467	0.377	0.422	0.409
2	DPL CA-2	0.547	0.553	0.550	0.633	0.487	0.560	0.555
3	DPL CA-3	0.450	0.480	0.465	0.573	0.413	0.493	0.479
4	DPL CA-4	0.803	0.847	0.825	0.950	0.527	0.738	0.782
5	DPL CA-5	0.543	0.570	0.557	0.620	0.627	0.623	0.590
6	DPL CA-6	0.743	0.780	0.762	0.827	0.737	0.782	0.772
7	DPL CA-7	0.640	0.647	0.643	0.767	0.670	0.718	0.681
8	DPL CA-8	0.683	0.727	0.705	0.830	0.743	0.787	0.746
9	DPL CA-9	0.397	0.397	0.397	0.460	0.517	0.488	0.443
10	DPL CA-10	0.623	0.663	0.643	0.830	0.667	0.748	0.696
11	DPL CA-11	0.373	0.453	0.413	0.523	0.487	0.505	0.459
12	DPL CA-12	0.570	0.603	0.587	0.647	0.570	0.608	0.598
13	DPL CA-13	0.787	0.813	0.800	0.863	0.697	0.780	0.790
14	DPL CA-14	0.417	0.437	0.427	0.533	0.490	0.512	0.469
15	DPL CA-15	0.590	0.530	0.560	0.590	0.720	0.655	0.608
16	DPL CA-16	0.477	0.520	0.498	0.657	0.587	0.622	0.560
17	DPL CA-17	0.450	0.480	0.465	0.550	0.753	0.652	0.558
18	DPL CA-18	0.600	0.613	0.607	0.657	0.613	0.635	0.621
19	DPL CA-19	0.857	0.820	0.838	0.857	0.727	0.792	0.815
20	DPL CA-20	0.647	0.640	0.643	0.667	0.730	0.698	0.671
21	DPL CA-21	0.527	0.537	0.532	0.633	0.637	0.635	0.583
22	DPL CA-22	0.573	0.610	0.592	0.650	0.557	0.603	0.598
23	DPL CA-23	0.627	0.643	0.635	0.673	0.763	0.718	0.677
24	DPL CA-24	0.690	0.733	0.712	0.780	0.743	0.762	0.737
25	DPL CA-25	0.427	0.443	0.435	0.513	0.567	0.540	0.488
26	DPL CA-26	0.500	0.520	0.510	0.580	0.590	0.585	0.548
27	DPL CA-27	0.963	0.933	0.948	0.995	0.987	0.991	0.970
28	DPL CA-28	0.563	0.607	0.585	0.657	0.660	0.658	0.622
29	DPL CA-29 (Arka Lohit)	0.587	0.680	0.633	0.690	0.780	0.735	0.684
30	DPL CA-30 (Konkan Kirti)	0.433	0.457	0.445	0.477	0.540	0.508	0.477
	S.E.m ±	0.048	0.041	0.032	0.044	0.047	0.035	0.023
	C.D.@ 5%	0.137	0.116	0.092	0.125	0.134	0.100	0.065
	C.V.	14.360	11.717	9.445	11.330	12.90	9.362	6.38

CA-27 and was significantly superior over all other genotypes under investigation. Lowest capsaicin content (0.377%) was found in DPL-CA-1 which was at par with other genotypes *viz.* DPL-CA-2, DPL-CA-3, DPL-CA-11 and DPL-CA-14.

The perusal of pooled *rabi* data pertaining to capsaicin content presented in Table 17 and illustrated in Figure 18 revealed that the greatest capsaicin content (0.991 %) was estimated in genotype DPL-CA-27 and was significantly superior over all other genotypes under investigation. Genotype DPL-CA-1 recorded minimum capsaicin content (0.422 %) which was at par with other genotypes *viz.* DPL-CA-3, DPL-CA-9, DPL-CA-11, DPL-CA-14 and DPL-CA-30 (Konkan Kirti).

The overall pooled data regarding to capsaicin content are presented in Table 18. The highest capsaicin content (0.970 %) was observed in genotype DPL-CA-27 which was significantly superior over all other genotypes under investigation. Genotype DPL-CA-1 recorded lowest capsaicin content (0.409 %) which was at par with other genotypes *viz.* DPL-CA-3, DPL-CA-9, DPL-CA-14 and DPL-CA-30 (Konkan Kirti).

Capsaicin content in green chilli fruit decides the pungency level of the respective genotype. The fruit with very high as well as very low capsaicin content are less acceptable as compared to fruit with moderate capsaicin content. During the present investigation, capsaicin content ranged between 0.409 % (DPL-CA-1) to 0.970 % (DPL-CA-27). For value addition the fruits with low to medium pungency are preferred. Pawar *et al.* (2019) reported minimum capsaicin content (0.084 mg/100 g) whereas maximum capsaicin content (0.254 mg/100 g) in various chilli genotypes under Konkan conditions. The comparable range in capsaicin content of different chilli genotypes was also reported by Krishnamurthy *et al.* (1998) and Uma (2008).

4.1.15 Ascorbic acid content (mg per100 g)

Among the solanaceous vegetables, chilli contains highest ascorbic acid which is considered as an important phytochemical having

nutraceutical value. The ascorbic acid content was estimated from mature green chilli fruits during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 18.

The perusal of the data revealed significant difference among the various chilli genotypes under study for ascorbic acid content during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the maximum ascorbic acid (180.90 mg/100 g) was found in genotype DPL-CA-3 which was at par with DPL-CA-4, DPL-CA-7, DPL-CA-14, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-30 (Konkan Kirti) whereas genotype DPL-CA-10 recorded minimum ascorbic acid (109.69 mg/100g) which was at par with other genotypes DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-6, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22 and DPL-CA-23. During *kharif* 2019 also the highest ascorbic acid (196.16 mg/100 g) was noticed in genotype DPL-CA-14 which was significantly superior over all other genotypes whereas DPL-CA-10 recorded lowest ascorbic acid (103.10 mg/100g) which was at par with DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-9, DPL-CA-13, DPL-CA-15, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-27 and DPL-CA-28. In *kharif* pooled data, the greatest ascorbic acid (187.85 mg/100g) was recorded in genotype DPL-CA-14 which was at par with DPL-CA-3 (169.77 mg/100g) and significantly superior over all other genotypes whereas genotype DPL-CA-10 estimated smallest ascorbic acid content (106.40 mg/100g) which was at par with other genotypes DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-9, DPL-CA-13, DPL-CA-18, DPL-CA-19, DPL-CA-20 and DPL-CA-21.

During *rabi* 2018-19, the highest ascorbic acid (179.79 mg/100g) was estimated in genotype DPL-CA-14 which was at par with DPL-CA-3, DPL-CA-7, DPL-CA-8, DPL-CA-13, DPL-CA-16, DPL-CA-17, DPL-CA-24, DPL-CA-25, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The genotype

Table 18 : Variation in ascorbic acid content (mg per 100 g) among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Ascorbic acid content (mg per 100 g)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	118.86	120.91	119.88	123.22	127.44	125.33	122.61
2	DPL CA-2	124.75	130.17	127.46	132.05	148.89	140.47	133.97
3	DPL CA-3	180.90	158.64	169.77	173.39	169.76	171.58	170.67
4	DPL CA-4	157.24	163.45	160.34	149.36	155.76	152.56	156.45
5	DPL CA-5	117.81	119.87	118.84	140.22	167.39	153.81	136.32
6	DPL CA-6	130.64	138.62	134.63	148.38	132.08	140.23	137.43
7	DPL CA-7	156.71	165.98	161.35	163.09	161.67	162.38	161.86
8	DPL CA-8	124.89	136.36	130.63	152.00	144.45	148.23	139.43
9	DPL CA-9	124.84	129.14	126.99	150.85	149.85	150.35	138.67
10	DPL CA-10	109.69	103.10	106.40	107.97	114.73	111.35	108.87
11	DPL CA-11	130.21	141.08	135.65	141.26	127.36	134.31	134.98
12	DPL CA-12	130.17	134.68	132.43	133.05	133.84	133.44	132.94
13	DPL CA-13	115.95	107.00	111.47	166.37	115.03	140.70	126.09
14	DPL CA-14	179.54	196.16	187.85	179.79	192.98	186.39	187.12
15	DPL CA-15	144.73	127.67	136.20	145.59	140.86	143.23	139.71
16	DPL CA-16	147.75	147.77	147.76	157.29	156.76	157.02	152.39
17	DPL CA-17	144.42	150.95	147.69	156.12	165.89	161.01	154.35
18	DPL CA-18	129.58	126.85	128.22	125.18	145.88	135.53	131.87
19	DPL CA-19	114.35	116.51	115.43	107.68	157.22	132.45	123.94
20	DPL CA-20	114.70	113.41	114.05	102.46	131.46	116.96	115.51
21	DPL CA-21	114.36	112.20	113.28	106.73	131.64	119.19	116.23
22	DPL CA-22	141.94	153.09	147.51	112.40	155.34	133.87	140.69
23	DPL CA-23	132.85	131.89	132.37	128.13	151.17	139.65	136.01
24	DPL CA-24	163.75	153.81	158.78	162.87	150.77	156.82	157.80
25	DPL CA-25	158.35	134.21	146.28	167.03	152.34	159.68	152.98
26	DPL CA-26	154.46	133.28	143.87	166.47	143.09	154.78	149.32
27	DPL CA-27	129.55	129.53	129.54	123.13	123.65	123.39	126.47
28	DPL CA-28	134.03	130.47	132.25	130.74	142.92	136.83	134.54
29	DPL CA-29 (Arka Lohit)	130.47	133.15	131.81	121.65	144.92	133.28	132.55
30	DPL CA-30 (Konkan Kirti)	167.73	150.39	159.06	153.60	176.42	165.01	162.04
	S.E.m ±	11.65	9.99	7.84	9.93	8.27	6.82	5.39
	C.D.@ 5%	33.07	28.34	22.26	28.18	23.48	19.36	15.30
	C.V.	14.68	12.69	9.92	12.20	9.75	8.21	6.65

DPL-CA-20 noted lowest ascorbic acid (102.46 mg/100g) which was at par with DPL-CA-1, DPL-CA-10, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-23 and DPL-CA-29 (Arka Lohit).

During *rabi* 2019-20, the greatest ascorbic acid content (192.98 mg/100g) was analyzed in genotype DPL-CA-14 which was at par with DPL-CA-3 and DPL-CA-30 (Konkan Kirti). The genotype DPL-CA-10 recorded smallest quantity of ascorbic acid (114.73 mg/100g) which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-6, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-20, DPL-CA-21 and DPL-CA-27.

The perusal of pooled *rabi* data pertaining to ascorbic acid content revealed that the maximum ascorbic acid content (186.39 mg/100 g) was registered in genotype DPL-CA-14 which was at par with DPL-CA-3 (171.58 mg/100 g) but significantly superior over all other genotypes under investigation. Genotype DPL-CA-10 recorded minimum ascorbic acid content (111.35 mg/100 g) and was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-20, DPL-CA-21, and DPL-CA-27.

The overall pooled data regarding ascorbic acid content are presented in Table 18 and illustrated in Figure 19. The maximum ascorbic acid content (187.12 mg/100 g) was recorded in genotype DPL-CA-14 and significantly superior over all other genotypes under investigation. Genotype DPL-CA-10 analyzed minimum ascorbic acid content (108.87 mg/100 g) which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-19, DPL-CA-20, and DPL-CA-21.

Ascorbic acid content in chilli is considered as one of the important quality attribute and given due consideration while selecting the better genotypes. The ascorbic acid content in the fruit is governed by the genetic diversity as well as the stage of maturation and storage conditions (Howard *et al.*, 2000 and Jimanez *et al.*, 2003). Hasan *et al.* (2014) reported that the ascorbic acid content in various chilli lines was deviated from 65.6 mg/100g to 80.5 mg/100g whereas; the same was ranged between 120.3 to 269.8 mg/100g (Priyanka Bijalwan and Naidu

Madhvi, 2016). The magnitude of ascorbic acid content was reported intermediate as compared to earlier two experiments by Kerketta *et al.*, 2018. The similar values were also reported by Bhaskar and Pradhan (2014) and Kumar *et al.* (2015) and Pawar *et al.* (2018).

4.1.16 β -carotene content ($\mu\text{g per } 100\text{g}$)

Chillies are also considered rich in β -carotene and hence their consumption is beneficial in counteracting the ill effects of vitamin A deficiency. The β -carotene content was estimated from mature green chilli fruits during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 19.

The examination of the data revealed that significant difference exists among the various chilli genotypes under study for β -carotene content during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the maximum β -carotene ($478.46 \mu\text{g}/100 \text{g}$) was estimated in genotype DPL-CA-30 (Konkan Kirti) which was at par with *viz.* DPL-CA-4, DPL-CA-6, DPL-CA-10, DPL-CA-11, DPL-CA-14, DPL-CA-17, DPL-CA-24 and DPL-CA-29 (Arka Lohit). The genotype DPL-CA-18 recorded minimum β -carotene content ($343.83 \mu\text{g}/100\text{g}$) which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-13, DPL-CA-15, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-23 and DPL-CA-27. During *kharif* 2019 also the highest β -carotene content ($497.31 \mu\text{g}/100 \text{g}$) was registered in genotype DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-3 ($472.78 \mu\text{g}/100 \text{g}$). The genotype DPL-CA-1 recorded lowest β -carotene content ($318.43 \text{ mg}/100\text{g}$) which was at par with DPL-CA-2 and DPL-CA-5. In *kharif* pooled data, the greatest β -carotene content ($487.89 \mu\text{g}/100\text{g}$) was found in genotype DPL-CA-30 (Konkan Kirti) which was significantly superior over all other genotypes under study. The genotype DPL-CA-5 recorded smallest β -carotene content ($346.33 \mu\text{g}/100\text{g}$) and

Table 19 : Variation in β -carotene among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	β -carotene (μg per 100 g)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	383.10	318.43	350.77	335.82	349.75	342.79	346.78
2	DPL CA-2	351.87	347.08	349.48	345.56	347.94	346.75	348.11
3	DPL CA-3	416.50	472.78	444.64	447.23	413.41	430.32	437.48
4	DPL CA-4	459.90	421.68	440.79	388.93	403.57	396.25	418.52
5	DPL CA-5	354.74	337.92	346.33	351.23	352.43	351.83	349.08
6	DPL CA-6	443.57	422.15	432.86	429.10	423.40	426.25	429.56
7	DPL CA-7	388.47	393.48	390.98	400.28	380.96	390.62	390.80
8	DPL CA-8	390.73	402.87	396.80	422.75	400.17	411.46	404.13
9	DPL CA-9	398.81	401.18	400.00	398.60	389.95	394.28	397.14
10	DPL CA-10	434.88	416.47	425.68	391.99	404.51	398.25	411.96
11	DPL CA-11	452.13	423.23	437.68	415.60	429.61	422.60	430.14
12	DPL CA-12	414.58	416.63	415.61	419.26	399.30	409.28	412.44
13	DPL CA-13	394.03	380.53	387.28	400.46	380.14	390.30	388.79
14	DPL CA-14	449.49	444.19	446.84	438.97	428.59	433.78	440.31
15	DPL CA-15	358.09	358.06	358.08	358.86	340.90	349.88	353.98
16	DPL CA-16	398.40	425.99	412.20	441.20	393.70	417.45	414.82
17	DPL CA-17	433.17	403.11	418.14	402.59	406.63	404.61	411.38
18	DPL CA-18	343.83	354.79	349.31	362.34	336.89	349.61	349.46
19	DPL CA-19	343.90	365.76	354.83	354.12	358.62	356.37	355.60
20	DPL CA-20	354.61	359.40	357.00	369.94	364.61	367.28	362.14
21	DPL CA-21	394.67	391.50	393.08	389.69	368.55	379.12	386.10
22	DPL CA-22	390.49	394.80	392.65	390.63	411.08	400.86	396.75
23	DPL CA-23	391.86	399.35	395.61	388.94	398.14	393.54	394.57
24	DPL CA-24	453.73	451.74	452.74	451.94	405.09	428.51	440.63
25	DPL CA-25	399.13	415.97	407.55	392.97	391.42	392.19	399.87
26	DPL CA-26	405.95	398.60	402.28	394.83	387.51	391.17	396.72
27	DPL CA-27	387.89	380.98	384.43	372.95	372.41	372.68	378.55
28	DPL CA-28	414.97	410.92	412.94	422.06	389.20	405.63	409.29
29	DPL CA-29 (Arka Lohit)	451.65	439.53	445.59	424.16	457.34	440.75	443.17
30	DPL CA-30 (Konkan Kirti)	478.46	497.31	487.89	471.26	443.87	457.57	472.73
	S.E.m \pm	18.55	11.94	11.49	18.89	13.01	10.17	6.88
	C.D.@ 5%	52.62	33.90	32.60	53.60	36.91	28.87	19.53
	C.V.	7.94	5.15	4.94	8.20	5.76	4.46	2.99

was at par with other genotypes DPL-CA-1, DPL-CA-2, DPL-CA-15, DPL-CA-18, DPL-CA-19 and DPL-CA-20.

During *rabi* 2018-19, the highest β -carotene (471.26 $\mu\text{g}/100\text{ g}$) was seen in genotype DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-3, DPL-CA-6, DPL-CA-8, DPL-CA-12, DPL-CA-14, DPL-CA-16, DPL-CA-24, DPL-CA-28 and DPL-CA-29 (Arka Lohit). The genotype DPL-CA-1 noted lowest β -carotene content (335.82 $\mu\text{g}/100\text{g}$) which was at par with other genotypes *viz.* DPL-CA-2, DPL-CA-4, DPL-CA-5, DPL-CA-15, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-23 and DPL-CA-27.

During *rabi* 2019-20, the maximum β -carotene (457.34 $\mu\text{g}/100\text{ g}$) was found in genotype DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-6, DPL-CA-11, DPL-CA-14 and DPL-CA-30 (Konkan Kirti) whereas genotype DPL-CA-18 noticed minimum β -carotene content (336.89 $\mu\text{g}/100\text{g}$) which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-2, DPL-CA-5, DPL-CA-15, DPL-CA-19, DPL-CA-20, DPL-CA-21 and DPL-CA-27.

The perusal of pooled *rabi* data pertaining to β -carotene content revealed that the greatest β -carotene (457.57 $\mu\text{g}/100\text{ g}$) was seen in genotype DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-3, DPL-CA-14 and DPL-CA-29 (Arka Lohit). The genotype DPL-CA-1 noted smallest β -carotene content (342.79 $\mu\text{g}/100\text{g}$) which was at par with other genotypes DPL-CA-2, DPL-CA-5, DPL-CA-15, DPL-CA-18, DPL-CA-19 and DPL-CA-20.

The overall pooled data with regards to β -carotene content are presented in Table 19 and depicted in Figure 20. The highest β -carotene content (472.73 $\mu\text{g}/100\text{ g}$) was recorded in genotype DPL-CA-30 (Konkan Kirti) and was significantly superior over all other genotypes. Genotype DPL-CA-1 recorded lowest β -carotene content (346.78 $\mu\text{g}/100\text{ g}$) but the genotypes *viz.* DPL-CA-2, DPL-CA-5, DPL-CA-15, DPL-CA-18, DPL-CA-19 and DPL-CA-20 where at par with it.

Chilli is the richest source of β -carotene among the solanaceous vegetable crops. The variation observed in the β -carotene content during present study might be attributed to the genotypic variation and the response of the specific genotype to the conditions to which it was exposed. The range of β -carotene was from 346.78 to 472.73 $\mu\text{g}/100\text{g}$. The similar pattern in β -carotene content was noticed by Pawar *et al.* (2018), Naseem *et al.* (2011) and Sarker *et al.* (2012).

4.1.17 Fruit pedicel length (cm)

The fruit pedicel length is considered as important morphological character for identification of the variety. The pedicel length of mature green chilli fruits was measured during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 20.

The examination of the data revealed that significant difference exists among the various chilli genotypes under study for length of pedicel during all the season (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). The longest pedicel (3.24 cm) was seen in genotype DPL-CA-4 which was at par with DPL-CA-2, DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-14, DPL-CA-17, DPL-CA-19, DPL-CA-23, DPL-CA-25, DPL-CA-26, DPL-CA-28, DPL-CA-29 (Arka Lohit) and DPL-CA-30 (Konkan Kirti) whereas shortest pedicel length was recorded in genotype DPL-CA-1 (2.25 cm) which was at par with other genotypes DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-18 and DPL-CA-27. During *kharif* 2019, the highest length of pedicel (3.12 cm) was found in genotype DPL-CA-28 and DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-16, DPL-CA-17, DPL-CA-22, DPL-CA-23, DPL-CA-25, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). The lowest pedicel length was recorded in genotype DPL-CA-1 (2.13 cm) which was at par with other genotypes DPL-CA-13 and DPL-CA-27. In *kharif* pooled data; the maximum length of pedicel (3.10 cm) was recorded in genotype DPL-CA-29 (Arka Lohit)

Table 20 : Variation in fruit pedicel length (cm) among chilli genotypes during *kharif* and *rabi* seasons

S.N.	Genotype	Fruit pedicel length (cm)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	2.25	2.13	2.19	2.15	2.26	2.20	2.20
2	DPL CA-2	2.98	2.76	2.87	2.77	2.95	2.86	2.87
3	DPL CA-3	2.98	3.03	3.01	2.99	2.95	2.97	2.99
4	DPL CA-4	3.24	2.45	2.84	2.66	3.24	2.95	2.90
5	DPL CA-5	2.89	3.05	2.97	3.01	2.60	2.81	2.89
6	DPL CA-6	2.76	2.74	2.75	2.74	2.65	2.69	2.72
7	DPL CA-7	3.07	3.11	3.09	3.03	3.09	3.06	3.07
8	DPL CA-8	3.00	2.83	2.92	2.78	3.08	2.93	2.92
9	DPL CA-9	2.61	2.49	2.55	2.44	2.57	2.51	2.53
10	DPL CA-10	2.90	2.81	2.86	2.79	2.84	2.82	2.84
11	DPL CA-11	2.58	2.58	2.58	2.58	2.51	2.54	2.56
12	DPL CA-12	2.76	2.76	2.76	2.65	2.43	2.54	2.65
13	DPL CA-13	2.36	2.35	2.35	2.51	2.35	2.43	2.39
14	DPL CA-14	2.93	2.64	2.78	2.63	2.52	2.58	2.68
15	DPL CA-15	2.68	2.56	2.62	2.52	2.51	2.51	2.57
16	DPL CA-16	2.74	2.81	2.77	2.96	2.60	2.78	2.78
17	DPL CA-17	3.00	2.88	2.94	2.88	2.90	2.89	2.92
18	DPL CA-18	2.56	2.66	2.61	2.68	2.55	2.61	2.61
19	DPL CA-19	2.92	2.76	2.84	2.56	2.93	2.75	2.79
20	DPL CA-20	2.82	2.67	2.74	2.36	2.69	2.52	2.63
21	DPL CA-21	2.74	2.51	2.63	2.33	2.61	2.47	2.55
22	DPL CA-22	2.76	3.05	2.91	2.93	2.48	2.70	2.81
23	DPL CA-23	2.87	2.97	2.92	3.02	2.78	2.90	2.91
24	DPL CA-24	2.70	2.76	2.73	2.66	2.55	2.61	2.67
25	DPL CA-25	2.94	2.81	2.88	2.81	2.91	2.86	2.87
26	DPL CA-26	2.95	2.86	2.90	2.89	2.90	2.89	2.90
27	DPL CA-27	2.56	2.32	2.44	2.27	2.44	2.36	2.40
28	DPL CA-28	3.06	3.12	3.09	2.99	3.00	2.99	3.04
29	DPL CA-29 (Arka Lohit)	3.07	3.12	3.10	3.12	3.12	3.12	3.11
30	DPL CA-30 (Konkan Kirti)	2.85	2.89	2.87	2.80	2.86	2.83	2.85
	S.E.m ±	0.14	0.11	0.09	0.10	0.10	0.06	0.05
	C.D.@ 5%	0.39	0.31	0.25	0.29	0.27	0.17	0.15
	C.V.	8.49	6.91	5.37	6.45	6.06	3.86	3.26

which was at par with DPL-CA-2, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-10, DPL-CA-17, DPL-CA-22, DPL-CA-25, DPL-CA-26, DPL-CA-28 and DPL-CA-30 (Konkan Kirti). The minimum pedicel length (2.19 cm) was seen in genotype DPL-CA-1 and was at par with DPL-CA-13 and DPL-CA-27.

During *rabi* 2018-19, the highest length of pedicel (3.12 cm) was found in genotype DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-16, DPL-CA-17, DPL-CA-22, DPL-CA-23, DPL-CA-26 and DPL-CA-28. The lowest pedicel length (2.15 cm) was observed in genotype DPL-CA-1 which was at par with DPL-CA-9, DPL-CA-20, DPL-CA-21 and DPL-CA-27.

During *rabi* 2019-20, the longest pedicel (3.24 cm) was found in genotype DPL-CA-4 which was at par with DPL-CA-7, DPL-CA-8, DPL-CA-28 and DPL-CA-29 (Arka Lohit) whereas shortest pedicel length (2.26 cm) was seen in genotype DPL-CA-1 which was at par with DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-22 and DPL-CA-27.

The pooled *rabi* data pertaining to length of pedicel revealed that the highest length of pedicel (3.12 cm) was observed in genotype DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-3, DPL-CA-4, DPL-CA-7 and DPL-CA-28 whereas lowest pedicel length (2.20 cm) was recorded in genotype DPL-CA-1 and was at par with DPL-CA-27.

The overall pooled data revealed that the maximum length of pedicel (3.11 cm) was recorded in genotype DPL-CA-29 (Arka Lohit) which was at par with DPL-CA-3, DPL-CA-7 and DPL-CA-28 and whereas minimum pedicel length (2.20 cm) was observed in genotype DPL-CA-1 and was significantly superior over all other genotypes.

Fruit pedicel length is the important morphological character for identification of the genotype. During present investigation, it ranged from 2.2 cm (DPL-CA-1) to 3.07 cm (DPL-CA-7). Quresh *et al.* (2015) revealed that the pedicel length was in the range of 1.3 cm to 2.5 cm

whereas Santhosha *et al.* (2019) observed fruit stalk length from 2 to 3.2 cm in bird eye chilli. Setiamihardjal and Knavai (1990) reported that distribution of pedicel length from 1.58 cm (Red cherry small) to 5.19 cm (Anaheim chilli) and the intermediate values of pedicel length were recorded in hybrids of these varieties with Serrano chilli. It was further reported that the pedicel length were positively correlated with the fruit length.

4.1.18 Fruit weight (g)

The fruit weight is one of the most important yields deciding parameter of the variety. The fruit weight of mature green chilli fruits was measured during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 21.

The examination of the data revealed that the difference between various chilli genotypes under study for average fruit weight was quite significant during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the highest fruit weight (5.88 g) was seen in genotype DPL-CA-14 and was significantly superior over all other genotypes under study whereas lowest fruit weight (1.56 g) was registered in genotype DPL-CA-26 which was at par with DPL-CA-6, DPL-CA-13, DPL-CA-19 and DPL-CA-21. During *kharif* 2019, the maximum fruit weight (5.56 g) was found in genotype DPL-CA-14 which was significantly superior over all other genotypes whereas minimum fruit weight (1.49 g) was noticed in genotype DPL-CA-21 which was at par with genotypes DPL-CA-19 and DPL-CA-26. In *kharif* pooled data, the greatest fruit weight (5.72 g) was noted in genotype DPL-CA-14 which was significantly superior over all other genotypes under study. The smallest fruit weight (1.54 g) was observed in genotype DPL-CA-21 which was at par with genotypes DPL-CA-19 and DPL-CA-26.

Table 21 : Variation in fruit weight among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Fruit weight (g)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	2.50	2.73	2.62	2.37	2.51	2.44	2.53
2	DPL CA-2	2.61	2.51	2.56	2.86	2.83	2.85	2.70
3	DPL CA-3	2.55	3.00	2.78	2.76	2.89	2.83	2.80
4	DPL CA-4	2.85	2.91	2.88	2.87	2.69	2.78	2.83
5	DPL CA-5	2.20	2.39	2.29	2.55	2.57	2.56	2.43
6	DPL CA-6	1.93	1.99	1.96	1.93	1.90	1.91	1.94
7	DPL CA-7	2.50	2.33	2.42	2.55	2.56	2.56	2.49
8	DPL CA-8	4.48	4.49	4.49	4.52	4.55	4.54	4.51
9	DPL CA-9	3.17	3.30	3.23	3.11	3.03	3.07	3.15
10	DPL CA-10	3.50	3.59	3.55	3.56	3.55	3.56	3.55
11	DPL CA-11	3.38	3.54	3.46	2.69	3.21	2.95	3.20
12	DPL CA-12	2.76	2.73	2.75	2.83	1.84	2.33	2.54
13	DPL CA-13	1.93	1.90	1.92	1.70	1.77	1.74	1.83
14	DPL CA-14	5.88	5.56	5.72	5.26	5.22	5.24	5.48
15	DPL CA-15	2.53	2.83	2.68	2.88	2.91	2.90	2.79
16	DPL CA-16	3.04	3.01	3.03	2.66	2.78	2.72	2.88
17	DPL CA-17	2.49	2.45	2.47	2.61	2.62	2.62	2.54
18	DPL CA-18	2.74	2.75	2.75	2.67	2.81	2.74	2.74
19	DPL CA-19	1.77	1.81	1.79	1.81	1.80	1.81	1.80
20	DPL CA-20	2.71	2.63	2.67	2.72	2.89	2.81	2.74
21	DPL CA-21	1.59	1.49	1.54	1.70	1.56	1.63	1.58
22	DPL CA-22	2.35	2.68	2.51	2.20	2.39	2.30	2.41
23	DPL CA-23	2.96	3.22	3.09	2.94	2.97	2.95	3.02
24	DPL CA-24	2.16	2.15	2.15	2.20	2.12	2.16	2.16
25	DPL CA-25	4.77	4.63	4.70	4.45	4.76	4.61	4.65
26	DPL CA-26	1.56	1.54	1.55	1.69	1.67	1.68	1.61
27	DPL CA-27	3.50	3.49	3.49	3.37	3.55	3.46	3.48
28	DPL CA-28	2.91	2.92	2.92	2.60	3.24	2.92	2.92
29	DPL CA-29 (Arka Lohit)	2.74	2.60	2.67	2.76	2.53	2.65	2.66
30	DPL CA-30 (Konkan Kirti)	2.65	2.72	2.69	2.61	2.72	2.66	2.68
	S.E.m ±	0.14	0.14	0.10	0.16	0.14	0.11	0.07
	C.D.@ 5%	0.38	0.38	0.29	0.46	0.40	0.31	0.19
	C.V.	8.26	8.16	6.14	10.17	8.74	6.73	4.13

During *rabi* 2018-19, the highest fruit weight (5.26 g) was noticed in genotype DPL-CA-14 which was significantly superior over all other genotypes tested under this investigation. The fruit weight observed in DPL-CA-26 was minimum (1.69 g) which was at par with genotypes DPL-CA-6, DPL-CA-13, DPL-CA-19 and DPL-CA-21.

During *rabi* 2019-20, the greatest fruit weight (5.22 g) was noted in DPL-CA-14 which was significantly superior over all other genotypes. The fruit weight recorded in DPL-CA-21 was smallest (1.56 g) which was at par with genotypes DPL-CA-6, DPL-CA-12, DPL-CA-13, DPL-CA-19 and DPL-CA-26.

The perusal of pooled *rabi* data pertaining to fruit weight revealed that genotype DPL-CA-14 produced maximum fruit weight (5.24 g) and was significantly superior over all other genotypes tested under this investigation. The fruit weight recorded in DPL-CA-21 was minimum (1.63 g) and the genotypes DPL-CA-6, DPL-CA-13, DPL-CA-19 and DPL-CA-26 were at par with it.

In overall pooled data presented in Table 21 and illustrated in Figure 21, it was observed that the genotype DPL-CA-14 produced highest fruit weight (5.48 g) which was significantly superior over all other genotypes under study whereas lowest fruit weight (1.58 g) was recorded in DPL-CA-21 and was at par with DPL-CA-26.

Higher fruit weight is one of the major yield contributing character. Average fruit weight along with number of fruits per plant ultimately decides the yield potential of that variety. Though average fruit weight is genetically controlled character, it is also affected by availability of nutrient and moisture. In present study the wide variation from 1.58 g per fruit (DPL-CA-21) to 5.48 g per fruit (DPL-CA-14) was observed. The various workers reported different range in average fruit weight of chilli genotypes *viz.* 1.81 g to 10.21 g (Priyanka Bijalwan and Naidu Madhvi, 2016), 2.22 g to 7.43 g per fruit (Kerketta *et al.*, 2018), 1.67 g to 3.20 g per fruit (Ngullie *et al.*, 2019), 0.79 to 2.27 g per fruit (Tembhurne and

Rao, 2013) and 1.65 to 6.05 g per fruit (Yatagiri *et al.*, 2017). The similar results were also mentioned by Sarkar *et al.* (2009), Cheema *et al.* (2010), Amit *et al.* (2014), Vijaya *et al.* (2014), Rohini and Lakshmanan (2014) and Pawar (2016).

4.1.19 Number of seeds per fruit

In chilli, seeds are born on placenta and its number varies as per the genotype as well as health of the plant. The number of seeds per fruit varies greatly and is considered as one of the character related with the morphological characterization of chilli. The fruits of each genotype were harvested at red ripe stage and then after sufficient drying the seed count per fruit were taken during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 22.

The data revealed that the difference between various chilli genotypes for number of seeds per fruit was quite significant during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the highest number of seeds (84.86/fruit) was observed in genotype DPL-CA-20 which was at par with other genotypes *viz.* DPL-CA-1, DPL-CA-3, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-13, DPL-CA-14, DPL-CA-18, DPL-CA-21, DPL-CA-22, DPL-CA-26 and DPL-CA-29 (Arka Lohit). The lowest number of seeds (41.06/fruit) was noticed in genotype DPL-CA-24 which was at par with DPL-CA-2, DPL-CA-4, DPL-CA-15, DPL-CA-21 and DPL-CA-30 (Konkan Kirti). During *kharif* 2019, the greatest number of seeds (101.78/fruit) was noted in genotype DPL-CA-20 which was at par with DPL-CA-3, DPL-CA-8, DPL-CA-9, DPL-CA-14, DPL-CA-18, DPL-CA-22 and DPL-CA-25 whereas smallest number of seeds (46.84/fruit) was registered in genotype DPL-CA-24 which was at par with DPL-CA-2, DPL-CA-6, DPL-CA-11 and DPL-CA-30 (Konkan Kirti). In *kharif* pooled data, the highest number of seeds (93.32/fruit) was found in genotype DPL-CA-20 which was at par

Table 22 : Variation in number of seeds per fruit among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Number of seeds /fruit						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	69.23	74.00	71.61	83.59	75.80	79.69	75.65
2	DPL CA-2	52.30	53.78	53.04	63.08	62.61	62.85	57.94
3	DPL CA-3	77.99	88.41	83.20	87.41	84.29	85.85	84.53
4	DPL CA-4	59.37	66.28	62.83	73.64	58.59	66.11	64.47
5	DPL CA-5	67.44	75.63	71.53	76.05	70.47	73.26	72.40
6	DPL CA-6	59.91	60.45	60.18	59.29	62.29	60.79	60.49
7	DPL CA-7	60.72	65.09	62.90	63.45	59.44	61.45	62.17
8	DPL CA-8	82.83	96.12	89.48	97.90	93.34	95.62	92.55
9	DPL CA-9	75.59	91.13	83.36	97.48	90.62	94.05	88.71
10	DPL CA-10	79.49	83.63	81.56	82.79	80.44	81.62	81.59
11	DPL CA-11	65.31	64.53	64.92	69.26	59.78	64.52	64.72
12	DPL CA-12	62.12	73.15	67.64	75.47	72.13	73.80	70.72
13	DPL CA-13	67.64	74.78	71.21	75.77	77.25	76.51	73.86
14	DPL CA-14	66.50	86.49	76.50	89.82	81.28	85.55	81.02
15	DPL CA-15	57.67	77.35	67.51	66.21	63.79	65.00	66.26
16	DPL CA-16	61.59	74.11	67.85	75.21	71.95	73.58	70.72
17	DPL CA-17	63.17	60.08	61.63	58.02	57.22	57.62	59.62
18	DPL CA-18	76.74	95.34	86.04	98.30	94.62	96.46	91.25
19	DPL CA-19	63.47	70.35	66.91	76.02	68.71	72.36	69.64
20	DPL CA-20	84.86	101.78	93.32	111.41	96.83	104.12	98.72
21	DPL CA-21	76.42	84.51	80.47	94.45	84.62	89.53	85.00
22	DPL CA-22	82.70	98.01	90.35	113.91	102.40	108.16	99.26
23	DPL CA-23	56.62	69.11	62.86	73.45	66.79	70.12	66.49
24	DPL CA-24	41.06	46.84	43.95	59.21	48.12	53.67	48.81
25	DPL CA-25	60.08	86.43	73.25	85.65	76.87	81.26	77.26
26	DPL CA-26	66.56	73.08	69.82	79.72	73.60	76.66	73.24
27	DPL CA-27	65.27	71.43	68.35	88.58	70.99	79.78	74.07
28	DPL CA-28	61.04	73.51	67.28	85.21	75.76	80.48	73.88
29	DPL CA-29 (Arka Lohit)	68.72	65.65	67.19	78.23	69.82	74.03	70.61
30	DPL CA-30 (Konkan Kirti)	50.44	53.93	52.19	61.35	46.19	53.77	52.98
	S.E.m ±	6.55	6.39	4.74	6.92	7.19	4.73	3.71
	C.D.@ 5%	18.60	18.13	13.44	19.64	20.42	13.42	10.52
	C.V.	17.18	14.72	11.61	14.99	17.02	10.69	8.72

with DPL-CA-3, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-18, DPL-CA-21 and DPL-CA-22, whereas lowest number of seeds (43.95/fruit) was seen in genotype DPL-CA-24 which was at par with DPL-CA-2 and DPL-CA-30 (Konkan Kirti).

During *rabi* 2018-19, the maximum number of seeds (113.91/fruit) was exhibited in genotype DPL-CA-22 which was at par with DPL-CA-8, DPL-CA-9, DPL-CA-18, DPL-CA-20 and DPL-CA-21 whereas, minimum number of seeds (58.02/fruit) was registered in genotype DPL-CA-17 which was at par with DPL-CA-2, DPL-CA-4, DPL-CA-5, DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-12, DPL-CA-13, DPL-CA-15, DPL-CA-16, DPL-CA-23, DPL-CA-24 and DPL-CA-30 (Konkan Kirti). During *rabi* 2019-20, the highest number of seeds (102.40/fruit) was noticed in genotype DPL-CA-22 which was at par with DPL-CA-3, DPL-CA-8, DPL-CA-9, DPL-CA-18, DPL-CA-20 and DPL-CA-21. The lowest number of seeds (46.19/fruit) was recorded in genotype DPL-CA-30 (Konkan Kirti) which was at par with DPL-CA-2, DPL-CA-4, DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-15, DPL-CA-17 and DPL-CA-24.

The perusal of pooled *rabi* data pertaining to number of seeds per fruit revealed that genotype DPL-CA-22 produced maximum number of seeds (108.16/fruit) which was at par with the genotypes DPL-CA-18 and DPL-CA-20, whereas minimum number of seeds (53.67/fruit) were recorded in DPL-CA-24 and was at par with the genotypes DPL-CA-2, DPL-CA-4, DPL-CA-6, DPL-CA-7, DPL-CA-11, DPL-CA-15, DPL-CA-17 and DPL-CA-30 (Konkan Kirti).

It was observed from overall pooled data that the genotype DPL-CA-22 produced highest number of seeds (99.26/fruit) which was at par with DPL-CA-20. The lowest number of seeds (48.81/fruit) was recorded in DPL-CA-24 and was at par with DPL-CA-30 (Konkan Kirti).

Number of seeds per fruit is important character as it directly affects the pungency of the fruit. It is reported that seed and placenta contains more capsaicin content. The number of seeds per fruit is

governed by the genetic makeup, size of the fruit as well as growing conditions. The variation in number of seeds per fruit 34.15 to 79.02 was also reported by Kerketta *et al.* (2018), 43.00 to 132.17 (Tembhurne and Rao, 2013) and 18.6 to 43.5 (Dhaliwal *et al.*, 2014).

4.1.20 100 seed weight (mg)

The seeds of each genotype were extracted from physiologically mature fruits after sufficient drying. The weight of 100 seeds was measured on electronic balance during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) of investigation. The data regarding same are presented in Table 23.

The data exhibited significant difference in 100 seed weight of various genotypes under study during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the maximum weight of 100 seeds (616.52 mg) was registered in genotype DPL-CA-23 which was at par with genotypes DPL-CA-11 (589.08 mg) and significantly superior over all other genotypes. The minimum weight of 100 seeds (378.12 mg) was observed in genotype DPL-CA-24 and no other genotype was statistically at par with it. During *kharif* 2019, the highest weight of 100 seeds (623.23 mg) was recorded in genotype DPL-CA-1 and was at par with DPL-CA-23 (612.18 mg) and significantly superior over all other genotypes. The lowest weight of 100 seeds (366.51 mg) was noted in genotype DPL-CA-24 and no other genotype was statistically at par with it. In *kharif* pooled data, the greatest weight of 100 seeds (614.35 mg) was estimated in genotype DPL-CA-23 which was at par with DPL-CA-1 (594.35 mg) and significantly superior over all other genotypes. The smallest weight of 100 seeds (372.32 mg) was found in genotype DPL-CA-24 and no other genotype was statistically at par with it.

During *rabi* 2018-19, the highest weight of 100 seeds (619.57 mg) was seen in genotype DPL-CA-23 which was at par with DPL-CA-1

Table 23 : Variation in 100 seed weight among chilli genotypes during *kharif* and *rabi* seasons

S.N.	Genotype	100 seed weight (mg)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	565.47	623.23	594.35	602.09	560.39	581.24	587.80
2	DPL CA-2	518.05	524.49	521.27	512.25	504.03	508.14	514.71
3	DPL CA-3	421.81	507.49	464.65	522.33	446.54	484.43	474.54
4	DPL CA-4	503.92	489.15	496.53	501.68	511.35	506.51	501.52
5	DPL CA-5	578.00	574.07	576.03	609.35	574.38	591.87	583.95
6	DPL CA-6	476.03	492.83	484.43	511.42	481.19	496.31	490.37
7	DPL CA-7	502.11	498.40	500.26	508.71	517.37	513.04	506.65
8	DPL CA-8	415.37	413.75	414.56	422.26	431.97	427.11	420.84
9	DPL CA-9	525.66	518.13	521.89	530.48	532.81	531.65	526.77
10	DPL CA-10	500.88	479.90	490.39	497.43	472.38	484.91	487.65
11	DPL CA-11	589.08	580.04	584.56	585.78	582.46	584.12	584.34
12	DPL CA-12	536.41	523.18	529.80	530.56	527.30	528.93	529.36
13	DPL CA-13	468.28	453.77	461.03	473.68	447.74	460.71	460.87
14	DPL CA-14	544.85	508.06	526.46	511.61	551.78	531.70	529.08
15	DPL CA-15	533.02	548.41	540.72	547.39	539.90	543.64	542.18
16	DPL CA-16	511.84	509.52	510.68	505.86	525.68	515.77	513.22
17	DPL CA-17	461.56	462.12	461.84	473.29	501.03	487.16	474.50
18	DPL CA-18	468.95	449.59	459.27	476.64	469.40	473.02	466.14
19	DPL CA-19	440.94	446.23	443.58	457.28	455.13	456.21	449.89
20	DPL CA-20	437.37	445.85	441.61	464.97	462.11	463.54	452.58
21	DPL CA-21	547.03	564.14	555.59	582.98	571.39	577.19	566.39
22	DPL CA-22	499.44	505.69	502.57	522.14	492.79	507.46	505.02
23	DPL CA-23	616.52	612.18	614.35	619.57	626.98	623.28	618.81
24	DPL CA-24	378.12	366.51	372.32	388.43	387.85	388.14	380.23
25	DPL CA-25	536.11	535.32	535.72	544.62	523.85	534.24	534.98
26	DPL CA-26	498.12	484.53	491.33	496.43	489.97	493.20	492.27
27	DPL CA-27	456.20	450.31	453.25	463.93	484.58	474.26	463.75
28	DPL CA-28	484.95	515.98	500.47	498.48	499.25	498.87	499.67
29	DPL CA-29 (Arka Lohit)	510.57	538.55	524.56	503.25	530.27	516.76	520.66
30	DPL CA-30 (Konkan Kirti)	484.86	474.11	479.49	478.66	496.37	487.52	483.50
	S.E.m ±	12.46	13.52	9.89	7.30	13.79	8.22	7.10
	C.D.@ 5%	35.37	38.38	28.06	20.71	39.13	23.33	20.14
	C.V.	4.31	4.66	3.41	2.47	4.71	2.80	2.43

(602.09 mg) and DPL-CA-5 (609.35 mg) whereas minimum weight of 100 seeds (388.43 mg) was registered in genotype DPL-CA-24 and no other genotype was statistically at par with it. During *rabi* 2019-20, the maximum weight of 100 seeds (626.98 mg) was recorded in genotype DPL-CA-23 and was significantly superior over all other genotypes under study whereas, minimum weight of 100 seeds (387.85 mg) was recorded in genotype DPL-CA-24 and no other genotype was statistically at par with it.

The perusal of pooled *rabi* data revealed that the greatest weight of 100 seeds (623.28 mg) was recorded in genotype DPL-CA-23 which was significantly superior over all other genotypes under study. The smallest weight of 100 seeds (388.14 mg) was observed in genotype DPL-CA-24 and no other genotype was statistically at par with it.

It was observed from overall pooled data that the highest weight of 100 seeds (618.81 mg) was found in genotype DPL-CA-23 and was significantly superior over all other genotypes under study. The minimum weight of 100 seeds (380.23 mg) was registered in genotype DPL-CA-24 and no other genotype was statistically at par with it.

100 seed weight decides the weight of individual seed which might be contributing to the seed germination and vigour of the plant which ultimately decides the further growth and development. In present investigation, the 100 seed weight recorded was in the range of 380.23 mg to 618.81 mg. Naganirmla and Mallikarjuna (2019) reported 100 seed weight in range of 0.374 g to 0.942 g. Kerketta *et al.* (2018) observed 100 seed weight in the range of 0.25 to 0.71 g in seventeen genotypes of chilli. The similar results were also reported by Hasan *et al.* (2014) and Indu Arora *et al.* (2015).

4.1.21 Fresh to dry fruit ratio

The fresh to dry fruit ratio is important in chilli as it decides the recovery of dry red chillies after drying. The fresh to dry fruit ratio was measured during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019,

rabi 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 24.

The data exhibited significant difference in fresh to dry fruit ratio of various genotypes under study during *kharif* 2018, pooled *kharif* and overall pooled whereas during both *rabi* season and pooled *rabi* data the difference in the genotypes for the fresh to dry ratio was non-significant. During *kharif* 2018, the maximum fresh to dry fruit ratio (0.23) was registered in genotype DPL-CA-14 which was at par with genotypes DPL-CA-4 (0.211) and significantly superior over all other genotypes. The minimum fresh to dry fruit ratio (0.168) was observed in genotype DPL-CA-29 and genotypes DPL-CA-2, DPL-CA-5, DPL-CA-7, DPL-CA-8, DPL-CA-11, DPL-CA-13, DPL-CA-15, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-25, DPL-CA-26, DPL-CA-27 and DPL-CA-30 (Konkan Kirti) were statistically at par with it. During *kharif* 2019, the highest fresh to dry fruit ratio (0.225) was observed in genotype DPL-CA-6 whereas the lowest fresh to dry fruit ratio was observed in DPL-CA-5 and DPL-CA-30 (Konkan Kirti) however, the difference among them was non-significant. In pooled *kharif* data, the highest fresh to dry fruit ratio (0.222) was registered in genotype DPL-CA-14 which was at par with genotypes DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-17, DPL-CA-24 and DPL-CA-28. The lowest fresh to dry fruit ratio (0.178) was observed in genotype DPL-CA-30 (Konkan Kirti) and genotypes DPL-CA-2, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-13, DPL-CA-20, DPL-CA-22, DPL-CA-25 and DPL-CA-29 (Arka Lohit) were statistically at par with it.

During *rabi* 2018-19 as well as pooled *rabi* data the difference among the various genotypes for the fresh to dry ratio was non-significant. The genotype DPL-CA-14 recorded highest fresh to dry ratio during *rabi* 2018-19 as well in pooled *rabi* data (0.212 and 0.205 respectively) whereas during *rabi* 2019-20 the maximum fresh to dry fruit ratio was observed in genotype DPL-CA-23 (0.205). The lowest fresh to dry ratio was registered in DPL-CA-22 (0.163) during *rabi* 2018-19 whereas during *rabi* 2019-20 and in pooled *rabi* data the lowest fresh to dry fruit ratio was observed in DPL-CA-2 (0.170 and 0.168 respectively).

Table 24 : Variation in fresh to dry fruit ratio of various chilli genotypes during and *kharif* and *rabi* season

S. N.	Genotype	Fresh to dry fruit ratio						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	0.198	0.211	0.205	0.193	0.190	0.191	0.198
2	DPL CA-2	0.177	0.199	0.189	0.165	0.170	0.168	0.178
3	DPL CA-3	0.194	0.221	0.208	0.181	0.188	0.185	0.196
4	DPL CA-4	0.211	0.218	0.215	0.203	0.198	0.201	0.207
5	DPL CA-5	0.174	0.184	0.179	0.187	0.190	0.189	0.184
6	DPL CA-6	0.195	0.225	0.210	0.182	0.178	0.180	0.195
7	DPL CA-7	0.191	0.208	0.200	0.193	0.192	0.193	0.196
8	DPL CA-8	0.180	0.202	0.191	0.19	0.193	0.192	0.191
9	DPL CA-9	0.200	0.186	0.193	0.199	0.198	0.199	0.196
10	DPL CA-10	0.196	0.197	0.197	0.192	0.186	0.189	0.193
11	DPL CA-11	0.183	0.196	0.190	0.188	0.194	0.191	0.190
12	DPL CA-12	0.195	0.196	0.196	0.193	0.190	0.192	0.194
13	DPL CA-13	0.181	0.197	0.190	0.191	0.193	0.192	0.191
14	DPL CA-14	0.232	0.211	0.222	0.212	0.199	0.205	0.214
15	DPL CA-15	0.184	0.215	0.200	0.189	0.191	0.190	0.195
16	DPL CA-16	0.194	0.196	0.195	0.195	0.196	0.195	0.195
17	DPL CA-17	0.197	0.216	0.207	0.196	0.193	0.194	0.201
18	DPL CA-18	0.188	0.202	0.196	0.184	0.190	0.187	0.191
19	DPL CA-19	0.200	0.199	0.199	0.197	0.191	0.194	0.197
20	DPL CA-20	0.180	0.192	0.186	0.171	0.197	0.184	0.185
21	DPL CA-21	0.192	0.199	0.196	0.188	0.173	0.181	0.188
22	DPL CA-22	0.171	0.195	0.183	0.163	0.176	0.170	0.177
23	DPL CA-23	0.197	0.193	0.195	0.194	0.205	0.199	0.197
24	DPL CA-24	0.197	0.219	0.208	0.194	0.198	0.196	0.202
25	DPL CA-25	0.187	0.195	0.192	0.193	0.201	0.197	0.194
26	DPL CA-26	0.187	0.208	0.198	0.201	0.183	0.192	0.195
27	DPL CA-27	0.183	0.223	0.203	0.204	0.190	0.197	0.200
28	DPL CA-28	0.200	0.214	0.208	0.186	0.182	0.184	0.196
29	DPL CA-29 (Arka Lohit)	0.168	0.19	0.179	0.178	0.188	0.183	0.181
30	DPL CA-30 (Konkan Kirti)	0.172	0.184	0.178	0.179	0.187	0.183	0.180
	S.E.m ±	0.009	0.01	0.005	0.009	0.008	0.007	0.005
	C.D.@ 5%	0.025	NS	0.015	NS	NS	NS	0.013
	C.V.	7.963	8.171	4.584	8.474	7.675	6.788	4.054

The overall pooled data for four successive seasons exhibited significant difference for the character. The highest fresh to dry fruit ratio (0.214) was registered in genotype DPL-CA-14 which was at par with genotypes DPL-CA-4, DPL-CA-17 and DPL-CA-24. The lowest fresh to dry fruit ratio (0.177) was noted in genotype DPL-CA-22 and genotypes DPL-CA-2, DPL-CA-5, DPL-CA-11, DPL-CA-20, DPL-CA-21, DPL-CA-29 and DPL-CA-30 (Konkan Kirti) were statistically at par with it.

Chilli is consumed as both spice as well as vegetable. The fresh to dry fruit ratio is considered important as it decides the recovery percentage of dry red chillies. It was observed that the fresh to dry fruit ratio varied significantly from 0.178 to 0.214. The variation in the fresh to dry fruit ratio might be due to difference in the moisture content as well as pericarp thickness and seed content. The genotypes having higher fresh to dry fruit ratio might be more suitable for red purpose. Popelka *et al.* (2017) determined that the moisture loss during drying of fresh peppers to dry peppers was in the range of 85.26 % to 88.65 %.

4.1.22 Number of fruits per plant

Chilli has capacity to produce continuous flowers once enter in reproductive phase. The fruits are produced in a quick succession until completion of the life cycle of the plant. The number of fruits produced on a single plant is an important factor deciding production potential of the plant. The number of fruits harvested from each observational plant was recorded during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 25.

The data revealed that the difference between various chilli genotypes for number of fruits per plant was significant during all seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the maximum number of fruits (116.21/plant) was produced in

Table 25 : Variation in number of fruits per plant among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Number of fruits per plant						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	58.29	69.76	64.03	57.09	76.75	66.92	65.47
2	DPL CA-2	93.49	100.87	97.18	92.59	113.77	103.18	100.18
3	DPL CA-3	71.78	104.39	88.09	75.24	94.75	84.99	86.54
4	DPL CA-4	94.69	107.70	101.20	95.57	94.59	95.08	98.14
5	DPL CA-5	85.73	108.35	97.04	82.02	93.39	87.71	92.37
6	DPL CA-6	108.14	106.14	107.14	111.46	107.52	109.49	108.31
7	DPL CA-7	72.99	77.66	75.33	76.28	70.01	73.15	74.24
8	DPL CA-8	89.17	100.81	94.99	88.62	104.42	96.52	95.76
9	DPL CA-9	98.28	113.22	105.75	106.95	115.98	111.47	108.61
10	DPL CA-10	68.16	85.50	76.83	69.23	86.80	78.02	77.42
11	DPL CA-11	66.88	72.61	69.75	68.22	69.29	68.76	69.25
12	DPL CA-12	82.83	95.83	89.33	83.24	76.42	79.83	84.58
13	DPL CA-13	98.63	90.95	94.79	126.24	148.83	137.54	116.17
14	DPL CA-14	52.32	48.50	50.41	69.06	84.78	76.92	63.67
15	DPL CA-15	74.66	74.96	74.81	56.79	80.39	68.59	71.70
16	DPL CA-16	91.08	93.26	92.17	92.10	75.08	83.59	87.88
17	DPL CA-17	99.12	122.58	110.85	102.73	114.21	108.47	109.66
18	DPL CA-18	99.08	97.60	98.34	100.86	107.55	104.20	101.27
19	DPL CA-19	69.14	68.95	69.04	73.25	75.33	74.29	71.67
20	DPL CA-20	90.44	84.43	87.44	94.12	71.25	82.68	85.06
21	DPL CA-21	95.12	108.01	101.56	82.52	99.57	91.05	96.30
22	DPL CA-22	98.69	100.83	99.76	99.10	84.38	91.74	95.75
23	DPL CA-23	110.95	120.39	115.67	103.40	117.77	110.59	113.13
24	DPL CA-24	100.59	100.96	100.77	104.25	84.24	94.25	97.51
25	DPL CA-25	89.12	93.63	91.38	90.17	113.46	101.81	96.59
26	DPL CA-26	77.49	63.25	70.37	72.60	66.10	69.35	69.86
27	DPL CA-27	58.18	68.69	63.44	65.10	65.57	65.34	64.39
28	DPL CA-28	105.22	105.39	105.30	100.88	93.08	96.98	101.14
29	DPL CA-29 (Arka Lohit)	116.21	97.63	106.92	117.74	103.57	110.66	108.79
30	DPL CA-30 (Konkan Kirti)	76.38	94.80	85.59	126.24	120.94	123.59	104.59
	S.E.m ±	6.49	5.94	4.38	7.37	7.00	5.69	3.80
	C.D.@ 5%	18.41	16.85	12.42	20.91	19.86	16.15	10.78
	C.V.	13.00	11.10	8.47	14.26	12.94	10.76	7.27

DPL-CA-29 (Arka Lohit) and was at par with DPL-CA-6, DPL-CA-9, DPL-CA-13, DPL-CA-17, DPL-CA-18, DPL-CA-22, DPL-CA-23, DPL-CA-24 and DPL-CA-28 whereas genotype DPL-CA-14 had minimum number of fruits (52.32/plant) and was at par with DPL-CA-1, DPL-CA-10, DPL-CA-11, DPL-CA-19 and DPL-CA-27. During *kharif* 2019, the maximum number of fruits (122.58/plant) was produced in genotype DPL-CA-17 and was at par with DPL-CA-4, DPL-CA-5, DPL-CA-6, DPL-CA-9, DPL-CA-21 and DPL-CA-23 whereas genotype DPL-CA-14 recorded minimum number of fruits (48.50/plant) and was at par with DPL-CA-26 (63.25/plant). In *kharif* pooled data, the maximum number of fruits (115.67/plant) was seen in genotype DPL-CA-23 which was at par with DPL-CA-6, DPL-CA-9, DPL-CA-17, DPL-CA-28 and DPL-CA-29 (Arka Lohit) whereas genotype DPL-CA-14 exhibited minimum number of fruits (50.41/plant).

During *rabi* 2018-19, the maximum number of fruits (126.24/plant) was noted in genotype DPL-CA-13 and DPL-CA-30 (Konkan Kirti) which were at par with other genotypes *viz.* DPL-CA-6, DPL-CA-9 and DPL-CA-29 (Arka Lohit). The genotype DPL-CA-15 registered minimum number of fruits (56.79/plant) and was at par with DPL-CA-1, DPL-CA-3, DPL-CA-7, DPL-CA-10, DPL-CA-11, DPL-CA-19, DPL-CA-26 and DPL-CA-27. During *rabi* 2019-20, the highest number of fruits (148.83/plant) was found in genotype DPL-CA-13 and was significantly superior over all other genotypes under study. The lowest number of fruits (65.57/plant) was noticed in genotype DPL-CA-27 and was at par DPL-CA-1, DPL-CA-7, DPL-CA-11, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-19, DPL-CA-20, DPL-CA-22 and DPL-CA-24.

The pooled *rabi* data revealed that genotype DPL-CA-13 had highest number of fruits per plant (137.54/plant) and was at par with DPL-CA-30 (Konkan Kirti) but significantly superior over all other genotypes. The lowest number of fruits (65.34/plant) were recorded in DPL-CA-27 and the genotypes DPL-CA-1, DPL-CA-7, DPL-CA-10, DPL-

CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-19 and DPL-CA-26 were at par with it.

The overall pooled data for number of fruits per plant presented in Table 25 and illustrated in Figure 22 indicated that the genotype DPL-CA-13 produced highest number of fruits (116.17/plant) and was at par with DPL-CA-6, DPL-CA-9, DPL-CA-17, DPL-CA-23 and DPL-CA-29 (Arka Lohit). The lowest number of fruits per plant was observed in DPL-CA-14 (63.67/plant) which was at par with DPL-CA-1, DPL-CA-7, DPL-CA-11, DPL-CA-15, DPL-CA-19, DPL-CA-26 and DPL-CA-27.

The number of fruits per plant is dependent on number of flowers produced per plant and per cent fruit set which in turn are dependent on the genetic makeup as well as the crop management practices and season in during which it is grown. The number of fruits in present investigation manifested huge variation indicating the ample scope for selection of elite genotypes for this character. Several workers have reported the variation in the number of fruits per plant. Kerketta *et al.* (2018) reported range of 35.67 to 205.25 fruits per plant whereas Naganirmala and Mallikarjuna (2019) observed deviation from 77.50 to 389.50 in number of fruits per plant. The similar results were also reported by Sandeep *et al.* (2008), Ajjappalavara and Channagoudra (2009), Indu Arora *et al.* (2015), Priyanka Bijalwan and Naidu Madhvi (2016), Yatagiri *et al.* (2017), Bharadwaza *et al.* (2018) and Mena *et al.* (2019), Ngullie and Biswas (2019).

4.1.23 Yield per plant (g)

Yield per plant is an important contributor of the yield per unit area. It is the important character in breeder's perspective which applying selection criteria in crop improvement. The weight of fruits harvested per plant was recorded during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 26.

Table 26 : Variation in yield per plant among chilli genotypes during kharif and rabi seasons

S. N.	Genotype	Yield per plant (g)						Over all pooled
		Kharif			Rabi			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	118.07	144.65	131.36	124.46	111.68	118.07	124.71
2	DPL CA-2	182.74	272.23	227.49	263.69	258.38	261.04	244.26
3	DPL CA-3	133.84	152.64	143.24	156.67	170.81	163.74	153.49
4	DPL CA-4	261.32	267.39	264.35	261.23	210.90	236.06	250.21
5	DPL CA-5	150.66	194.25	172.45	162.71	216.88	189.80	181.12
6	DPL CA-6	198.69	197.66	198.18	193.26	192.19	192.73	195.45
7	DPL CA-7	163.73	178.89	171.31	159.80	156.95	158.37	164.84
8	DPL CA-8	388.41	404.49	396.45	363.16	381.35	372.25	384.35
9	DPL CA-9	310.52	334.77	322.65	329.23	303.13	316.18	319.41
10	DPL CA-10	202.04	277.40	239.72	200.91	215.60	208.26	223.99
11	DPL CA-11	211.94	302.57	257.26	202.93	201.68	202.31	229.78
12	DPL CA-12	133.57	150.32	141.94	185.14	191.22	188.18	165.06
13	DPL CA-13	169.22	182.81	176.02	164.75	186.74	175.75	175.88
14	DPL CA-14	298.72	369.66	334.19	431.65	378.43	405.04	369.15
15	DPL CA-15	184.56	192.91	188.73	177.43	179.49	178.46	183.60
16	DPL CA-16	235.18	281.63	258.40	240.20	222.79	231.50	244.95
17	DPL CA-17	242.42	303.11	272.76	235.21	293.39	264.30	268.53
18	DPL CA-18	265.41	279.67	272.54	244.80	277.16	260.98	266.76
19	DPL CA-19	126.34	140.53	133.43	130.15	146.82	138.48	135.96
20	DPL CA-20	130.40	152.16	141.28	169.95	178.79	174.37	157.82
21	DPL CA-21	122.31	141.85	132.08	124.64	165.37	145.01	138.54
22	DPL CA-22	206.58	234.29	220.44	208.83	161.71	185.27	202.85
23	DPL CA-23	280.44	293.52	286.98	291.29	230.93	261.11	274.05
24	DPL CA-24	169.03	155.55	162.29	183.31	160.97	172.14	167.21
25	DPL CA-25	366.31	356.06	361.18	359.34	337.22	348.28	354.73
26	DPL CA-26	106.77	148.62	127.70	126.53	157.28	141.91	134.80
27	DPL CA-27	118.03	129.58	123.81	125.76	187.59	156.68	140.24
28	DPL CA-28	292.07	291.45	291.76	297.27	265.60	281.43	286.60
29	DPL CA-29 (Arka Lohit)	185.46	216.99	201.22	198.43	221.86	210.14	205.68
30	DPL CA-30 (Konkan Kirti)	143.12	131.63	137.37	254.24	222.63	238.44	187.91
	S.E.m ±	10.34	10.85	7.73	15.46	10.96	9.69	6.41
	C.D.@ 5%	29.33	30.80	21.93	43.88	31.10	27.50	18.18
	C.V.	8.81	8.13	6.16	12.23	8.65	7.66	5.09

The data revealed that the difference between various chilli genotypes for yield per plant was quite significant during all the seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the highest fruit yield (388.41 g/plant) was noted in genotype DPL-CA-8 and was at par with DPL-CA-25. The genotype DPL-CA-26 produced lowest fruit yield (106.77 g/plant) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-12, DPL-CA-19, DPL-CA-20 and DPL-CA-27. During *kharif* 2019, the greatest fruit yield (404.49 g/plant) was recorded in genotype DPL-CA-8 which was at par with genotype DPL-CA-14 but significantly superior over all other genotypes. The genotype DPL-CA-27 produced smallest fruit yield (129.58 g/plant) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-12, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-24, DPL-CA-26 and DPL-CA-30 (Konkan Kirti). In *kharif* pooled data, the maximum fruit yield (396.45 g/plant) was registered in genotype DPL-CA-8 which was significantly superior over all other genotypes. The genotype DPL-CA-27 produced minimum fruit yield (123.81 g/plant) which was at par with DPL-CA-1, DPL-CA-3, DPL-CA-12, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-26 and DPL-CA-30 (Konkan Kirti).

During *rabi* 2018-19, the highest fruit yield (431.65 g/plant) was observed in genotype DPL-CA-14 which was significantly superior over all other genotypes tested under investigation whereas, genotype DPL-CA-1 produced lowest fruit yield (124.46 g/plant) which was at par with DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-13, DPL-CA-19, DPL-CA-21, DPL-CA-26 and DPL-CA-27. During *rabi* 2019-20, the greatest fruit yield (381.35 g/plant) was found in genotype DPL-CA-8 and was significantly superior over all other genotypes except DPL-CA-14. The lowest fruit yield (111.68 g/plant) was recorded in genotype DPL-CA-1 and was significantly inferior to all other genotypes which were tested during the investigation.

The perusal of pooled *rabi* data pertaining to yield per plant revealed that genotype DPL-CA-14 registered maximum yield per plant

(405.04 g/plant) and was significantly superior over all other genotypes whereas lowest yield per plant (118.07 g/plant) were recorded in DPL-CA-1 and the genotypes DPL-CA-19, DPL-CA-21 and DPL-CA-26 were at par with it.

It was observed in overall pooled data that the genotype DPL-CA-8 recorded highest yield per plant (384.35 g/plant) which was at par with DPL-CA-14 (369.15 g/plant) and both were significantly superior over all other genotypes. The lowest yield per plant was registered in DPL-CA-1 (124.71 g/plant) which was at par with genotypes DPL-CA-19, DPL-CA-21, DPL-CA-26 and DPL-CA-27.

Yield per plant is complex character and is dependent on number of other characters like number of fruits per plant and average fruit weight. Though, it is basically genetically controlled character, it is also deviated by season of cultivation as well as management practices. In present experimentation, the yield per plant was ranged between 124.71 g to 384.35 g indicating the wide potential for genotype selection with high yield. Wide variation in the fruit yield per plant was also reported by Priyanka Bijalwan and Naidu Madhvi in 2016 (59.28 g to 414.65 g), 118.30 g to 555.63 g (Yatagiri *et al.*, 2017), 79.36 g to 1432.83 g (Kerketta *et al.*, 2018), Naganirmala and Mallikarjuna in 2019 (85.99 g to 305.50 g), and 100 to 260 g by Mena *et al.* (2019). These findings are also in the line of results reported by Janaki *et al.* (2005), Suryakumari *et al.* (2014), Indu Arora *et al.* (2015), Santhosha *et al.* (2019).

4.1.24 Yield per hectare (t)

Yield is ultimate important character which is considered while developing the new variety through crop improvement. The yield of all thirty genotypes was recorded during four successive seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) during present investigation. The data regarding same are presented in Table 27.

The perusal of data revealed that the difference between various chilli genotypes for yield per hectare was quite significant during all the

Table 27 : Variation in yield per hectare among chilli genotypes during *kharif* and *rabi* seasons

S. N.	Genotype	Yield per ha (t)						Over all pooled
		<i>Kharif</i>			<i>Rabi</i>			
		2018	2019	Pooled	2018-19	2019-20	Pooled	
1	DPL CA-1	5.83	7.29	6.56	6.31	7.21	6.76	6.66
2	DPL CA-2	9.56	10.49	10.02	12.58	14.32	13.45	11.74
3	DPL CA-3	6.79	8.72	7.76	7.45	8.78	8.11	7.94
4	DPL CA-4	13.03	12.65	12.84	13.26	10.87	12.07	12.45
5	DPL CA-5	7.44	8.49	7.97	8.38	7.52	7.95	7.96
6	DPL CA-6	9.81	10.78	10.30	9.56	9.92	9.74	10.02
7	DPL CA-7	8.09	8.93	8.51	7.93	7.32	7.62	8.07
8	DPL CA-8	19.18	19.47	19.33	18.15	17.99	18.07	18.70
9	DPL CA-9	15.34	15.70	15.52	16.74	14.47	15.61	15.56
10	DPL CA-10	9.98	10.82	10.40	10.25	11.11	10.68	10.54
11	DPL CA-11	10.47	11.51	10.99	10.19	9.85	10.02	10.51
12	DPL CA-12	6.53	8.86	7.69	8.26	8.95	8.60	8.15
13	DPL CA-13	8.36	8.90	8.63	11.12	12.39	11.75	10.19
14	DPL CA-14	13.30	13.71	13.50	20.73	18.91	19.82	16.66
15	DPL CA-15	9.11	9.79	9.45	8.95	8.93	8.94	9.20
16	DPL CA-16	11.62	11.49	11.55	11.77	11.07	11.42	11.49
17	DPL CA-17	11.97	13.47	12.72	10.58	12.90	11.74	12.23
18	DPL CA-18	13.11	12.48	12.80	12.31	9.72	11.01	11.90
19	DPL CA-19	6.24	7.91	7.08	6.83	9.84	8.34	7.71
20	DPL CA-20	6.36	9.10	7.73	8.47	9.11	8.79	8.26
21	DPL CA-21	6.04	7.73	6.88	6.75	8.24	7.50	7.19
22	DPL CA-22	10.20	11.29	10.75	10.03	8.51	9.27	10.01
23	DPL CA-23	13.88	15.49	14.69	13.44	14.15	13.79	14.24
24	DPL CA-24	8.35	8.26	8.30	9.00	8.76	8.88	8.59
25	DPL CA-25	18.10	19.03	18.56	15.69	13.90	14.79	16.68
26	DPL CA-26	5.27	7.06	6.17	6.42	6.62	6.52	6.34
27	DPL CA-27	5.83	8.34	7.09	7.52	6.69	7.11	7.10
28	DPL CA-28	14.42	15.54	14.98	14.33	12.24	13.29	14.13
29	DPL CA-29 (Arka Lohit)	9.16	8.80	8.98	10.56	10.92	10.74	9.86
30	DPL CA-30 (Konkan Kirti)	7.07	7.75	7.41	13.49	11.47	12.48	9.94
	S.E.m \pm	0.48	0.41	0.33	0.31	0.52	0.31	0.25
	C.D.@ 5%	1.37	1.17	0.95	0.87	1.49	0.88	0.70
	C.V.	8.34	6.47	5.50	10.99	8.44	7.25	4.77

seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) as well as in pooled data (*kharif*, *rabi* and overall pooled). During *kharif* 2018, the highest fruit yield (19.18 t/ha) was seen in genotype DPL-CA-8 which was at par with genotype DPL-CA-25 (18.10 t/ha). The genotype DPL-CA-26 produced lowest fruit yield (5.27 t/ha) which was at par with DPL-CA-1, DPL-CA-12, DPL-CA-19, DPL-CA-20, DPL-CA-21 and DPL-CA-27. During *kharif* 2019, the maximum fruit yield (19.47 t/ha) was recorded in genotype DPL-CA-8 which was at par with genotype DPL-CA-25 (19.03 t/ha) but significantly superior over all other genotypes. The genotype DPL-CA-26 registered minimum fruit yield (7.06 t/ha) which was at par with DPL-CA-1, DPL-CA-19, DPL-CA-21 and DPL-CA-30 (Konkan Kirti). In *kharif* pooled data, the maximum fruit yield (19.33 t/ha) was found in genotype DPL-CA-8 which was significantly superior over all other genotypes. The genotype DPL-CA-26 produced minimum fruit yield (6.17 t/ha) which was at par with DPL-CA-1, DPL-CA-19, DPL-CA-21 and DPL-CA-27.

During *rabi* 2018-19, the highest fruit yield (20.73 t/ha) was observed in genotype DPL-CA-14 which was significantly superior over all other genotypes tested under investigation. The genotype DPL-CA-1 produced lowest fruit yield (6.31 t/ha) which was at par with DPL-CA-19 and DPL-CA-26. During *rabi* 2019-20, the greatest fruit yield (18.91 t/ha) was observed in genotype DPL-CA-14 which was at par with DPL-CA-8 (17.99 t/ha) but significantly superior over all other genotypes; whereas smallest fruit yield (6.62 t/ha) was recorded in genotype DPL-CA-26 which was at par with DPL-CA-1, DPL-CA-5, DPL-CA-7 and DPL-CA-27.

The perusal of pooled *rabi* data pertaining to yield per hectare revealed that genotype DPL-CA-14 registered maximum yield (19.82 t/ha) and was significantly superior over all other genotypes. The minimum yield per hectare (6.52 t/ha) was recorded in DPL-CA-26 and the genotypes *viz.* DPL-CA-1 and DPL-CA-27 were at par with it.

The overall pooled data presented in Table 27 and depicted in Figure 23 revealed that the genotype DPL-CA-8 produced highest yield

(18.70 t/ha) and was significantly superior over all other genotypes whereas, lowest yield per hectare was recorded in DPL-CA-26 (6.34 t/ha) and was at par with genotypes DPL-CA-1 (6.66 t/ha).

Yield per hectare is important quantitative character having highest significance considering the commercial cultivation of the crop. Most of the selections by the breeder are made based on this parameter. In present investigation, yield per hectare ranged between 6.34 tonnes per hectare to 18.70 tonnes per hectare and thus created wide scope for imparting selection to develop high yielding variety. Yielding potential of genotype under commercial cultivation is dependent on both genotype of the plant as well as the crop management factors. Several researchers *viz.* Thul *et al.* (2009), Saravaiya *et al.* (2011), Yatagiri *et al.* (2017), Kerketta *et al.* (2018), Bharadwaza *et al.* (2018), Pawar *et al.* (2018) reported yield per hectare which is in line with the present research.

4.1.25 Qualitative characters of various chilli genotypes

Various qualitative plant descriptors were observed and recorded as per standard procedure during all the growing seasons of present investigation. Study of these plant descriptors helps for varietal identification. Results of various plant descriptors are presented here.

4.1.25.1 Plant descriptors (nodal anthocyanin, stem shape, stem pubescence and plant growth habit)

The important plant descriptors like nodal anthocyanin, stem shape and stem pubescence were recorded during all the growing seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) and the results are presented in Table 28. Three different shades of nodal anthocyanin *viz.* green, light purple and dark purple were observed in different genotypes under investigation. Out of thirty genotypes the shade of nodal anthocyanin was green in seven genotypes, light purple in fourteen genotypes and dark purple in nine genotypes. Thus, presence of light purple colour is more dominant as compared to green and dark purple. As far as stem shape was concerned cylindrical shape of the stem was observed in all the genotypes under study. None

Table 28 : Nodal anthocyanin, stem shape, stem pubescence and plant growth habit of different chilli genotypes studied during investigation

S. N.	Genotype	Plant descriptors			
		Nodal anthocyanin	Stem shape	Stem pubescence	Plant growth habit
1	DPL CA-1	Dark purple	Cylindrical	Intermediate	Intermediate
2	DPL CA-2	Green	Cylindrical	Sparse	Dense
3	DPL CA-3	Light purple	Cylindrical	Sparse	Dense
4	DPL CA-4	Dark purple	Cylindrical	Sparse	Intermediate
5	DPL CA-5	Light purple	Cylindrical	Intermediate	Intermediate
6	DPL CA-6	Light purple	Cylindrical	Sparse	Intermediate
7	DPL CA-7	Dark purple	Cylindrical	Sparse	Dense
8	DPL CA-8	Light purple	Cylindrical	Sparse	Intermediate
9	DPL CA-9	Dark purple	Cylindrical	Sparse	Intermediate
10	DPL CA-10	Light purple	Cylindrical	Sparse	Dense
11	DPL CA-11	Light purple	Cylindrical	Sparse	Intermediate
12	DPL CA-12	Green	Cylindrical	Intermediate	Intermediate
13	DPL CA-13	Light purple	Cylindrical	Sparse	Dense
14	DPL CA-14	Green	Cylindrical	Sparse	Intermediate
15	DPL CA-15	Dark purple	Cylindrical	Sparse	Intermediate
16	DPL CA-16	Light purple	Cylindrical	Intermediate	Intermediate
17	DPL CA-17	Green	Cylindrical	Intermediate	Intermediate
18	DPL CA-18	Green	Cylindrical	Intermediate	Intermediate
19	DPL CA-19	Light purple	Cylindrical	Sparse	Intermediate
20	DPL CA-20	Green	Cylindrical	Sparse	Intermediate
21	DPL CA-21	Light purple	Cylindrical	Sparse	Intermediate
22	DPL CA-22	Green	Cylindrical	Intermediate	Intermediate
23	DPL CA-23	Dark purple	Cylindrical	Sparse	Dense
24	DPL CA-24	Light purple	Cylindrical	Sparse	Intermediate
25	DPL CA-25	Light purple	Cylindrical	Intermediate	Dense
26	DPL CA-26	Light purple	Cylindrical	Sparse	Sparse
27	DPL CA-27	Dark purple	Cylindrical	Sparse	Dense
28	DPL CA-28	Light purple	Cylindrical	Intermediate	Intermediate
29	DPL CA-29 (Arka Lohit)	Dark purple	Cylindrical	Sparse	Intermediate
30	DPL CA-30 (Konkan Kirti)	Dark purple	Cylindrical	Sparse	Sparse

of the genotypes under study recorded angled or flattened stem shape. Extent of stem pubescence is also considered as important qualitative character for the characterization of the genotype. It is evident from the Table 28 that the stem pubescence was predominantly sparse whereas twenty one genotypes exhibited sparse pubescence and remaining nine genotypes recorded intermediate pubescence. The dense stem pubescence was not observed in any of the genotype under study. Among the various types of plant growth habits, intermediate type was observed in twenty genotypes whereas eight and two genotypes exhibited dense and sparse type of plant growth habit respectively. Thus, it was evident that among the different types of plant growth habits intermediate type was more dominant in the genotypes studied during present investigation.

The nodal anthocyanin was categorized as green, light purple and dark purple whereas all the genotypes recorded cylindrical stem shape and the intermediate and sparse stem pubescence was recorded during present study. The study on these parameters help for varietal identification and purity assessment after release of the variety. The presence of anthocyanin on nodes of all the varieties under study was also recorded by Padma *et al.* (2017) and Orobiyi *et al.* (2017). Nsabiyeera *et al.* (2013) reported light purple in eleven genotypes, purple in eight genotypes and green in 81 genotypes. The angular stem shape in all accessions under study was observed by Naganirmala and Mallikarjuna (2019) which is contradictory with present study whereas the results reported by Santhosha *et al.* (2019) are in accordance with the result of present study. Only sparse stem pubescence was registered in all the accessions under study by Santhosha *et al.* (2019) whereas sparse, dense and intermediate by Padma *et al.* (2017), Orobiyi *et al.* (2017) and Naganirmala and Mallikarjuna (2019).

4.1.25.2 Plant descriptors (Branching habit, leaf colour, leaf shape and leaf pubescence)

The data related to the plant descriptors like branching habit, leaf colour, leaf shape and leaf pubescence were also recorded during all the

growing seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) and the results are presented in Table 29. Among the various types of branching habits, intermediate type was dominant as compared to dense and sparse branching. Among the thirty genotypes studied during the present investigation, in twenty genotypes intermediate, in eight genotypes dense whereas in only two genotypes sparse type of branching habit was noted. Leaf colour in different genotypes was also variable. The varying intensities of green colour was recorded. Eight genotypes were having light green leaf colour, five possessed dark green whereas all other *i.e.*, seventeen genotypes exhibited green leaf colour. Leaf shape is considered as genotypic character and considered important in characterization of genotypes. Varying leaf shapes were depicted by different genotypes. Among thirty genotypes, thirteen exhibited ovate leaf shape whereas remaining seventeen produced lanceolate leaves. Leaf pubescence was also recorded and all the genotypes were having sparse leaf pubescence.

The branching habit of the plant and various leaf characters like leaf colour, leaf shape and leaf pubescence helps for characterization of the individual genotype as well as for grouping of the genotypes. The branching habit is also important to decide the crop management practices to be followed especially appropriate spacing. The results of present investigation are partially in agreement with the results reported by Padma *et al.* (2017) where only intermediate branching was observed. The difference in the leaf colour, was also reported by Santhosha *et al.* (2019) and Padma *et al.* (2017). The present investigation confirmed lanceolate and ovate shape of leaves in various genotypes studied whereas only lanceolate shape of leaves was reported by Padma *et al.* (2017) and Santhosha *et al.* (2019) and deltoid as well as lanceolate leaf shapes were reported by Orobiya *et al.* (2017). In case of leaf pubescence only sparse type was visualized and similar results are also reported by Santhosha *et al.* (2019) whereas sparse, intermediate as well as dense type of leaf pubescence was reported by Padma *et al.* (2017) and Orobiyi *et al.* (2017).

Table 29 : Branching habit, leaf colour, leaf shape and leaf pubescence of different chilli genotypes studied during investigation

S. N.	Genotype	Growth parameter			
		Branching habit	Leaf colour	Leaf shape	Leaf pubescence
1	DPL CA-1	Intermediate	Green	Lanceolate	Sparse
2	DPL CA-2	Dense	Green	Ovate	Sparse
3	DPL CA-3	Dense	Green	Lanceolate	Sparse
4	DPL CA-4	Intermediate	Green	Lanceolate	Sparse
5	DPL CA-5	Intermediate	Light green	Lanceolate	Sparse
6	DPL CA-6	Intermediate	Light green	Ovate	Sparse
7	DPL CA-7	Dense	Green	Ovate	Sparse
8	DPL CA-8	Intermediate	Light green	Ovate	Sparse
9	DPL CA-9	Intermediate	Dark Green	Ovate	Sparse
10	DPL CA-10	Dense	Green	Ovate	Sparse
11	DPL CA-11	Intermediate	Green	Lanceolate	Sparse
12	DPL CA-12	Intermediate	Light green	Lanceolate	Sparse
13	DPL CA-13	Dense	Green	Lanceolate	Sparse
14	DPL CA-14	Intermediate	Green	Ovate	Sparse
15	DPL CA-15	Intermediate	Light green	Lanceolate	Sparse
16	DPL CA-16	Intermediate	Dark Green	Ovate	Sparse
17	DPL CA-17	Intermediate	Light green	Lanceolate	Sparse
18	DPL CA-18	Intermediate	Dark Green	Lanceolate	Sparse
19	DPL CA-19	Intermediate	Light green	Lanceolate	Sparse
20	DPL CA-20	Intermediate	Green	Lanceolate	Sparse
21	DPL CA-21	Intermediate	Light green	Ovate	Sparse
22	DPL CA-22	Intermediate	Green	Ovate	Sparse
23	DPL CA-23	Dense	Dark Green	Lanceolate	Sparse
24	DPL CA-24	Intermediate	Green	Lanceolate	Sparse
25	DPL CA-25	Dense	Dark Green	Ovate	Sparse
26	DPL CA-26	Sparse	Green	Lanceolate	Sparse
27	DPL CA-27	Dense	Green	Lanceolate	Sparse
28	DPL CA-28	Intermediate	Green	Lanceolate	Sparse
29	DPL CA-29 (Arka Lohit)	Intermediate	Green	Ovate	Sparse
30	DPL CA-30 (Konkan Kirti)	Sparse	Green	Ovate	Sparse

4.1.25.3 Inflorescence characters (flower position, number of flowers per axil, corolla colour and corolla shape)

The inflorescence characters of various chilli genotypes were also recorded during the present investigation and the data related to inflorescence characters are presented in Table 30. The data indicated that eighteen genotypes exhibited intermediate flower position; nine recorded pendant flower position whereas only three have erect flowering position. Thus, intermediate flower position was dominant on other flower positions. Number of flowers per axil is an important character related with the number of fruits per plant and ultimately contributes for increasing the yield. However, among the thirty genotypes under study only one genotype (DPL-CA-23) depicted three flowers per axil whereas seven genotypes (DPL-CA-2, DPL-CA-4, DPL-CA-9, DPL-CA-10, DPL-CA-11, DPL-CA-13 and DPL-CA-19) recorded two flowers per axil and remaining twenty two genotypes exhibited only one flower per axil. In chilli varying colours of corolla were observed, however, during present investigation only two *i.e.*, DPL-CA-6 and DPL-CA-9 produced flowers having light yellow colour. All other genotypes exhibited white colour flowers. As far as corolla shape is concerned, ten genotypes (DPL-CA-4, DPL-CA-5, DPL-CA-9, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-17, DPL-CA-20 and DPL-CA-30 (Konkan Kirti) produced flowers with rotate shape corolla whereas all remaining genotypes produced corolla with campanulate shape.

The occurrence of all flower positions *viz.* erect, intermediate and pendant was visible in present investigation and similar results were also reported by Orobiyi *et al.* (2017) whereas Padma *et al.* (2017) observed only intermediate and erect type flowers and Naganirmala and Mallikarjuna (2019) observed pendant and erect flower positions. Number of flowers per axil is not only important for identification of the variety but is also responsible for imparting cluster bearing habit in the plant. During present investigation presence of single flower was dominant but occurrence of two and three flowers per node were also visible whereas presence of three flowers per axil in all genotypes studied

Table 30 : Inflorescence characters (flower position, number of flowers per axil, corolla colour and corolla shape) of different chilli genotypes studied during investigation

S. N.	Genotype	Inflorescence characters			
		Flower position	Number of flowers per axil	Corolla colour	Corolla shape
1	DPL CA-1	Intermediate	One	White	Campanulate
2	DPL CA-2	Intermediate	Two	White	Campanulate
3	DPL CA-3	Intermediate	One	White	Campanulate
4	DPL CA-4	Intermediate	Two	White	Rotate
5	DPL CA-5	Intermediate	One	White	Rotate
6	DPL CA-6	Intermediate	One	Light Yellow	Campanulate
7	DPL CA-7	Pendant	One	White	Campanulate
8	DPL CA-8	Intermediate	One	White	Campanulate
9	DPL CA-9	Intermediate	Two	Light Yellow	Rotate
10	DPL CA-10	Pendant	Two	White	Campanulate
11	DPL CA-11	Pendant	Two	White	Campanulate
12	DPL CA-12	Pendant	One	White	Rotate
13	DPL CA-13	Erect	Two	White	Campanulate
14	DPL CA-14	Intermediate	One	White	Rotate
15	DPL CA-15	Pendant	One	White	Rotate
16	DPL CA-16	Pendant	One	White	Rotate
17	DPL CA-17	Intermediate	One	White	Rotate
18	DPL CA-18	Intermediate	One	White	Campanulate
19	DPL CA-19	Intermediate	Two	White	Campanulate
20	DPL CA-20	Erect	One	White	Rotate
21	DPL CA-21	Pendant	One	White	Campanulate
22	DPL CA-22	Intermediate	One	White	Campanulate
23	DPL CA-23	Pendant	Three	White	Campanulate
24	DPL CA-24	Intermediate	One	White	Campanulate
25	DPL CA-25	Intermediate	One	White	Campanulate
26	DPL CA-26	Erect	One	White	Campanulate
27	DPL CA-27	Intermediate	One	White	Campanulate
28	DPL CA-28	Pendant	One	White	Campanulate
29	DPL CA-29 (Arka Lohit)	Intermediate	One	White	Campanulate
30	DPL CA-30 (Konkan Kirti)	Intermediate	One	White	Rotate

was registered by Padma *et al.* (2017). White corolla colour was dominant and only two genotypes recorded light yellow colour. Dominance of white colour was also reported by Padma *et al.* (2017) and Santhosha *et al.* (2019) whereas Orobiyi *et al.* (2017) reported dominance of yellow green corolla colour. In case of corolla shape, rotate as well as campanulate shape of corolla were seen. However, Padma *et al.* (2017) observed only rotate shape of corolla in all eleven genotypes under study.

4.1.25.4 Inflorescence characters (anther colour, filament colour, calyx margin and calyx angular constriction)

Various inflorescence characters (anther colour, filament colour, calyx margin and calyx angular constriction) are important morphological character for characterization of any variety. During present investigation these inflorescence characters were also observed during all the growing seasons (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) and the results are presented in Table 31. The pale blue and blue colour anthers were observed in various genotypes studied. Blue color was observed in eight genotypes (DPL-CA-1, DPL-CA-2, DPL-CA-10, DPL-CA-13, DPL-CA-21, DPL-CA-23, DPL-CA-25 and DPL-CA-30 (Konkan Kirti)) whereas remaining twenty two genotypes exhibited pale blue colour anthers. Variation was also observed in colour of filaments (yellow and white), however, white colour was dominant on yellow colour. Only four genotypes (DPL-CA-3, DPL-CA-8, DPL-CA-14 and DPL-CA-26) depicted yellow filament colour. All other genotypes exhibited white coloured anther filaments.

Different shapes of calyx margin are entire, intermediate and dentate. Six genotypes (DPL-CA-7, DPL-CA-11, DPL-CA-14, DPL-CA-15, DPL-CA-29 and DPL-CA-30 *i.e.*, Konkan Kirti) depicted entire calyx margin, twenty two genotypes had intermediate calyx margin whereas only two genotypes (DPL-CA-12 and DPL-CA-24) recorded dentate calyx margin. Presence or absence of calyx angular constriction is also considered as important morphological characters for identification of the variety. The calyx angular constriction was absent in eleven

Table 31: Inflorescence characters (anther colour, filament colour, calyx margin and calyx angular constriction) of different chilli genotypes studied during investigation

S. N.	Genotype	Inflorescence characters			
		Anther colour	Filament colour	Calyx margin	Calyx angular constriction
1	DPL CA-1	Blue	White	Intermediate	Present
2	DPL CA-2	Blue	White	Intermediate	Absent
3	DPL CA-3	Pale blue	Yellow	Intermediate	Absent
4	DPL CA-4	Pale blue	White	Intermediate	Present
5	DPL CA-5	Pale blue	White	Intermediate	Present
6	DPL CA-6	Pale blue	White	Intermediate	Present
7	DPL CA-7	Pale blue	White	Entire	Absent
8	DPL CA-8	Pale blue	Yellow	Intermediate	Absent
9	DPL CA-9	Pale blue	White	Intermediate	Present
10	DPL CA-10	Blue	White	Intermediate	Present
11	DPL CA-11	Pale blue	White	Entire	Present
12	DPL CA-12	Pale blue	White	Dentate	Present
13	DPL CA-13	Blue	White	Intermediate	Absent
14	DPL CA-14	Pale blue	Yellow	Entire	Absent
15	DPL CA-15	Pale blue	White	Entire	Absent
16	DPL CA-16	Pale blue	White	Intermediate	Present
17	DPL CA-17	Pale blue	White	Intermediate	Absent
18	DPL CA-18	Pale blue	White	Intermediate	Present
19	DPL CA-19	Pale blue	White	Intermediate	Absent
20	DPL CA-20	Pale blue	White	Intermediate	Present
21	DPL CA-21	Blue	White	Intermediate	Present
22	DPL CA-22	Pale blue	White	Intermediate	Present
23	DPL CA-23	Blue	White	Intermediate	Absent
24	DPL CA-24	Pale blue	White	Dentate	Present
25	DPL CA-25	Blue	White	Intermediate	Present
26	DPL CA-26	Pale blue	Yellow	Intermediate	Present
27	DPL CA-27	Pale blue	White	Intermediate	Present
28	DPL CA-28	Pale blue	White	Dentate	Present
29	DPL CA-29 (Arka Lohit)	Pale blue	White	Entire	Present
30	DPL CA-30 (Konkan Kirti)	Blue	White	Entire	Absent

genotypes (DPL-CA-2, DPL-CA-3, DPL-CA-7, DPL-CA-8, DPL-CA-13, DPL-CA-14, DPL-CA-15, DPL-CA-17, DPL-CA-19, DPL-CA-23 and DPL-CA-30 *i.e.*, Konkan Kirti) whereas it was present in remaining nineteen genotypes under study.

The colour of anther and filament also carries significance as a marker gene which is helpful for identification of the variety especially for maintaining the purity during seed production. All genotypes under study exhibited either blue or pale blue anther colour and white as well as yellow filament colour. Such findings are also reported by Padma *et al.* (2017). Orobiyi *et al.* (2017) also reported yellow, pale blue, blue, purple and green coloured anthers whereas filament colour was white and purple. Intermediate calyx margin was dominant but entire and dentate type calyx margin were also visible. Only dentate type of calyx margin was reported by Padma *et al.* (2017). Presence or absence of calyx angular constriction can be considered as important character for identification for off type plants. The results regarding this character are also in agreement with the results reported by Padma *et al.* (2017).

4.1.25.5 Fruit characters (neck at base of fruit, fruit shape and fruit shape at pedicel attachment)

Large variability exists in chilli as far as fruit characters are concerned. The fruit character *viz.* neck at base of fruit, fruit shape and fruit shape at pedicel attachment are also given consideration for characterization of any variety of chilli. In present investigation, the above fruit characters were recorded during all the season (*i.e.*, *kharif* 2018, *kharif* 2019, *rabi* 2018-19 and *rabi* 2019-20) and the data regarding it are presented in Table 32. The data revealed that neck at the base of the fruit was present in fourteen genotypes (DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-13, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-29 and DPL-CA-30 *i.e.*, Konkan Kirti) whereas it was absent in remaining genotype under study. Neck at base fruit was observed in both the control genotypes (DPL-CA-29 *i.e.*, Arka Lohit and DPL-CA-30 *i.e.*, Konkan Kirti).

Table 32 : Fruit characters (neck at base of fruit, fruit shape and fruit shape at pedicel attachment) of different chilli genotypes studied during investigation

S. N.	Genotype	Fruit characters		
		Neck at base of fruit	Fruit shape	Fruit shape at pedicel attachment
1	DPL CA-1	Absent	Triangular	Cordate
2	DPL CA-2	Absent	Triangular	Truncate
3	DPL CA-3	Present	Triangular	Truncate
4	DPL CA-4	Absent	Triangular	Truncate
5	DPL CA-5	Present	Elongated	Obtuse
6	DPL CA-6	Absent	Triangular	Truncate
7	DPL CA-7	Present	Elongated	Obtuse
8	DPL CA-8	Absent	Triangular	Truncate
9	DPL CA-9	Absent	Triangular	Truncate
10	DPL CA-10	Absent	Elongated	Truncate
11	DPL CA-11	Absent	Triangular	Truncate
12	DPL CA-12	Absent	Triangular	Truncate
13	DPL CA-13	Present	Elongated	Obtuse
14	DPL CA-14	Absent	Triangular	Truncate
15	DPL CA-15	Absent	Triangular	Truncate
16	DPL CA-16	Absent	Triangular	Truncate
17	DPL CA-17	Present	Elongated	Obtuse
18	DPL CA-18	Absent	Triangular	Truncate
19	DPL CA-19	Present	Elongated	Obtuse
20	DPL CA-20	Absent	Triangular	Truncate
21	DPL CA-21	Present	Elongated	Obtuse
22	DPL CA-22	Absent	Elongated	Truncate
23	DPL CA-23	Present	Elongated	Obtuse
24	DPL CA-24	Present	Elongated	Obtuse
25	DPL CA-25	Present	Elongated	Obtuse
26	DPL CA-26	Present	Elongated	Obtuse
27	DPL CA-27	Present	Elongated	Obtuse
28	DPL CA-28	Absent	Elongated	Truncate
29	DPL CA-29 (Arka Lohit)	Present	Elongated	Obtuse
30	DPL CA-30 (Konkan Kirti)	Present	Elongated	Obtuse

Fruit shape is one of the most important characters for identification and characterization of the variety. Triangular and elongated were the two predominant shapes which were observed in the fruits of the genotypes studied during the present investigation. The triangular fruit shape was noted in fourteen genotypes (DPL-CA-1, DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-6, DPL-CA-8, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-18 and DPL-CA-20) whereas all remaining genotypes exhibited elongated fruit shape. Both the check variety Konkan Kirti as well as Arka Lohit exhibited elongated fruit shape.

Fruit shape at pedicel attachment was also observed during present investigation as it is also considered as the character which helps in characterization of the variety. Three different shapes at pedicel attachment were observed *i.e.*, cordate, truncate and obtuse. Only one genotype *i.e.*, DPL-CA-1 noted cordate fruit shape at pedicel attachment whereas thirteen genotypes (DPL-CA-5, DPL-CA-7, DPL-CA-13, DPL-CA-17, DPL-CA-19, DPL-CA-21, DPL-CA-23, DPL-CA-24, DPL-CA-25, DPL-CA-26, DPL-CA-27, DPL-CA-29 and DPL-CA-30) exhibited obtuse fruit shape at the pedicel attachment. Remaining sixteen genotypes had truncate shape at the fruit attachment.

Various fruit characters like neck at base of fruit, fruit shape and fruit shape at pedicel attachment are of prime importance as these characters are controlled genetically and these visual observations can be used as a basis for identification of the variety. In present study, neck at base of fruit was absent in certain genotypes whereas it was present in other genotypes. Santhosha *et al.* (2019) and Nsabiyera *et al.* (2013) observed absence at neck of basal end of fruit in all the genotypes studied. Shape of the fruit in chilli carries significance as the elongated fruits are preferred in daily preparations whereas the triangular fruits are used for value addition. Both triangular as well as elongated fruit shapes were observed during present investigation and similar results were also reported by Pawar *et al.* (2018) and Nsabiyera *et al.* (2013)

whereas the shape was moderately triangular as reported by Santhosha *et al.* (2019). The fruit shape at pedicel attachment was either truncate or obtuse and rarely cordate. Similar results are also registered by Nsabiyera *et al.* (2013).

4.1.25.6 Fruit characters (fruit shape at blossom end, fruit colour at tender stage and fruit colour at maturity)

The various other fruit characters like fruit shape at blossom end, fruit colour at tender stage and fruit colour at maturity vary greatly in chilli. It is not only important in breeder's perspective but it is also related with the consumer acceptability of chilli for both tender as well as mature stage. The data pertaining to these character are stated in Table 33.

The various fruit shapes at blossom end *viz.* pointed, blunt, sunken, sunken and pointed have been reported in chilli. During the present investigation only two fruit shapes at blossom end *i.e.*, blunt and pointed were recorded. Thirteen genotypes (DPL-CA-1, DPL-CA-4, DPL-CA-6, DPL-CA-9, DPL-CA-10, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-16, DPL-CA-18, DPL-CA-20, DPL-CA-22 and DPL-CA-23) noted blunt shape at blossom end whereas remaining seventeen genotypes exhibited pointed shape at the blossom end.

Fruit colour of chilli at tender stage is also an important character which matters especially with the consumers' preference. The green to dark green fruits are having more acceptability in the fresh fruit market whereas comparative acceptability for pale green fruits is limited. Among the genotypes tested during this study, only six genotypes (DPL-CA-2, DPL-CA-8, DPL-CA-12, DPL-CA-21, DPL-CA-24 and DPL-CA-28) noted pale green colour whereas nine genotypes (DPL-CA-3, DPL-CA-6, DPL-CA-9, DPL-CA-17, DPL-CA-18, DPL-CA-23, DPL-CA-25, DPL-CA-29 *i.e.*, Arka Lohit and DPL-CA-30 *i.e.*, Konkan Kirti) produced fruits with dark green colour. Fruit colour of remaining all fifteen genotypes was found green.

Table 33 : Fruit characters (fruit shape at blossom end, fruit colour at tender stage and fruit colour at maturity) of different chilli genotypes studied during investigation

S. N.	Genotype	Fruit characters		
		Fruit shape at blossom end	Fruit colour at tender stage	Fruit colour at maturity
1	DPL CA-1	Blunt	Green	Light Red
2	DPL CA-2	Pointed	Pale green	Orange
3	DPL CA-3	Pointed	Dark green	Orange
4	DPL CA-4	Blunt	Green	Red
5	DPL CA-5	Pointed	Green	Orange
6	DPL CA-6	Blunt	Dark green	Orange
7	DPL CA-7	Pointed	Gsreen	Light red
8	DPL CA-8	Pointed	Pale green	Pale orange
9	DPL CA-9	Blunt	Dark green	Red
10	DPL CA-10	Blunt	Green	Orange
11	DPL CA-11	Pointed	Green	Orange
12	DPL CA-12	Blunt	Pale green	Orange
13	DPL CA-13	Pointed	Green	Light Red
14	DPL CA-14	Blunt	Green	Orange
15	DPL CA-15	Blunt	Green	Red
16	DPL CA-16	Blunt	Green	Orange
17	DPL CA-17	Pointed	Dark green	Red
18	DPL CA-18	Blunt	Dark green	Orange
19	DPL CA-19	Pointed	Green	Orange
20	DPL CA-20	Blunt	Green	Orange
21	DPL CA-21	Pointed	Pale green	Orange
22	DPL CA-22	Blunt	Green	Light Red
23	DPL CA-23	Blunt	Dark green	Orange
24	DPL CA-24	Pointed	Pale green	Orange
25	DPL CA-25	Pointed	Dark green	Orange
26	DPL CA-26	Pointed	Green	Red
27	DPL CA-27	Pointed	Green	Red
28	DPL CA-28	Pointed	Pale green	Light Red
29	DPL CA-29 (Arka Lohit)	Pointed	Dark green	Light Red
30	DPL CA-30 (Konkan Kirti)	Pointed	Dark green	Red

Chilli is wonder crop and considered as important vegetable as well as condiment. The red chilli fruits harvested at physiological maturity are used for preparation of chilli powder which is an important condiment which is consumed in almost every house hold in India. The various fruit colours *viz.* pale orange, orange, light red and red were exhibited by different genotypes. The genotype DPL-CA-8 noted pale orange colour at fruit maturity whereas six genotypes (DPL-CA-1, DPL-CA-7, DPL-CA-13, DPL-CA-22, DPL-CA-28 and DPL-CA-29) reported light red colour at fruit maturity. The seven genotypes *viz.* DPL-CA-4, DPL-CA-9, DPL-CA-15, DPL-CA-17, DPL-CA-26, DPL-CA-27 and DPL-CA-30 *i.e.*, Konkan Kirti reported red fruit colour at maturity. All remaining genotypes (DPL-CA-2, DPL-CA-3, DPL-CA-5, DPL-CA-6, DPL-CA-10, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-16, DPL-CA-18, DPL-CA-19, DPL-CA-20, DPL-CA-21, DPL-CA-23, DPL-CA-24 and DPL-CA-25) recorded orange colour at physiological maturity.

The fruit shape at blossom end (blunt or pointed) is an important character deciding the shape of the fruit and also associated with consumer acceptability. The variation in the fruit shape at the blossom end is due to genetic constituent of the genotype. The similar variation in the fruit shape at blossom end was also reported by Nsabiyeera *et al.* (2013) whereas Santhosha *et al.* (2019) observed only pointed shape at blossom end. The variation in the colour at green as well as mature stage is usually controlled both by genetic makeup as well as the crop management practices. The variation in the fruit colour at tender stage is also reported by many workers *viz.* Pawar *et al.*, 2018 (light green and dark green), Santhosha *et. al.*, 2019 and Nsabiyeera *et al.*, 2013 (only green). Fruit colour at maturity carries significance only for those genotypes which are used for purpose of chilli powder. Similarly, it also can be considered as important maturity index was harvesting the chilli at physiological maturity for seed purpose. Various colours (light red, pale orange, orange, red etc.) at physiological maturity were noted during experimentation whereas dominance of red colour at maturity was reported by Nsabiyeera *et al.* (2013) and Santhosha *et al.* (2019).

4.1.26 Ranking of the genotypes

Substantial variability was observed in 30 chilli genotypes tested during the present investigation. The extent of variability is not uniform for all the characters under study. Several characters were studied during present investigation, however ten most important characters *viz.* days to fifty per cent flowering, fruit length, fruit breadth, capsaicin content, ascorbic acid, carotene content, fruit weight, number of fruits per plant, yield per plant and yield per hectare were considered while allotting the ranking, The details of the ranking are presented in Table 34.

Based on the ranking of various genotypes, the genotype DPL-CA-8 was found to be the most promising genotype during present investigation. It has secured first rank for yield per plant as well as yield per hectare. It has also achieved higher ranks for the various characters like fruit length, fruit breadth and fruit weight. It has also gained average rank for most of the other characters under consideration.

The second rank was achieved by the genotype DPL-CA-4. However, this genotype had not secured first rank for any of the character considered for the ranking. But it had secured higher ranks for various characters like fruit length, capsaicin content and yield per hectare. It has also secured better rank for the fruit breadth, fruit weight and number of fruits per plant. Similarly it has not secured low rank for any of the characters considered for ranking.

DPL-CA-14 is third ranking genotype and it was observed that this genotype is ranking first in many of the important breeding traits *viz.* fruit breadth, ascorbic acid content and fruit weight whereas it was also a second ranking genotype in yield per plant and yield per hectare. It also exhibited high ranking performance for fruit length and beta carotene content in the fruit whereas average ranking performance for days to fifty per cent flowering. However, performance for the number of fruits per plant was very poor.

Table 34 : Ranking of various genotypes for important yield and quality attributing characters studied during present investigation

Genotype	Rank obtained										
	Days to 50% Flowering	Fruit Length	Fruit breadth	Capsaicin content	Ascorbic acid	Carotene	Fruit weight	No of fruits/pl	Yield /pl	Yield / ha	Total
DPL CA-1	1	30	7	30	27	30	21	28	30	29	233
DPL CA-2	9	16	19	22	20	29	16	10	11	10	162
DPL CA-3	23	25	5	25	2	5	12	19	25	25	166
DPL CA-4	7	14	11	4	6	8	11	11	9	7	88
DPL CA-5	27	8	29	18	16	28	23	17	19	24	209
DPL CA-6	12	23	25	5	15	7	26	6	16	15	150
DPL CA-7	2	12	24	10	4	20	22	23	23	23	163
DPL CA-8	11	4	3	6	13	14	3	15	1	1	71
DPL CA-9	20	22	2	29	14	16	7	5	4	4	123
DPL CA-10	16	11	6	8	30	11	4	22	13	12	133
DPL CA-11	6	9	9	28	18	6	6	27	14	13	136
DPL CA-12	17	21	8	17	21	10	19	21	22	22	178
DPL CA-13	21	26	17	3	25	21	27	1	20	14	175
DPL CA-14	15	7	1	27	1	4	1	30	2	2	90
DPL CA-15	26	24	10	15	12	26	13	24	18	19	187
DPL CA-16	4	29	4	20	9	9	10	18	10	11	124
DPL CA-17	13	10	23	21	7	12	20	3	7	8	124
DPL CA-18	14	13	20	14	23	27	15	8	8	9	151
DPL CA-19	3	15	27	2	26	25	28	25	28	26	205
DPL CA-20	5	27	16	12	29	24	14	20	24	21	192
DPL CA-21	10	17	26	19	28	22	30	14	27	27	220
DPL CA-22	18	20	13	17	11	17	24	16	15	16	167
DPL CA-23	22	18	15	11	17	19	8	2	6	5	123
DPL CA-24	19	19	21	7	5	3	25	12	21	20	152
DPL CA-25	24	2	14	24	8	15	2	13	3	3	108
DPL CA-26	25	28	12	23	10	18	29	26	29	30	230
DPL CA-27	8	5	18	1	24	23	5	29	26	28	167
DPL CA-28	28	3	22	13	19	13	9	9	5	6	127
Arka Lohit	29	1	30	7	22	2	18	4	14	18	145
Konkan Kirti	30	6	29	26	3	1	17	7	17	17	153

Genotype DPL-CA-25 secured fourth position in overall ranking on the basis of high ranking for fruit length, fruit weight, yield per plant and yield per hectare, Similarly, its performance for fruit breadth, ascorbic acid content and number of fruits per plant was above average whereas it reported poor ranking for days to fifty per cent flowering and capsaicin content.

The genotypes DPL-CA-9 and DPL-CA-23 occupied fifth position and recorded high ranking for fruit breadth, capsaicin content, number of fruits per plant along with the yield per plant and yield per hectare. Similarly, the genotypes DPL-CA-16 had also recorded elite performance by securing high ranking especially for the various characters like days to fifty per cent flowering, fruit breadth, ascorbic acid content, carotene content as well as yield per plant and per hectare. DPL-CA-17 had recorded high ranking for the various characters like fruit length, ascorbic acid, number of fruits per plant as well as yield per plant and yield per hectare. Besides these the genotypes DPL-CA-6, DPL-CA-18 and DPL-CA-24 have also shown promise by registering the above average performance regarding various growth and yield attributing characters.

Thus, genotypes DPL-CA-8, DPL-CA-4, DPL-CA-14, DPL-CA-25, DPL-CA-9, DPL-CA-23, DPL-CA-16, DPL-CA-17, DPL-CA-6, DPL-CA-18 and DPL-CA-19 showed promise with better performance for various characters and selected for further crop improvement (Plate 2a, 2b and 2c).

4.2 Stability Analysis

The Genotype – environment (G x E) interaction measures the response of various genotypes to different environments. It constitutes an important factor for estimation of variance components and also facilitates the further selection programme. During present investigation the magnitude of G x E interactions and stability parameters for different traits were estimated as per the procedure described by Eberhart and Russel (1966).

4.2.1 Analysis of variance for phenotypic stability

The mean square for phenotypic stability for eleven different characters is presented in Table 35. The mean square due to genotypes and environment were found highly significant when tested against the pooled error for all the characters under consideration except fruit weight, fruit length and capsaicin content. This indicated that there are differences among the genotypes and showed variation according to season.

The mean squares due to environment + variety x environment was also reported as highly significant for almost all character under consideration except fruit weight, fruit length and capsaicin content when tested against pooled deviation.

The mean squares due to environment (linear) was also highly significant for the characters days to commencement of flowering and yield per plant whereas it was significant for days to fifty per cent flowering, number of fruits per plant, ascorbic acid content and 100 seed weight. However, it was non-significant for fruit weight, fruit length, yield per hectare and capsaicin content. It indicated that performance of various genotypes could be predicted reasonably for the characters like fruit weight, fruit length, yield per hectare and capsaicin content during different growing seasons where it could not be predicted in all other characters under consideration.

The coincidence of genotypic performance with environmental values was observed significant for all the characters under consideration except average fruit weight, fruit length and capsaicin content as evident from variety (G) x environment (E) interaction (linear) when tested against pooled deviation. The mean squares due to pooled deviation were found to be highly significant for majority of the characters like days to commencement of flowering, days to fifty per cent flowering, number of fruits per plant, ascorbic acid content and 100 seed weight which suggested that prediction of performance of genotypes

Table 35 : Analysis of variance (mean square) for phenotypic stability for different characters in chilli

Source of variation	DF	Days for commencement of flowering	Days to fifty per cent flowering	Fruit weight	Fruit length	Number of fruits /plant	Yield per plant	Yield per hectare	Capsaicin content	Ascorbic acid	Number of seeds per fruit	100 seed weight
Variety	29	17.32**	19.00**	2.977**	3.564**	917.39**	21566.70**	41.84**	0.068	1,193.726**	637.48**	10,601.80**
Environment	3	438.41**	434.89**	0.028	0.031	573.96**	3920.25**	5.25	0.045	697.784**	1,010.69**	667.16**
Var. X Environ.	87	4.62**	3.672**	0.029	0.009	136.24**	674.68**	1.85**	0.003	124.491**	21.37**	223.44**
Env+Var X Env	90	19.08**	18.05**	0.029	0.010	150.83**	782.86**	1.97**	0.005	143.601**	54.35**	238.23**
Env (Linear)	1	1315.23**	1304.68**	0.085	0.093	1721.89*	11760.75**	15.74	0.135	2,093.351*	3,032.08*	2,001.48*
Env X Var(Lin)	29	10.35**	7.67**	0.032	0.011	140.98**	527.86**	0.87**	0.001	107.468**	36.08**	162.43**
Pooled Deviation	60	1.69**	1.62**	0.027	0.008	129.41**	723.15**	2.27**	0.004	128.569**	13.55**	245.47**
Pooled Error	232	1.91	1.80	0.061	0.041	211.26	436.12	0.61	0.006	301.527	137.84	438.42

during different seasons based on regression analysis for these characters might not be reliable. The results obtained are in accordance with the results reported by Zewdiel and Poulos (1996), Datta and Dey (2009), Samnotra *et al.* (2011), Srividya and Ponnuswamy (2011) and Desai Suchitra (2016).

4.2.2 Stability parameters

Stability performance of genotype is considered as one of the most desirable properties for wide adaptation in varying environments. The stability parameters *viz.* mean performance (\bar{x}), regression coefficient (b_i) and individual regression deviation from linear regression (S^2di) various genotypes were estimated for eleven characters to assess stability of individual genotypes over seasons are presented in Table 36 to 41. The character wise results are presented below.

4.2.2.1 Days for commencement of flowering

The perusal of data presented in Table 36 revealed that non-linear component (S^2di) was significant for four genotypes *viz.* DPL-CA-9, DPL-CA-11, DPL-CA-18 and DPL-CA-30 (Konkan Kirti) indicating unpredictable behaviour of these genotypes under different environments. All twenty eight genotypes recorded lesser number of days for commencement of flowering as compared to both check varieties.

The genotypes DPL-CA-6, DPL-CA-10, DPL-CA-12 and DPL-CA-24 recorded higher mean, $b_i < 1$ and S^2di around zero recorded above average response and were specifically adapted to unfavourable environments. The genotypes DPL-CA-2, DPL-CA-3, DPL-CA-4, DPL-CA-5, DPL-CA-14, DPL-CA-16 and DPL-CA-22 recorded $b_i > 1$ and S^2di around zero indicating below average response and their adaptability to favourable environments.

4.2.2.2 Days to fifty per cent flowering

The data regarding stability parameter in respect of days to fifty per cent flowering are presented in Table 36. It was observed that

Table 36 : Stability parameters of different chilli genotypes for days for commencement of flowering and days to fifty per cent flowering

S. N.	Genotype	Days for commencement of flowering			Days to fifty per cent of flowering		
		Mean	bi	S ² di	Mean	bi	S ² di
1	DPL CA-1	42.81	0.81	0.64	45.71	0.91	-0.19
2	DPL CA-2	45.74	1.14	0.38	47.67	0.87	-0.14
3	DPL CA-3	46.93	1.06	-0.55	48.93	0.95	-0.52
4	DPL CA-4	45.44	1.01	-0.53	47.50	0.94	-0.57
5	DPL CA-5	47.20	1.12	-0.11	49.25	0.90	3.73**
6	DPL CA-6	45.41	0.71	-0.23	47.98	0.57	-0.29
7	DPL CA-7	44.10	1.28	1.67	46.46	1.11	-0.27
8	DPL CA-8	46.03	1.20	-0.25	47.95	1.09	-0.56
9	DPL CA-9	46.05	0.74	3.21**	48.46	0.95	0.05
10	DPL CA-10	46.34	0.86	-0.28	48.12	0.99	-0.12
11	DPL CA-11	45.39	0.65	5.34**	47.40	0.84	1.10
12	DPL CA-12	46.13	0.76	-0.40	48.21	1.00	-0.15
13	DPL CA-13	46.15	0.72	-0.42	48.58	0.80	-0.24
14	DPL CA-14	46.54	1.05	0.08	48.09	0.96	1.15
15	DPL CA-15	47.22	0.56	1.38	49.24	0.67	0.64
16	DPL CA-16	44.72	1.55	0.17	47.17	1.52	-0.02
17	DPL CA-17	46.09	0.47	0.17	48.02	0.59	0.08
18	DPL CA-18	45.47	1.09	3.15**	48.02	1.14	1.19
19	DPL CA-19	44.66	0.71	0.32	47.03	0.78	0.16
20	DPL CA-20	45.26	1.23	1.49	47.31	1.13	0.13
21	DPL CA-21	45.23	0.68	-0.15	47.71	0.73	-0.23
22	DPL CA-22	46.28	1.09	-0.22	48.30	1.07	0.17
23	DPL CA-23	46.72	0.80	1.27	48.74	0.84	0.88
24	DPL CA-24	46.22	0.58	-0.56	48.39	0.60	0.00
25	DPL CA-25	46.80	0.91	1.25	48.99	0.91	-0.05
26	DPL CA-26	46.99	0.90	0.40	48.99	0.91	0.85
27	DPL CA-27	45.69	0.76	0.38	47.57	0.79	0.78
28	DPL CA-28	47.28	0.70	1.42	49.41	0.80	0.95
29	DPL CA-29 (Arka Lohit)	52.06	1.88	1.83	54.25	1.99	2.43*
30	DPL CA-30 (Konkan Kirti)	54.09	3.01	10.84**	57.72	2.67	19.63**

significant non-linear component was exhibited by only three genotypes (DPL-CA-5, DPL-CA-29 and DPL-CA-30), revealing larger contribution of non-linear component towards GxE interaction and these genotypes were found unpredictable in various environments. The data also exhibited that the genotypes DPL-CA-1, DPL-CA-2, DPL-CA-9, DPL-CA-16, DPL-CA-20 and DPL-CA-21 noted $b_i < 1$ and S^2_{di} (non-linear component) around zero with above average response and adaptability to unfavourable environments. The genotype DPL-CA-12 registered $b_i = 1$ and S^2_{di} around zero and thus found highly stable with average response. The genotypes DPL-CA-7, DPL-CA-16, DPL-CA-20 and DPL-CA-22 registered $b_i > 1$ and S^2_{di} around unity and were identified with below average response specifically adapted to favourable environment. All twenty eight local chilli genotypes exhibited lesser number of days for fifty per cent flowering.

4.2.2.3 Fruit weight

The data regarding stability parameter in respect of fruit weight (Table 37) revealed that only two genotypes DPL-CA-12 and DPL-CA-14 exhibited significant non-linear component (S^2_{di}) which indicated that the performance of these genotypes in different environments is unpredictable. The genotypes DPL-CA-4, DPL-CA-6, DPL-CA-10, DPL-CA-19, DPL-CA-24, DPL-CA-29 (Arka Lohit) recorded $b_i < 1$ and S^2_{di} around zero indicating adaptability of these genotypes to unfavourable environments. The genotypes DPL-CA-9, DPL-CA-11, DPL-CA-25, DPL-CA-27, DPL-CA-28 and DPL-CA-30 (Konkan Kirti) registered $b_i > 1$ and S^2_{di} around zero indicating their adaptability to favourable environments.

4.2.2.4 Fruit length

The data presented in Table 37 revealed that all the thirty genotypes under study recorded non-significant non-linear component (S^2_{di}) indicating better stability of all the genotypes for fruit length during all the season, whereas non-significant deviation in regression

Table 37 : Stability parameters of different chilli genotypes for fruit weight and fruit length

S. N.	Genotype	Fruit weight (g)			Fruit length (cm)		
		Mean	bi	S ² di	Mean	Bi	S ² di
1	DPL CA-1	2.53	4.77	-0.02	2.80	0.34	-0.01
2	DPL CA-2	2.70	-5.10	-0.01	4.29	3.00	-0.01
3	DPL CA-3	2.80	2.91	0.02	3.09	-1.89	-0.01
4	DPL CA-4	2.83	0.92	-0.01	4.36	4.74	0.02
5	DPL CA-5	2.43	-2.55	0.01	4.86	-0.38	-0.01
6	DPL CA-6	1.94	0.88	-0.02	3.52	0.05	-0.01
7	DPL CA-7	2.49	-3.11	-0.02	4.51	5.91	0.02
8	DPL CA-8	4.51	-0.56	-0.02	5.39	4.41	0.00
9	DPL CA-9	3.15	2.78	-0.01	3.59	-0.83	-0.01
10	DPL CA-10	3.55	0.35	-0.02	4.80	1.60	0.00
11	DPL CA-11	3.20	11.00	0.01	4.85	1.70	-0.01
12	DPL CA-12	2.54	1.17	0.31**	3.68	-3.05	0.02
13	DPL CA-13	1.83	2.78	-0.01	3.02	0.31	-0.01
14	DPL CA-14	5.48	4.76	0.09**	4.89	0.26	-0.01
15	DPL CA-15	2.79	-1.06	0.02	3.32	-0.23	-0.01
16	DPL CA-16	2.88	4.88	0.00	2.87	0.05	-0.01
17	DPL CA-17	2.54	-2.40	-0.02	4.81	-0.16	-0.01
18	DPL CA-18	2.74	-1.27	-0.02	4.47	-0.77	-0.01
19	DPL CA-19	1.80	-0.09	-0.02	4.35	0.61	-0.01
20	DPL CA-20	2.74	-1.75	-0.01	3.00	-0.12	-0.01
21	DPL CA-21	1.58	-2.75	-0.02	4.14	1.90	-0.01
22	DPL CA-22	2.41	6.30	-0.02	3.70	0.47	-0.01
23	DPL CA-23	3.02	3.87	-0.02	4.13	1.29	-0.01
24	DPL CA-24	2.16	-0.62	-0.02	4.01	1.36	-0.01
25	DPL CA-25	4.65	2.01	0.01	5.51	2.69	-0.01
26	DPL CA-26	1.61	-2.14	-0.02	2.90	1.08	-0.01
27	DPL CA-27	3.48	1.30	-0.01	5.13	2.08	-0.01
28	DPL CA-28	2.92	3.03	0.07	5.44	0.52	0.01
29	DPL CA-29 (Arka Lohit)	2.66	-1.68	-0.01	6.61	2.54	0.03
30	DPL CA-30 (Konkan Kirti)	2.68	1.34	-0.02	5.09	0.54	-0.01

coefficient was manifested in all the genotypes under study which indicated that all the genotypes were stable during all the season. Similarly, all the genotypes recorded lower mean for fruit length than both the check varieties (Arka Lohit and Konkan Kirti).

4.2.2.5 Number of fruits per plant

Higher mean for number of fruits per plant was registered by genotypes DPL-CA-6, DPL-CA-9, DPL-CA-13, DPL-CA-17 and DPL-CA-23 than both the check varieties (Table 38). All the genotypes exhibited non-significant deviation from S^2di except DPL-CA-13, DPL-CA-28 and DPL-CA-30 and hence except these three genotypes all other genotypes were identified as stable genotypes for this character.

4.2.2.6 Yield per plant

Perusal of data presented in Table 38 revealed significant non-linear component (S^2di) in genotypes DPL-CA-4, DPL-CA-5, DPL-CA-10, DPL-CA-11, DPL-CA-14, DPL-CA-17, DPL-CA-22, DPL-CA-23, DPL-CA-27 and DPL-CA-30 which indicated that the performance of these genotypes was unpredictable. It also revealed that the remaining genotypes are relatively stable in various environments for this character.

4.2.2.7 Yield per hectare

The perusal of the data presented in Table 39 indicated that significant deviation of non-linear component (S^2di) was manifested by ten genotypes (DPL-CA-2, DPL-CA-4, DPL-CA-9, DPL-CA-13, DPL-CA-14, DPL-CA-17, DPL-CA-18, DPL-CA-19, DPL-CA-22, DPL-CA-23, DPL-CA-25, DPL-CA-28, DPL-CA-29 and DPL-CA-30) revealing larger contribution of nonlinear components towards $G \times E$ interaction. Among twenty eight local genotypes, fifteen genotypes recorded higher mean yield as compared to both the check varieties. The genotypes DPL-CA-8 and DPL-CA-16 recorded $bi < 1$ and S^2di around zero indicating above average response indicating their adaptability to unfavourable climate.

Table 38 : Stability parameters of different chilli genotypes for number of fruit per plant and yield per plant

S. N.	Genotype	Number of fruit per plant			Yield per plant (g)		
		Mean	bi	S ² di	Mean	Bi	S ² di
1	DPL CA-1	65.47	1.95	-46.09	124.71	0.87	12.30
2	DPL CA-2	100.18	2.34	131.34	244.26	3.34	240.12
3	DPL CA-3	86.54	3.22	-1.77	153.49	0.78	82.16
4	DPL CA-4	98.14	0.63	-20.62	250.21	0.04	897.06**
5	DPL CA-5	92.37	1.82	38.63	181.12	1.68	661.63**
6	DPL CA-6	108.31	2.87	123.19	195.45	-0.06	-130.78
7	DPL CA-7	74.24	-0.07	-52.91	164.84	0.47	-46.10
8	DPL CA-8	95.76	1.71	-56.88	384.35	0.47	251.80
9	DPL CA-9	108.61	1.61	-63.63	319.41	0.81	64.65
10	DPL CA-10	77.42	2.20	-55.94	223.99	2.54	562.59*
11	DPL CA-11	69.25	0.43	-66.67	229.78	2.95	1711.52**
12	DPL CA-12	84.58	0.19	27.49	165.06	0.83	869.11
13	DPL CA-13	116.17	2.41	819.04**	175.88	0.50	-27.19
14	DPL CA-14	63.67	1.65	268.46	369.15	4.72	1196.05**
15	DPL CA-15	71.70	0.96	61.86	183.60	0.25	-86.19
16	DPL CA-16	87.88	-1.07	7.01	244.95	1.51	387.87
17	DPL CA-17	109.66	2.18	-33.25	268.53	2.16	740.55**
18	DPL CA-18	101.27	0.55	-48.13	266.76	0.48	189.55
19	DPL CA-19	71.67	0.31	-58.48	135.96	0.54	-70.55
20	DPL CA-20	85.06	-1.80	-12.26	157.82	0.86	336.81
21	DPL CA-21	96.30	1.35	46.61	138.54	0.79	325.62
22	DPL CA-22	95.75	-0.93	-7.95	202.85	0.77	1102.58**
23	DPL CA-23	113.13	4.31	-28.34	274.05	0.25	1128.63**
24	DPL CA-24	97.51	-1.22	-0.42	167.21	-0.45	33.75
25	DPL CA-25	96.59	1.95	16.60	354.73	-0.43	45.93
26	DPL CA-26	69.86	-1.40	-65.15	134.80	1.58	139.31
27	DPL CA-27	64.39	0.87	-62.38	140.24	0.62	1308.27**
28	DPL CA-28	101.14	0.25	403.03**	286.60	-0.10	156.92
29	DPL CA-29 (Arka Lohit)	108.79	-1.91	-31.10	205.68	1.18	5.83
30	DPL CA-30 (Konkan Kirti)	104.59	2.67	538.32**	187.91	0.06	5243.58**

Table 39 : Stability parameters of different chilli genotypes for yield per hectare

S. N.	Genotype	Yield per hectare (t)		
		Mean	bi	S ² di
1	DPL CA-1	6.66	1.28	0.13
2	DPL CA-2	11.74	2.53	4.95**
3	DPL CA-3	7.96	1.71	0.46
4	DPL CA-4	12.45	-0.44	1.51**
5	DPL CA-5	7.96	1.03	-0.02
6	DPL CA-6	9.97	0.37	0.05
7	DPL CA-7	8.07	0.32	0.43
8	DPL CA-8	18.70	-0.45	0.56
9	DPL CA-9	15.56	0.68	1.01**
10	DPL CA-10	10.54	0.78	0.04
11	DPL CA-11	10.51	0.41	0.53
12	DPL CA-12	8.48	0.92	-0.03
13	DPL CA-13	10.19	2.09	4.02**
14	DPL CA-14	16.66	4.23	15.92**
15	DPL CA-15	9.26	-0.01	0.04
16	DPL CA-16	11.49	-0.09	-0.07
17	DPL CA-17	12.23	0.44	2.15**
18	DPL CA-18	11.90	-1.21	2.78**
19	DPL CA-19	7.71	1.77	2.72**
20	DPL CA-20	8.26	2.93	0.10
21	DPL CA-21	7.19	1.63	0.56
22	DPL CA-22	10.01	0.32	1.73**
23	DPL CA-23	24.15	0.79	0.81**
24	DPL CA-24	8.59	0.29	-0.04
25	DPL CA-25	16.68	-1.10	7.61**
26	DPL CA-26	6.34	1.74	-0.13
27	DPL CA-27	7.10	2.33	0.12
28	DPL CA-28	14.13	0.30	2.62**
29	DPL CA-29 (Arka Lohit)	9.86	0.64	1.30**
30	DPL CA-30 (Konkan Kirti)	9.94	3.78	10.03**

4.2.2.8 Capsaicin content

The stability analysis showed that only one genotype recorded significant non-linear component *i.e.*, DPL-CA-4 (Table 40) which cannot be considered as stable genotype for capsaicin content in various environments. The higher capsaicin content (0.684) than DPL-CA-29 (Arka Lohit) was reported in DPL-CA-4, DPL-CA-6, DPL-CA-8, DPL-CA-10, DPL-CA-13, DPL-CA-19, DPL-CA-24 and DPL-CA-27. The genotypes DPL-CA-6, DPL-CA-13, DPL-CA-19, DPL-CA-24 and DPL-CA-27 recorded above average response and specifically adapted to favourable environments as the $b_i < 1$ and S^2d_i was around zero with high mean. The genotypes DPL-CA-8 and DPL-CA-10 recorded $b_i > 1$ and S^2d_i around zero and were adapted to favourable environments.

4.2.2.9 Ascorbic acid content

The data presented in Table 40 regarding stability of ascorbic acid content revealed non-significant non-linear component exhibited by majority of genotypes except DPL-CA-13 and DPL-CA-22 indicating stability of most of the genotypes for ascorbic acid content over environments. Only two genotypes *i.e.*, DPL-CA-3 and DPL-CA-14 registered higher mean value than mean of the check variety (Konkan Kirti).

4.2.2.10 Number of seeds per fruit

The data regarding stability parameters of different chilli genotypes for number of seed per fruit are presented in Table 41. All the genotype exhibited non-significant deviation from S^2d_i indicating the stability of these genotypes for number of seeds per fruit in different environments. The genotypes DPL-CA-1, DPL-CA-3, DPL-CA-5, DPL-CA-8, DPL-CA-9, DPL-CA-10, DPL-CA-14, DPL-CA-16, DPL-CA-18, DPL-CA-20, DPL-CA-21, DPL-CA-22, DPL-CA-23, DPL-CA-25, DPL-CA-26, DPL-CA-27 and DPL-CA-28 recorded higher mean value of number of seeds per fruit than DPL-CA-29 (Arka Lohit) which is having higher number of seeds per fruit than DPL-CA-30 (Konkan Kirti).

Table 40 : Stability parameters of different chilli genotypes for capsaicin and ascorbic acid content

S.N.	Genotype	Capsaicin (%)			Ascorbic acid (mg/100g)		
		Mean	bi	S ² di	Mean	bi	S ² di
1	DPL CA-1	0.409	0.831	-0.001	122.61	0.72	-98.45
2	DPL CA-2	0.555	0.803	0.002	133.97	2.02	-80.07
3	DPL CA-3	0.479	1.162	0.002	170.09	0.30	3.35
4	DPL CA-4	0.782	0.875	0.045**	156.45	-0.56	-61.36
5	DPL CA-5	0.590	0.907	-0.001	136.32	4.74	-85.97
6	DPL CA-6	0.772	0.757	-0.001	137.43	-0.21	-3.95
7	DPL CA-7	0.681	1.427	-0.001	161.84	-0.02	-78.43
8	DPL CA-8	0.746	1.563	-0.002	139.43	1.37	35.75
9	DPL CA-9	0.443	0.941	0.001	138.67	2.30	-7.78
10	DPL CA-10	0.696	2.201	0.000	108.87	0.85	-91.26
11	DPL CA-11	0.459	1.564	-0.001	134.98	-0.83	45.71
12	DPL CA-12	0.598	0.711	-0.001	132.94	0.10	-95.12
13	DPL CA-13	0.790	0.553	0.005	126.09	0.80	983.22**
14	DPL CA-14	0.469	1.353	-0.002	187.12	0.30	10.00
15	DPL CA-15	0.608	0.503	0.007	139.71	0.64	-11.79
16	DPL CA-16	0.560	2.031	-0.002	152.39	0.92	-87.08
17	DPL CA-17	0.558	1.600	0.020	154.35	1.73	-82.17
18	DPL CA-18	0.621	0.597	-0.002	131.87	1.67	-62.38
19	DPL CA-19	0.815	-0.121	0.004	123.94	3.89	132.22
20	DPL CA-20	0.671	0.416	0.000	115.51	1.58	27.82
21	DPL CA-21	0.583	1.357	-0.001	116.23	1.71	-28.69
22	DPL CA-22	0.598	0.663	0.000	140.69	0.40	478.91**
23	DPL CA-23	0.677	0.726	0.002	136.01	1.76	-48.87
24	DPL CA-24	0.737	0.927	-0.002	157.80	-0.65	-52.06
25	DPL CA-25	0.488	1.176	0.001	152.93	0.92	158.51
26	DPL CA-26	0.548	0.984	-0.001	149.32	0.25	205.68
27	DPL CA-27	0.973	0.679	-0.001	126.47	-0.60	-94.25
28	DPL CA-28	0.622	1.052	-0.001	134.54	1.03	-86.57
29	DPL CA-29 (Arka Lohit)	0.684	1.162	0.004	132.55	1.15	-8.23
30	DPL CA-30 (Konkan Kirti)	0.477	0.602	0.000	162.04	1.73	16.53

Table 41 : Stability parameters of different chilli genotypes for number of seeds per fruit and 100 seed weight

S.N.	Genotype	Number of seeds per fruit			100 seed weight (mg)		
		Mean	bi	S ² di	Mean	bi	S ² di
1	DPL CA-1	75.65	0.95	-38.40	587.80	1.30	1152.41**
2	DPL CA-2	57.94	0.65	-18.76	514.71	-0.98	-64.45
3	DPL CA-3	84.53	0.74	-40.33	474.54	6.64	1852.30**
4	DPL CA-4	64.47	1.02	-24.82	501.52	0.42	-24.17
5	DPL CA-5	72.41	0.66	-42.31	583.95	2.89	9.77
6	DPL CA-6	60.49	-0.04	-43.52	490.37	2.23	-20.81
7	DPL CA-7	62.17	0.25	-39.31	506.65	0.98	-74.14
8	DPL CA-8	92.55	1.12	-41.14	420.84	0.96	-73.74
9	DPL CA-9	88.71	1.57	-40.53	526.77	0.81	-104.77
10	DPL CA-10	81.59	0.27	-44.04	487.65	-0.10	134.56
11	DPL CA-11	64.72	0.27	-26.82	584.34	-0.12	-122.58
12	DPL CA-12	70.72	0.98	-41.91	529.36	-0.25	-101.34
13	DPL CA-13	73.86	0.58	-35.77	460.87	0.62	62.18
14	DPL CA-14	81.02	1.73	-38.39	529.08	-1.66	518.01
15	DPL CA-15	66.26	0.84	19.96	542.18	0.89	-96.53
16	DPL CA-16	70.72	1.02	-39.90	513.22	-0.23	-35.36
17	DPL CA-17	59.62	-0.35	-41.42	474.50	1.65	253.05
18	DPL CA-18	90.25	1.46	-21.24	466.14	1.33	-3.35
19	DPL CA-19	69.64	1.13	-45.74	449.89	1.54	-137.41
20	DPL CA-20	98.72	1.90	-45.30	452.58	2.63	-116.16
21	DPL CA-21	83.33	1.27	-26.38	566.59	3.19	-125.23
22	DPL CA-22	99.26	2.13	-24.26	505.02	1.72	-8.06
23	DPL CA-23	66.49	1.22	-44.77	618.81	0.60	-99.83
24	DPL CA-24	48.81	1.21	-33.35	380.23	1.48	-60.28
25	DPL CA-25	77.26	1.97	-17.24	534.98	1.05	-67.91
26	DPL CA-26	73.24	0.91	-43.90	492.27	0.16	-88.64
27	DPL CA-27	74.07	1.58	-23.83	464.25	1.23	125.69
28	DPL CA-28	73.88	1.66	-36.74	499.67	0.43	89.63
29	DPL CA-29 (Arka Lohit)	70.61	0.54	-17.47	520.66	-1.25	210.44
30	DPL CA-30 (Konkan Kirti)	52.98	0.77	-14.25	483.05	-0.15	-3.32

4.2.2.11 100 seed weight

The data regarding stability parameters of different chilli genotypes for 100 seed weight are presented in Table 41. All the genotypes except DPL-CA-1 and DPL-CA-3 exhibited non-significant deviation from non-linear component (S^2_{di}) indicating stability of all the genotypes for 100 seed weight during different seasons except DPL-CA-1 and DPL-CA-3. The genotypes DPL-CA-1, DPL-CA-5, DPL-CA-9, DPL-CA-11, DPL-CA-12, DPL-CA-14, DPL-CA-15, DPL-CA-21 and DPL-CA-25 recorded higher mean value for 100 seed weight than both the check varieties.

Thus, the chances of selection of stable genotypes can be strengthened by selection based on the stability with respect to individual component. Similar results with respect to stability were also reported by Roy *et al.* (1998), Chowdhury *et al.* (2001), Senapati and Sarkar (2002), Nehru *et al.* (2003), Saxena and Hundal (2008), Abu and Uguru (2006), Mishra *et al.* (2009), Samnotra *et al.* (2011), Srividhya and Ponnuswami (2011), Gurung *et al.* (2012), Tembhurne and Rao (2013), Rahadi *et al.* (2013), Syukur *et al.* (2014) and Desai Suchitra (2016).

4.3 Marker Analysis

Establishment of genetic profiles by using molecular markers is quite useful for detection of variation at genetic level present among the various genotypes. Assessment of genetic variability by using molecular markers is comparatively more reliable and precised method. The experimental results obtained in the present study regarding molecular analysis of various chilli genotypes samples by using molecular markers are presented and discussed under following subheads.

4.3.1 Extraction of DNA

The plant samples were collected for extraction of genomic DNA from thirty chilli genotypes and the DNA was extracted by rapid DNA method. The quantities of components for 10 ml of extraction buffer used for DNA extraction are given in Table 42.

Table 42 : Standardization of concentration of chemical constituents in extraction buffer

S. N.	Components	T ₁	T ₂	T ₃
1	0.5M Glucose	0.800 g	0.900 g	0.950 g
2	3% PVP	0.050 g	0.100 g	0.150 g
3	0.4% Sodium bisulphate	0.030 g	0.040 g	0.050 g
4	Sodium Lauryl Sulphate	0.040 g	0.050 g	0.060 g
5	5% Sarcosyl	400 µl	500 µl	600 µl

The gel photograph of DNA isolated from thirty genotypes of chilli proved that T₂ combination *i.e.* 0.900 g glucose, 0.100 g PVP, 0.40 g Sodium bisulphate, 0.050 g Sodium Lauryl Sulphate and 500 µl Sarcosyl was proved to be ideal concentration and depicted clear DNA bands which were utilized for further extraction of DNA (Patil, 2019).

Selection of plant tissues during isolation of high quality DNA is very important in any molecular analysis work as various contaminants such as proteins, polyphenols and polysaccharides may interfere with different enzymes like restriction enzyme and *Taq* polymerase. Similarly, contaminating RNA gets precipitated and causes suppression of PCR amplification (Padmalatha and Prasad, 2006). During present study the tender leaves from 30 selected genotypes were used for extraction of DNA. Genomic DNA extraction from fresh young leaf at 3 – 4 leaf stage was also reported by Sharmin *et al.*, 2018. The use of fresh young plant tissues for extraction of DNA was also reported by Bhadragoudar and Patil (2011), Uddin *et al.* (2012) and Bahurupe *et al.* (2013).

4.3.2 Modification in extraction procedure of DNA isolation

The DNA extraction was carried out by the procedure suggested by Doyle and Doyle (1990) with slight modifications. The modifications made in the various steps are presented in Table 43.

Table 43 : Modification in extraction procedure of DNA isolation

S. N.	Procedure by Doyle and Doyle (1990)	Modifications Made	Results
1	Sample size: 500 mg – 1 g	Sample size: 200 mg – 500 mg	200 mg size was optimum
2	Volume of buffer used: Not mentioned	Volume of buffer used: 0.5 ml / sample	Good precipitation
3	Use of polyvinyl polypyrrolidone: No	Use of polyvinyl polypyrrolidone: Yes	Resulted in elimination of polyphenol impurities
4	Incubation temp: 60 ° C for 30 min.	Incubation temp: 65 ° C for 45 min.	Resulted in precipitation of major impurities
5	Isopropanol volume used: 0.6 volume	Isopropanol volume used: twice volume	Provided good precipitation of DNA under low temp.
6	Washing: 76 % ethanol	Washing: 70 % ethanol	Removal of maximum salts and purification of DNA

The clarity of DNA bands in the gel revealed that the sample amount of 200 mg was optimum which helped in reducing the mucilage content degrading the quality of DNA (Plate 3). The use of buffer volume @ 0.5 ml/sample produced good DNA precipitation. Use of PVP helped to remove the polyphenols. The increased temperature and time of exposure *i.e.*, 65 ° C for 45 minutes resulted in precipitation of major impurities. Good precipitation of DNA was obtained due to twice volume of isopropanol. Similarly, 70 per cent ethanol also resulted in removal of maximum salts which further helped in precipitation of DNA. The sample amount of 200 mg of sterilized leaf sample was also found optimum as reported by Sharmin *et al.* (2018).

4.3.3 Standardization of PCR parameters for rapid method

Better banding pattern was observed with slight modification in PCR parameters *viz.* master mixture and thermo profile. The

modifications made in the PCR master mixture and thermoprofile for ISSR markers which gave better amplification are given in Table 44 and 45.

Table 44 : Standardization of master mixture for ISSR markers

S. N.	Chemical content	Tested range	Remarks
1.	MgCl ₂ (25 mM)	0.2, 0.5, 1.0 μ l	0.5 μl: Less / excess increases the non specificity and yield of the product
2.	dNTPs (10 mM)	0.5, 1.0, 1.5 (μ M)	1.0 μM: Exhibited clear band
3.	Template DNA (40 ng/ μ l)	0.5, 1.0, 1.5 μ l	1 μl: Pipetting error was reduced and gave good amplification
4.	Tag polymerase (3 U / μ l)	0.3, 0.5, 1.0 μ l	0.5 μl: –Better and clear amplification was obtained
5.	PCR reaction volume (μ l)	10, 20, 25 μ l	20 μl: Excellent yield of amplicons

Table 45 : Standardization of thermo profile for ISSR markers

S. N.	Temperature	Tested range	Remarks
1.	Initial denaturation time 94°C	4, 5, 6 min	5 min. was found to be optimum initial denaturation time
2.	Denaturation time 94°C	20, 30, 60 sec	30 sec. proved better denaturation time
3.	Annealing temperature (° C)	0.45, 1, 2 min	1 min. initial primer extension time was found better
4.	Initial Primer extension	0.45, 1, 2 min	1 min. initial primer extension time was found better
5.	Final Extension	5, 6, 7 min	7 min. final extension time was better

In the present experiment, the clear banding pattern was observed with 2 μ l of DNA which provided 40-50 ng of template DNA for reaction. Padmalata and Prasad (2006) observed the clarity of the bands with 1 μ l of template DNA which has the concentration of 40 ng/ μ l. The PCR master mix was standardized for ISSR marker for each PCR component and the optimum concentration of each component in master mix which gave better amplification was used for further analysis.

4.3.4 Standardization of annealing temperature

Various temperature ranges were calibrated on PCR machine and tried by following gradient PCR. The necessary reaction mixture was prepared as per the procedure and template DNA was utilized for optimization of annealing temperature. The standard annealing temperature range for ISSR marker was 40 to 54.8 $^{\circ}$ C. The standardized annealing temperatures of ISSR markers are depicted in Table 46.

Table 46 : Standardization of annealing temperature of ISSR markers

S. N.	Name of primer	Tm Value ($^{\circ}$C)	Temperature ($^{\circ}$C)	Standardized Annealing temperature ($^{\circ}$C)
1	UBC-811	43.3	40-50	43.4
2	UBC-814	41.4	40-50	42.3
3	UBC-815	45.0	40-50	49.5
4	UBC-817	52.8	40-50	47.0
5	UBC-818	52.1	45-55	47.9
6	UBC-825	49.3	45-55	47.9
7	UBC-834	49.8	45-55	50.4
8	UBC-844	39.4	40-50	40.2
9	UBC-845	43.4	40-50	41.6
10	UBC-853	54.0	45-55	54.4
11	UBC-854	51.1	45-55	54.8
12	UBC-857	57.1	45-55	51.7
13	UBC-876	36.4	40-50	40.0
14	UBC-881	66.5	45-55	50.0
15	UBC-884	51.8	40-50	40.0
16	UBC-885	41.7	40-50	40.7
17	UBC-886	36.9	45-55	51.4
18	UBC-889	39.4	45-55	47.0
19	UBC-891	51.8	45-55	50.0
20	UBC-897	56.2	50-60	54.5
21	UBC-898	47.3	50-60	55.0

Standardization of annealing temperature is important for proper amplification of the fragments. The annealing temperature was finalized based on the appearance of distinctive bands at specific temperature (Azhar *et al.*, 2013).

Among the twenty one ISSR primers only ten primers showed clear amplification pattern and others were failed to generate the fragments. Hence, the eleven amplified primers were taken for further analysis.

4.3.5 ISSR Analysis in between thirty chilli genotypes

The ISSR profile of thirty chilli genotypes selected from various chilli growing pockets in the region were computed individually for each primer and were used for further analysis. The ISSR pattern of genomic DNA with respect to thirty chilli genotypes were analyzed for the number of fragments, informative ness of the markers and polymorphism for the assessment of genetic diversity present within the genotypes under study.

4.3.5.1 The primer wise amplification details of genomic DNA with respect to thirty chilli genotypes and per cent polymorphism across the ten ISSR primers are presented in Table 47 (Plate 4, Plate 5, Plate 6, Plate 7). A total of 591 scorable DNA fragments were amplified and all fragments were found to be polymorphic. Thus, 100 per cent polymorphism was recorded in all the primers under study. The range of amplification in various ISSR markers used was also variable. The widest range of amplification was observed in primer UBC-845 (0.353-3.0 Kb) which was followed by UBC-818 (0.347-2.703 Kb) and UBC-811 (0.41-2.759 Kb).

The analysis of polymorphism information content (PIC value) indicated that the ISSR markers were informative and polymorphic. The PIC value of each marker, which can be analyzed on the basis of its alleles differed considerably in all tested ISSR loci. The average PIC values obtained in ISSR markers used during present study are given in Table 48. The ISSR profile generated by each primer was analyzed by

using standard DNA marker (100 bp) and compared with their respective banding pattern. The highest PIC value (0.86) was shown by marker UBC-834. The marker UBC-811 was followed by UBC-834 with respect to PIC value and recorded 0.84 PIC value. The PIC value during present investigation was in the range of 0.52 to 0.86 with the average of 0.716. It indicated, ISSR markers have great potential to establish molecular signature of various chilli genotypes under present study. During present study, ISSR patterns separated all the genotypes of chilli under study from each other and also confirmed the variability at molecular level. Molecular analysis can be employed for individual identification of cultivar or genotype for determination of genetic relatedness. Phenotypic descriptors do not always allow the quantification of the genotypic differences or similarities between cultivars like genetic distances based on DNA polymorphism (Lafebvre *et al.*, 2001). ISSR markers provide a large amount of information and enable the identification of polymorphic loci, making the correct differentiation among the accessions (Bianchi *et al.*, 2020). The ISSR markers have been successfully employed in capsicum by Kochieva *et al.*, 2004.

Table 47 : ISSR primer wise amplification and per cent polymorphism in various chilli genotypes

S. N.	Primer	Total No. of Bands	% Polymorphism	Range of Amplification (Kb)	Polymorphic Information Content (PIC value)
1	UBC - 811	96	100	0.41 – 2.759	0.84
2	UBC - 814	58	100	0.117 – 1.672	0.77
3	UBC - 818	60	100	0.347 – 2.703	0.78
4	UBC - 825	38	100	0.053 – 1.555	0.65
5	UBC - 834	108	100	0.395 – 2.73	0.86
6	UBC - 844	49	100	0.192 – 2.196	0.75
7	UBC - 845	62	100	0.353 – 3.0	0.69
8	UBC - 884	38	100	0.024 – 1.562	0.52
9	UBC - 885	37	100	0.021 – 1.786	0.62
10	UBC - 886	45	100	0.043 – 1.873	0.68
	Total	591	-	-	-

The PIC values provide an estimate of discriminating power of a marker by taking into account not only the number of alleles at a locus but also relative frequencies of these alleles. Further these values

depend upon the genetic diversity among the accessions. Lower PIC values might be the result of closely related genotypes and vice-versa (Dhaliwal *et al.*, 2014). Avni Patel *et al.* (2011) also reported 100 per cent polymorphism and PIC value in the range of 0.76 and 0.96 in *Capsicum annuum* L. whereas Tilahan *et al.* (2013) reported polymorphism in the range of 50 to 100 per cent in chilli and paprika by using RAPD and SSR markers. Sharmin *et al.* (2018) also reported PIC value in the range of 0.225 to 0.500 with a mean of 0.371 in 20 genotypes of *Capsicum annuum* L. by using 5 primers. Gor *et al.* (2016) observed 72.22 per cent polymorphism and 0.88 PIC value for RAPD markers whereas it was 0.66 for EST-SSR markers in paprika.

4.3.5.2 Similarity matrices of various chilli genotypes based on ISSR profiles

The similarity matrices was based on Jaccard's similarity coefficient and the data pertaining to it are presented in Table 48. The overall range of similarity in between thirty chilli genotypes was in the range of 0 to 0.556. The maximum similarity coefficient (0.556) was noted between DPL-CA-1 and DPL-CA-3 as well as in DPL-CA-3 and DPL-CA-4. The similarity coefficient was also high in between DPL-CA-13 and DPL-CA-14 (0.542), DPL-CA-22 and DPL-CA-23 (0.536), DPL-CA-8 and DPL-CA-10 (0.515), DPL-CA-6 and DPL-CA-8 (0.483), DPL-CA-6 and DPL-CA-9 (0.480), DPL-CA-4 and DPL-CA-5 (0.474), DPL-CA-6 and DPL-CA-10 (0.469), DPL-CA-11 and DPL-CA-12 (0.438), DPL-CA-10 and DPL-CA-12 (0.432), DPL-CA-8 and DPL-CA-9 (0.429), DPL-CA-9 and DPL-CA-10 (0.419), DPL-CA-14 and DPL-CA-15 (0.417), DPL-CA-24 and DPL-CA-25 (0.412), DPL-CA-24 and DPL-CA-26 (0.405), DPL-CA-3 and DPL-CA-5 (0.400) indicating considerable distinctiveness of these samples with each other. The similarity coefficient was zero in between DPL-CA-5 and DPL-CA-16, DPL-CA-6 and DPL-CA-17, DPL-CA-11 and DPL-CA-17, DPL-CA-9 and DPL-CA-22. The similarity coefficient was also observed low (<0.03) in between DPL-CA-7 and DPL-CA-17 (0.025), DPL-CA-5 and DPL-CA-24 (0.027), DPL-CA-5 and DPL-CA-25 (0.027), DPL-CA-3 and DPL-CA-27 (0.029).

Table 48 : Genetic similarity coefficient based on ISSRs pooled over the ten primers within various chilli genotypes

UPGMA																														
Jaccard's Coefficient																														
Similarity matrix																														
	DPL-CA-1	DPL-CA-2	DPL-CA-3	DPL-CA-4	DPL-CA-5	DPL-CA-6	DPL-CA-7	DPL-CA-8	DPL-CA-9	DPL-CA-10	DPL-CA-11	DPL-CA-12	DPL-CA-13	DPL-CA-14	DPL-CA-15	DPL-CA-16	DPL-CA-17	DPL-CA-18	DPL-CA-19	DPL-CA-20	DPL-CA-21	DPL-CA-22	DPL-CA-23	DPL-CA-24	DPL-CA-25	DPL-CA-26	DPL-CA-27	DPL-CA-28	DPL-CA-29	DPL-CA-30
DPL-CA-1	1																													
DPL-CA-2	0.4	1																												
DPL-CA-3	0.556	0.333	1																											
DPL-CA-4	0.4	0.217	0.556	1																										
DPL-CA-5	0.333	0.167	0.4	0.474	1																									
DPL-CA-6	0.172	0.308	0.36	0.259	0.259	1																								
DPL-CA-7	0.25	0.29	0.25	0.212	0.333	0.353	1																							
DPL-CA-8	0.194	0.37	0.321	0.321	0.156	0.483	0.324	1																						
DPL-CA-9	0.148	0.292	0.24	0.24	0.107	0.48	0.303	0.429	1																					
DPL-CA-10	0.206	0.281	0.206	0.206	0.171	0.469	0.395	0.515	0.419	1																				
DPL-CA-11	0.172	0.36	0.214	0.172	0.133	0.333	0.353	0.303	0.37	0.382	1																			
DPL-CA-12	0.176	0.29	0.176	0.176	0.081	0.314	0.368	0.361	0.344	0.432	0.438	1																		
DPL-CA-13	0.185	0.231	0.185	0.103	0.067	0.31	0.158	0.323	0.296	0.286	0.226	0.333	1																	
DPL-CA-14	0.32	0.32	0.269	0.179	0.138	0.3	0.286	0.355	0.385	0.394	0.3	0.364	0.542	1																
DPL-CA-15	0.208	0.16	0.208	0.16	0.115	0.207	0.242	0.188	0.28	0.235	0.25	0.242	0.32	0.417	1															
DPL-CA-16	0.167	0.077	0.077	0.077	0	0.063	0.053	0.121	0.107	0.108	0.063	0.111	0.103	0.065	0.036	1														
DPL-CA-17	0.16	0.074	0.074	0.115	0.036	0	0.025	0.086	0.067	0.077	0	0.051	0.1	0.133	0.071	0.381	1													
DPL-CA-18	0.036	0.036	0.036	0.074	0.074	0.094	0.108	0.086	0.103	0.05	0.029	0.051	0.065	0.097	0.034	0.074	0.25	1												
DPL-CA-19	0.133	0.097	0.133	0.172	0.133	0.081	0.122	0.132	0.057	0.068	0.053	0.122	0.056	0.114	0.094	0.133	0.296	0.4	1											
DPL-CA-20	0.138	0.1	0.138	0.179	0.138	0.026	0.154	0.105	0.029	0.045	0.083	0.098	0.057	0.056	0.03	0.179	0.308	0.308	0.5	1										
DPL-CA-21	0.161	0.029	0.091	0.125	0.125	0.077	0.171	0.154	0.114	0.167	0.167	0.116	0.176	0.206	0.276	0.286	0.321	0.156	0.313	0.367	1									
DPL-CA-22	0.179	0.1	0.138	0.1	0.179	0.054	0.098	0.05	0	0.07	0.114	0.047	0.088	0.118	0.097	0.179	0.214	0.063	0.3	0.357	0.367	1								
DPL-CA-23	0.152	0.152	0.188	0.056	0.086	0.158	0.111	0.175	0.079	0.159	0.158	0.163	0.167	0.229	0.147	0.188	0.219	0.114	0.333	0.265	0.314	0.536	1							
DPL-CA-24	0.086	0.118	0.056	0.086	0.027	0.1	0.111	0.175	0.171	0.186	0.128	0.136	0.167	0.229	0.182	0.118	0.182	0.147	0.257	0.194	0.211	0.229	0.263	1						
DPL-CA-25	0.118	0.086	0.086	0.086	0.027	0.073	0.042	0.119	0.139	0.133	0.073	0.087	0.2	0.194	0.147	0.152	0.182	0.083	0.189	0.162	0.211	0.265	0.231	0.412	1					
DPL-CA-26	0.135	0.135	0.077	0.105	0.105	0.116	0.149	0.133	0.125	0.17	0.091	0.149	0.15	0.175	0.132	0.167	0.194	0.132	0.171	0.175	0.25	0.205	0.209	0.405	0.3	1				
DPL-CA-27	0.061	0.129	0.029	0.061	0.061	0.206	0.175	0.158	0.267	0.263	0.108	0.146	0.147	0.176	0.125	0.129	0.161	0.2	0.139	0.176	0.162	0.111	0.125	0.324	0.25	0.4	1			
DPL-CA-28	0.091	0.091	0.059	0.091	0.161	0.105	0.143	0.071	0.147	0.14	0.077	0.116	0.143	0.108	0.088	0.161	0.233	0.121	0.105	0.171	0.158	0.206	0.179	0.179	0.211	0.282	0.344	1		
DPL-CA-29	0.118	0.152	0.118	0.086	0.086	0.128	0.22	0.175	0.079	0.244	0.1	0.163	0.077	0.103	0.054	0.086	0.147	0.114	0.128	0.162	0.07	0.103	0.143	0.143	0.171	0.238	0.364	0.353	1	
DPL-CA-30	0.185	0.143	0.231	0.185	0.28	0.056	0.128	0.139	0.061	0.154	0.086	0.1	0.059	0.121	0.1	0.103	0.138	0.118	0.121	0.081	0.088	0.105	0.077	0.105	0.122	0.219	0.212	0.2	1	
	DPL-CA-1	DPL-CA-2	DPL-CA-3	DPL-CA-4	DPL-CA-5	DPL-CA-6	DPL-CA-7	DPL-CA-8	DPL-CA-9	DPL-CA-10	DPL-CA-11	DPL-CA-12	DPL-CA-13	DPL-CA-14	DPL-CA-15	DPL-CA-16	DPL-CA-17	DPL-CA-18	DPL-CA-19	DPL-CA-20	DPL-CA-21	DPL-CA-22	DPL-CA-23	DPL-CA-24	DPL-CA-25	DPL-CA-26	DPL-CA-27	DPL-CA-28	DPL-CA-29	DPL-CA-30

In present study, the similarity coefficient was maximum (0.556) in between genotypes DPL-CA-1 and DPL-CA-4 indicating maximum similarity in the genotypes studied during present investigation on the basis of Jaccard's similarity coefficient. In morphological characterization also, DPL-CA-1, DPL-CA-3 as well as DPL-CA-4 exhibited lanceolate type of leaf shape, triangular fruit shape and intermediate type of calyx margin. Similarly the fruit shape at pedicel attachment was truncate in DPL-CA-3 and DPL-CA-4. The high similarity coefficient was also observed in genotypes DPL-CA-22 and DPL-CA-23. Both these genotypes were having elongated fruit shape and calyx margin of these genotypes was also intermediate. On the other hand, the similarity coefficient was zero in between DPL-CA-5 and DPL-CA-16, DPL-CA-16 and DPL-CA-17, DPL-CA-11 and DPL-CA-17, DPL-CA-9 and DPL-CA-22. In morphological characterization, the fruit shape of DPL-CA-5 was recorded as elongated whereas the same in DPL-CA-16 was triangular. Similarly, neck at base of the fruit was present in DPL-CA-5 but it was absent in DPL-CA-16. Similarly, in DPL-CA-6 the fruit shape was triangular whereas it was elongated in DPL-CA-17 and the neck at base of the fruit was absent in DPL-CA-6 whereas it was present in DPL-CA-17. It indicated that the similarity matrices as per Jaccard's similarity coefficient and morphological characterization was comparable to each other to certain extent.

In present study, the similarity coefficient was in the range of 0-0.556 indicating huge diversity in the various chilli genotypes under study. The high level of genetic diversity in different chilli genotypes may be due to cross pollination by insects, dispersal of seeds, changes in habitat as well as may be due to larger population size in different locations. The significant degree of variation in the genotypes revealed maximum genetic diversity which may be due to geographical isolation and change in the environmental conditions to which the respective genotype belongs (Bhadragoudar and Patil, 2011). Close genetic similarity between various genotypes depicted that these genotypes are

genetically similar and may be developed from same progenitors and hence showed highest level of similarities indicating the same genetic base.

Bahurupe *et al.* (2013) investigated the similarity coefficient in the range of 0.42-0.97 with an average of 0.73. Similarly, Bhadragoudar and Patil (2011) and Ince *et al.* (2009) found similarity coefficients ranging between 0.20-0.94 and 0.32-0.88 respectively indicating diversity in chilli genotypes studied. Aniel kumar *et al.* (2014) studied the similarity index of 21 cultivars of *Capsicum annum* which ranged from 0 to 100%. The similar results were also reported by Gupta *et al.* (1997). Patel Avni (2011) reported similarity coefficient based on five ISSR markers in the range of 0.029-0.333 showing the close relationship between GVC-111 and GVC-101 and least genetic similarity between Reshamapatti and Kunthi genotypes indicating high level of diversity existing among the group. The similar results were also reported by Tilahun *et al.* (2013).

4.3.5.3 The dendrogram based on Jaccard's similarity coefficient was constructed by using UPGMA after analysis of banding patterns generated by thirty chilli genotypes from various locations in Konkan region with ISSR markers (Figure 24). The dendrogram separated the genotypes in two main clusters *viz.* Cluster I and Cluster II (Table 49). Cluster I was further subdivided into Cluster IA and Cluster IB whereas Cluster II was also subdivided into IIA and IIB. Cluster IA consisted six genotypes (DPL-CA-29, DPL-CA-28, DPL-CA-27, DPL-CA-26, DPL-CA-25 and DPL-CA-24) whereas cluster IB included eight genotypes (DPL-CA-23, DPL-CA-22, DPL-CA-21, DPL-CA-20, DPL-CA-19, DPL-CA-18, DPL-CA-17 and DPL-CA-16). Cluster IIA was the largest cluster consisting eleven genotypes (DPL-CA-15, DPL-CA-14, DPL-CA-13, DPL-CA-12, DPL-CA-11, DPL-CA-7, DPL-CA-10, DPL-CA-8, DPL-CA-9, DPL-CA-6 and DPL-CA-2) whereas only five genotypes (DPL-CA-1, DPL-CA-3, DPL-CA-4, DPL-CA-5 and DPL-CA-13) were included in cluster IIB.

Table 49 : ISSR clustering pattern within various chilli genotypes

Cluster		Number of genotypes	Genotypes
I	IA	6	DPL-CA-29 DPL-CA-28 DPL-CA-27 DPL-CA-26 DPL-CA-24 DPL-CA-25
	IB	8	DPL-CA-23 DPL-CA-22 DPL-CA-21 DPL-CA-20 DPL-CA-19 DPL-CA-18 DPL-CA-17 DPL-CA-16
II	IIA	11	DPL-CA-15 DPL-CA-14 DPL-CA-13 DPL-CA-12 DPL-CA-11 DPL-CA-7 DPL-CA-10 DPL-CA-8 DPL-CA-9 DPL-CA-6 DPL-CA-2
	IIB	5	DPL-CA-30 DPL-CA-5 DPL-CA-4 DPL-CA-3 DPL-CA-1

The present dendrogram revealed two main clusters indicating the genetic similarity in the genotypes which are clustered together. Morphological traits based clustering showed some degree of similarity to dendrogram based clustering. In present study the genotypes clustered in group I as per dendrogram also showed considerable similarity when compared with various morphological traits. In cluster I,

most of the genotypes are having campanulate corolla except DPL-CA-16 and DPL-CA-17. Similarly, neck at fruit base was present in most of the genotypes grouped in cluster I except DPL-CA-16, DPL-CA-18, DPL-CA-20, DPL-CA-22 and DPL-CA-28 whereas neck at base of the fruit was absent in many genotypes from Group II however DPL-CA-3, DPL-CA-5, DPL-CA-7, DPL-CA-13 and DPL-CA-30 where exception to it. With respect to fruit shape the clusters based on dendrogram as well as grouping as per morphological traits exhibited much similarity. Most of the genotypes having elongated fruit shape were grouped in cluster I with exception of DPL-CA-16, DPL-CA-18 and DPL-CA-20 whereas triangular fruit shape was dominant in genotypes belonging to cluster II but the genotypes DPL-CA-5, DPL-CA-7, DPL-CA-10, DPL-CA-13 and DPL-CA-30 where exceptions and reported elongated fruit shape. The exact comparison of molecular and morphological characterization is possible may be by using additional ISSR markers which might give better coverage of the genomes. During present investigation, the set of markers used may not be sufficient for true detection of genotypes at molecular level. Based on the molecular analysis it was possible to characterize most of the genotypes under study. The qualitative characters are subjective and hard to score and the quantitative characters are influenced by the environment. Molecular analysis could help to reveal genetic diversity more accurately and help to unambiguously differentiate the genotypes with identical allelic pattern. Several studies have also addressed the characterization of chilli based on phenotypic and molecular descriptors (Pickersgill *et al.*, 1991, Jarret and Berke, 2008, Moses, 2014, Carvalho *et al.*, 2014, Grover and Sharma, 2014, Carvalho *et al.*, 2015, Baba *et al.*, 2016 and Cardoso *et al.*, 2018). However most of the workers focused the characterization of chilli either by morphological descriptors or by molecular characterization. Very few studies addressed the characterization of chilli by using both the approaches. The comparison of clusters formed by morphological and molecular data are in considerable agreement only. The low correlation or even no correlation between morphological and

molecular data was reported in earlier studies. (Carvalho *et al.*, 2014, Leite *et al.*, 2016 and Meng *et al.*, 2017). The molecular markers are present in both coding and noncoding regions and are therefore not necessarily inked to the expression of morphological traits (Bianchi *et al.*, 2020). However, both characterization stages are important for an understanding of genetic variability of a population and for developing effective strategies for germplasm conservation and breeding purposes.

Sharmin *et al.* (2018) reported two main clusters of twenty chilli germplasm based on UPGMA dendrogram. Each of the main cluster was further subdivided into two sub-clusters. Bhadragoudar and Patil (2011) reported 14 different clusters in 45 genotypes of Capsicum by using 3 RAPD primers whereas Bahurupe *et al.* (2013) reported two major clusters in chilli genotypes. The similar results were also reported by Uddin *et al.* (2012), Akbar *et al.* (2010), Knapp *et al.* (2014) and Dhaliwal *et al.* (2014), Patel Avni *et al.* (2011) and Kumar *et al.* (2014).

CHAPTER V

SUMMARY AND CONCLUSION

Chilli is a popular spice cum vegetable crop grown in various states of the country. In Konkan region of Maharashtra especially in southern part, the commercial cultivation has limitations. However, various local genotypes are cultivated here during *kharif* as well as *rabi* season. These types are acclimatized to the climatic conditions of the region and are preferred in the market for their specific taste, colour and pungency. For conservation and characterization of these chilli types, a systematic study was planned and undertaken entitled “Evaluation of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters and their characterization through molecular markers” was conducted during 2018 to 2020 at College of Horticulture, Dapoli with following experiments.

1. Performance of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters under Konkan conditions and their stability.
2. Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers.

The results of above experiment are summarized below.

Experiment 1 : Performance of local chilli (*Capsicum annuum* L.) genotypes for morphological, flowering and yield attributing characters under Konkan conditions and their stability

Twenty eight local chilli genotypes along with Arka Lohit and Konkan Kirti were tested for various quantitative and qualitative morphological characters during four successive seasons *i.e.*, *kharif* and *rabi* during 2018-19 and 2019-20. Significant difference in plant height was registered at 30, 60, 90 and 120 DAP. The highest plant height was recorded in Arka Lohit at all growth stages whereas the maximum

number of branches were observed in Konkan Kirti. At 120 DAP, the highest canopy width was registered in DPL-CA-20 (56.26 cm) and was at par with many other genotypes.

Days to commencement of flowering also varied significantly and earliest commencement of flowering (42.81 DAP) and 50 percent flowering (45.71 DAP) was observed in DPL-CA-1 whereas DPL-CA-30 (Konkan Kirti) noted the delayed commencement of flowering (54.90 DAP). As well as fifty percent flowering (57.72 DAP). Minimum days to fruiting was recorded in DPL-CA-1 and proved the earliest among all the genotypes which was at par with DPL-CA-7. The number of days for fruiting was highest (70.12) in DPL-CA-30 (Konkan Kirti). The highest percent fruit set (59.02 %) was exhibited by DPL-CA-14 and was significantly superior over all other genotypes under study. The fruit set percentage was lowest in DPL-CA-3 (40.54 %). Days for attaining horticulture maturity from anthesis also differed significantly and which were minimum in DPL-CA-9 (15.34 days) but at par with nine other genotypes. The highest number of days (17.23) were noted in DPL-CA-19. The genotype DPL-CA-16 took minimum days (29.03) for physiological maturity but was at par with twelve other genotypes under study. DPL-CA-25 registered maximum days (34.59) for physiological maturity after anthesis. Genotype DPL-CA-13 (257.17) topped the list by producing maximum flowers per plant; the genotypes DPL-CA-6 and DPL-CA-17 were at par with it. Highest fruit bearing period was observed in DPL-CA-12 (56.33 days) but was at par with 14 other genotypes whereas the minimum fruit bearing period was exhibited by DPL-CA-30 (48.21 days).

Fruit length and fruit breadth also varied significantly. Highest fruit breadth was seen in DPL-CA-14 (20.85 mm) which was significantly superior over other genotypes whereas DPL-CA-29 noted minimum fruit breadth (8.27 mm) and was statistically at par with DPL-CA-30 (Konkan Kirti). The genotype DPL-CA-29 (Arka Lohit) recorded highest fruit length (6.61 cm) whereas shortest length of fruit (2.80 cm) was found in DPL-CA-1. The significant variation was also observed in various quality

parameters *viz.* capsaicin, ascorbic acid and β -carotene. The highest capsaicin was seen in DPL-CA-27 (0.970 %) and was significantly superior over all other genotypes. The lowest capsaicin content (0.409 %) was noted in DPL-CA-1 and was at par with DPL-CA-3, DPL-CA-9, DPL-CA-14 and DPL-CA-30 (Konkan Kirti). The genotype DPL-CA-14 (186.39 mg/100g) was significantly superior for ascorbic acid content whereas the lowest ascorbic acid was noticed in DPL-CA-10 (108.87 mg/100g) and was at par with DPL-CA-1, DPL-CA-19, DPL-CA-20 and DPL-CA-21. Highest β -carotene (472.73 μ g/100 g) was noted in DPL-CA-30 (Konkan Kirti) and was significantly superior over all other genotypes. The lowest β -carotene content (342.79 μ g/100 g) was observed in DPL-CA-1 and was at par with six other genotypes. The highest pedicel length (3.11 cm) was noted in DPL-CA-29 (Arka Lohit) and was at par with DPL-CA-3, DPL-CA-7 and DPL-CA-28 whereas it was lowest in DPL-CA-1 (2.20 cm).

In yield attributing character, fruit weight exhibited significant variation and maximum fruit weight was registered in DPL-CA-14 (5.48 g) whereas it was minimum in DPL-CA-21 (1.58 g) and it was at par with DPL-CA-26. The highest 100 seed weight was seen in DPL-CA-23 (618.81 mg) and was significantly superior over other genotypes whereas the minimum 100 seed weight was recorded in DPL-CA-24 (383.23 mg). The highest fresh to dry fruit ratio was found in DPL-CA-14 (0.214 %) which was at par with DPL-CA-4, DPL-CA-17 and DPL-CA-24 whereas the lowest fresh to dry fruit ratio was registered in DPL-CA-22 (0.177 %) which was at par with seven other chilli genotypes including Konkan Kirti. Wider and significant variation for number of fruits per plant was observed. The genotype DPL-CA-13 (116.17) had the highest number of fruits per plant and was at par with five other genotypes including Arka Lohit whereas the lowest number of fruits per plant were obtained in DPL-CA-14 (63.67) which was at par with seven other genotypes. The yield per plant varied significantly indicating large variation in yield potential of various genotypes. DPL-CA-8 (384.35 g/plant) registered

highest yield per plant which was at par with DPL-CA-14 (369.15 g/plant). DPL-CA-1 (124.71g/plant) produced lowest yield per plant. Among the various genotypes tested during the investigation, DPL-CA-8 (18.7 t/ha) was the highest yielder and was significantly superior over all other genotypes. The genotype DPL-CA-26 had the lowest yield (6.34 t/ha) and was at par with DPL-CA-1.

Among various qualitative characters, nodal anthocyanin was green in seven genotypes, light purple in fourteen genotypes and dark purple in nine genotypes. The stem shape of all the genotypes was cylindrical and none of the genotype registered angled or flattened stem shape. The stem pubescence was sparse in twenty one genotypes whereas it was intermediate in nine genotypes. The branching habit in twenty one genotypes was intermediate, in eight genotypes it was dense and in two genotypes it was sparse. Eight genotypes were light green, five possessed dark green whereas remaining seventeen exhibited green leaf colour. Leaf shape of thirteen genotypes was ovate whereas all remaining genotypes were having lanceolate leaves. In flower position, nine recorded pendant, three had erect and remaining eighteen exhibited intermediate flower position. Only one genotype (DPL-CA-23) recorded three flowers per axil whereas seven genotypes produced two flowers per axil and remaining genotypes exhibited only one flower per axil. DPL-CA-6 and DPL-CA-9 produced flowers with light yellow colour and all remaining genotypes produced white coloured flowers. Ten genotypes produced flowers with rotate shaped corolla whereas all other genotypes exhibited campanulate shaped corolla. Eight genotypes produced blue colour anthers whereas remaining twenty two genotypes exhibited pale blue colour. Filament colour was either yellow or white. Only four genotypes depicted yellow colour filament whereas all other genotypes were having white coloured filament. Six genotypes depicted entire calyx margin, twenty two genotypes were having intermediate calyx margin

whereas calyx margin of only two genotypes was dentate. Calyx angular constriction was absent in eleven genotypes whereas it was present in remaining nineteen genotypes. Among various fruit characters neck at base of fruit was present in fourteen genotypes and it was absent in remaining sixteen genotypes. Fourteen genotypes produced fruit with triangular shape whereas sixteen genotypes including both check varieties *i.e.*, Konkan Kirti and Arka Lohit registered elongated fruit shape. Fruit shape at pedicel attachment was either cordate, truncate or obtuse. Among thirty genotypes, only one was cordate, in thirteen it was obtuse and remaining were having truncate shape at fruit attachment. The fruit shapes at blossom end recorded variation and thirteen genotypes noted blunt shape at blossom end whereas remaining seventeen genotypes had pointed shape at blossom end. The fruits of six genotypes were pale green in colour, nine genotypes produced dark green fruits whereas fruit colour was green in remaining fifteen genotypes. At physiological maturity, DPL-CA-8 developed pale orange colour, six genotypes developed light red colour, seven genotypes were red and all other genotypes recorded orange colour at physiological maturity.

The ranking of genotypes revealed that the genotype DPL-CA-8, DPL-CA-4 and DPL-CA-14 secured higher ranking based on their performance for important growth and yield attributing characters. The genotypes DPL-CA-25 and DPL-CA-9 also showed promise with respect to characters under consideration and can be studied further.

The analysis of variance revealed highly significant difference in mean square due to genotype and environment for all the characters under study except fruit weight, fruit length and capsaicin content. The mean squares due to environment + variety x environment was also highly significant except fruit weight, fruit length and capsaicin content whereas the mean square due to environment (linear) was highly

significant for days to commencement of flowering and yield per plant and it was significant for days to fifty percent flowering, number of fruits per plant, ascorbic acid content and 100 seed weight. The mean squares due to pooled deviation was highly significant for days to commencement of flowering, days to fifty percent flowering, number of fruits per plant, ascorbic acid content and 100 seed weight.

In stability performance, DPL-CA-3, DPL-CA-4, DPL-CA-14, DPL-CA-18 and DPL-CA-22 exhibited better adaptability for days to commencement of flowering. The genotypes DPL-CA-9, DPL-CA-10 and DPL-CA-25 exhibited high stability for days to fifty percent flowering. The genotypes DPL-CA-9, DPL-CA-11, DPL-CA-14, DPL-CA-16, DPL-CA-25 and DPL-CA-27 recorded average response and found suitable for cultivation in favourable environment for fruit weight whereas the genotypes DPL-CA-8, DPL-CA-10, DPL-CA-19 and DPL-CA-24 were found suitable for cultivation under adverse environmental conditions for fruit weight. All the genotypes were found stable for number of fruits per plant. Genotype DPL-CA-8 noted highest mean yield per plant and performed better under adverse climatic conditions. Similarly, the genotypes DPL-CA-4, DPL-CA-9, DPL-CA-18, DPL-CA-23, DPL-CA-25 and DPL-CA-28 were also suitable for better performance under poor growing conditions whereas DPL-CA-2, DPL-CA-10, DPL-CA-14, DPL-CA-16 and DPL-CA-17 were proved better for congenial climatic conditions. The genotype DPL-CA-5 was found better for cultivation in ideal climate for yield per hectare whereas genotype DPL-CA-2, DPL-CA-13, DPL-CA-14, DPL-CA-18, DPL-CA-22 and DPL-CA-25 reported unpredictable performance for yield per hectare. The best five genotypes for capsaicin content under favourable climate were DPL-CA-6, DPL-CA-8, DPL-CA-10, DPL-CA-19 and DPL-CA-24. Most of the genotypes except DPL-CA-13 and DPL-CA-22 indicated stability for ascorbic acid content over different environments. The genotypes DPL-CA-11, DPL-CA-4, DPL-CA-16 and DPL-CA-26 were found to be most stable across the various environments for number of seeds per fruit.

Experiment 2 : Establishment of genotype profiles and analysis of genetic diversity in chilli using molecular markers

The molecular analysis of thirty chilli genotypes was done during present investigation. The DNA of these genotypes were extracted following the protocol of Doyle and Doyle (1990). After purification of DNA, purified DNA was used for amplification with ISSR primers. The amplified products were then separated by using agarose gel electrophoresis and the gel was photographed under gel documentation system (UV transilluminator).

The standardization of buffer constituents for isolation of DNA depicted optimum resulted at 0.900 g glucose, 0.100 g PVP, 0.40 g sodium bisulphite and 0.050 g sodium lauryl sulphate and 500 µl sarcosyl. 200 mg sample size helped in reducing the mucilage content. The use of buffer volume @ 0.5 ml per sample and twice volume of isopropanol helped in obtaining good quality DNA. The clear banding pattern was observed with 2 µl of DNA which provided 40 – 50 ng of template DNA. Slight modification in PCR parameters like PCR master mixture and thermo profile recorded clear and specific banding pattern. Out of 21 ISSR primers tried ten ISSR primers were used for further analysis. In total, 591 scorable DNA fragments were amplified and all were polymorphic. The widest range of amplification was observed in primer UBC-845 (0.353-3.0 Kb) which was followed by UBC-818 (0.347-2.703 Kb). The polymorphic information content (PIC) value ranged from 0.52 (UBC-884) to 0.86 (UBC-834).

The similarity matrices based on Jaccard's similarity coefficient was in the range of 0 - 0.556. The dendrogram constructed by using UPGMA separated the genotypes under study in two main clusters and each cluster was further divided into two sub-clusters.

Conclusion

During present investigation, thirty chilli genotypes were evaluated for their morphological characters, stability across various seasons as well as molecular diversity. It was observed that wide variability existed among different chilli genotypes. Based on ranking in various yield and yield attributing characters as well as chemical parameters *viz.* days to fifty per cent flowering, fruit length, fruit breadth, capsaicin content, ascorbic acid and β -carotene content, fruit weight, number of fruits per plant, yield per plant and yield per hectare ; it was concluded that the genotype DPL-CA-8 was found to be most promising genotype. It recorded highest yield as well as better ranks for fruit length, fruit breadth and fruit weight. Similarly, the genotypes DPL-CA-4, DPL-CA-14, DPL-CA-25, DPL-CA-9 and DPL-CA-23 also recorded better performance during the investigation as compared to other genotypes.

In stability analysis, the genotype DPL-CA-8 registered maximum mean yield per plant and indicated that this genotype has ability to perform better even under adverse climatic conditions. The other promising genotypes *viz.* DPL-CA-4, DPL-CA-9, DPL-CA-18, DPL-CA-23 and DPL-CA-25 also exhibited ability to perform better under poor environments whereas the promising genotype DPL-CA-14 was found to be better under congenial climatic conditions. Among the various promising genotypes DPL-CA-4, DPL-CA-8, DPL-CA-9 and DPL-CA-14 produced *gundu* (fat) type fruits and are suitable for preparation of various value-added products.

The study indicated that ISSR primers are suitable for molecular analysis of various chilli genotypes and revealed 100 percent polymorphism. The results also indicated the efficacy of ISSR primers in investigating the genetic variation at molecular level and it quite important for detecting the distinctness of the elite genotypes for their commercialization in future.

The results of the present studies are based on two years experimentation. The further studies for advanced evaluation of the superior genotypes *viz.* DPL-CA-4, DPL-CA-8, DPL-CA-9, DPL-CA-14, DPL-CA-23 and DPL-CA-25 for two more years, at various locations in Konkan region and across different seasons will help in recommending the superior genotype/genotypes for commercial cultivation under Konkan agro-climatic conditions.

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Appendix I

Weekly weather data during the period of study

1. June 2018 to May 2019

Period	MW	Tmax.	Tmin.	RH-I	RH-II	Wind speed	Rainfal 1	RD	BSS	Epan
		(°C)	(°C)	(%)	(%)	(Kmph)	(mm)	(day)	(hrs.)	(mm)
28.05 - 03.06	22	33.9	25.4	89	76	6.5	10.2	1	6.8	5.2
04.06 - 10.06	23	32.2	23.6	95	89	4.2	135.2	5	4.2	2.4
11.06 - 17.06	24	31.2	24.5	97	90	7.3	96.6	4	2.6	3.3
18.06 - 24.06	25	28.4	22.4	96	96	5.1	642.8	6	0.7	2.8
25.06 - 01.07	26	28.4	23.1	96	95	6.8	205.9	7	0.1	2.1
02.07 - 08.07	27	28.1	22.9	98	96	7.9	545.4	7	1.3	1.8
09.07 - 15.07	28	27.7	23.6	99	95	9.9	316.9	7	0.0	1.9
16.07 - 22.07	29	27.7	23.7	98	95	11.1	203.4	7	0.4	2.5
23.07 - 29.07	30	28.0	24.2	94	94	9.6	33.2	6	0.2	2.8
30.07 - 05.08	31	28.3	24.1	93	90	8.5	100.6	6	0.6	2.5
06.08 - 12.08	32	28.1	23.9	96	90	8.5	92.0	7	0.9	2.1
13.08 - 19.08	33	26.7	23.1	97	94	5.5	194.4	7	0.0	2.2
20.08 - 26.08	34	27.1	22.8	96	92	2.6	205.6	7	1.0	2.4
27.08 - 02.09	35	28.0	22.6	92	92	2.4	129.8	7	1.5	3.1
03.09 - 09.09	36	28.3	22.0	91	85	4.6	52.2	6	3.8	3.1
10.09 - 16.09	37	29.5	20.8	87	81	1.8	0.0	0	8.0	4.4
17.09 - 23.09	38	29.8	22.1	89	79	2.2	49.2	2	3.6	3.3
24.09 - 30.09	39	31.1	22.5	93	77	1.8	15.4	2	5.2	3.7
01.10 - 07.10	40	34.1	21.7	91	64	1.4	28.2	3	5.1	4.2
08.10 - 14.10	41	33.2	22.5	90	73	0.9	0.0	0	5.8	4.5
15.10 - 21.10	42	33.4	21.0	90	69	0.5	8.8	1	6.3	4.4
22.10 - 28.10	43	33.9	19.5	89	60	0.5	0.0	0	7.9	4.7
29.10 - 04.11	44	33.6	17.0	86	60	0.9	0.0	0	8.9	4.5
05.11 - 11.11	45	34.6	19.6	85	68	0.6	0.0	0	8.7	4.7
12.11 - 18.11	46	34.6	15.2	90	65	0.6	0.0	0	8.9	4.6
19.11 - 25.11	47	33.5	18.4	88	65	0.8	0.0	0	7.2	4.5
26.11 - 02.12	48	33.2	14.0	90	66.1	0.9	0.0	0	8.4	4.8
03.12 - 09.12	49	33.1	15.7	91	66	1.0	0.0	0	6.1	4.0
10.12 - 16.12	50	31.4	13.2	84	63	1.8	0.0	0	6.7	3.8
17.12 - 23.12	51	26.6	12.0	88	65	1.2	0.0	0	7.0	3.9
24.12 - 31.12	52	31.8	11.9	88	66	0.8	0.0	0	8.5	4.5
01.01 - 07.01	1	32.6	10.1	90	61	0.2	0.0	0	8.8	4.3
08.01 - 14.01	2	32.0	10.6	86	60	0.2	0.0	0	8.5	4.1
15.01 - 21.01	3	33.8	13.4	89	58	3.0	0.0	0	8.0	4.0
22.01 - 28.01	4	29.2	11.5	89	59	3.0	0.0	0	8.4	3.8
29.01 - 04.02	5	31.4	13.3	90	61	3.8	0.0	0	8.2	4.3
05.02 - 11.02	6	30.5	10.8	88	62	4.5	0.0	0	8.8	4.8

Period	MW	Tmax.	Tmin.	RH-I	RH-II	Wind speed	Rainfall	RD	BSS	Epan
		(°C)	(°C)	(%)	(%)	(Kmph)	(mm)	(day)	(hrs.)	(mm)
19.02 - 25.02	8	32.6	14.9	89	60	3.8	0.0	0	8.5	5.9
26.02 - 04.03	9	31.2	12.7	90	65	4.6	0.0	0	8.8	6.1
05.03 - 11.03	10	31.0	14.0	90	64	4.7	0.0	0	7.0	5.8
12.03 - 18.03	11	32.4	14.5	85	56	4.8	0.0	0	7.6	5.7
19.03 - 25.03	12	33.0	14.6	89	52	4.4	0.0	0	7.6	6.4
26.03 - 01.04	13	34.6	20.5	88	64	4.7	0.0	0	7.3	6.3
02.04 - 08.04	14	33.2	20.1	89	53	5.0	0.0	0	7.2	6.6
09.04 - 15.04	15	33.7	21.7	90	52	5.7	0.0	0	7.2	6.9
16.04 - 22.04	16	33.6	19.6	90	56	5.7	0.0	0	8.4	6.8
23.04 - 29.04	17	34.9	23.4	85	65	6.0	0.0	0	7.9	6.4
30.04 - 06.05	18	33.0	21.1	85	60	5.2	0.0	0	8.0	6.7
07.05 - 13.05	19	33.5	22.5	82	60	6.2	0.0	0	8.8	6.7
14.05 - 20.05	20	33.7	21.1	81	55	6.9	0.0	0	9.3	6.8
21.05 - 27.05	21	33.9	23.7	83	56	6.5	0.0	0	9.0	6.9
28.05 - 03.06	22	34.0	23.9	81	57	6.2	0.0	0	8.6	7.2

2. June 2019 to May 2020

Period	MW	Tmax.	Tmin.	RH-I	RH-II	Wind speed	Rainfall	RD	BSS	Epan
		(°C)	(°C)	(%)	(%)	(Kmph)	(mm)	(day)	(hrs.)	(mm)
04.06 - 10.06	23	34.5	25.9	86	61	6.4	10.0	1	6.7	6.8
11.06 - 17.06	24	32.6	25.1	91	81	11.1	110.4	5	6.4	4.0
18.06 - 24.06	25	31.1	24.2	94	84	4.7	162.3	5	5.1	3.3
25.06 - 01.07	26	28.7	24.2	95	91	6.2	455.2	6	1.9	1.8
02.07 - 08.07	27	29.1	24.2	95	89	9.3	294.2	7	1.5	2.5
09.07 - 15.07	28	29.1	23.9	98	92	9.6	399.4	7	2.9	1.1
16.07 - 22.07	29	29.6	24.1	94	86	2.7	118.2	6	5.2	4.4
23.07 - 29.07	30	27.6	23.6	98	96	4.5	759.6	7	1.3	2.5
30.07 - 05.08	31	26.9	23.5	98	96	10.7	719.2	7	0.1	3.3
06.08 - 12.08	32	27.2	24.6	96	93	9.4	353.8	7	0.1	2.8
13.08 - 19.08	33	29.1	24.3	95	86	1.8	112.6	7	3.5	3.4
20.08 - 26.08	34	29.1	20.9	95	83	2.6	103.6	6	7.2	3.3
27.08 - 02.09	35	28.4	23.7	97	87	3.3	318.4	6	4.3	3.2
03.09 - 09.09	36	26.5	23.1	99	96	5.8	771.6	7	0.0	2.0
10.09 - 16.09	37	28.3	23.8	97	90	3.4	167.2	7	2.8	3.1
17.09 - 23.09	38	29.1	24.1	95	86	2.9	53.4	6	4.5	2.9
24.09 - 30.09	39	29.7	23.4	93	85	2.1	55.0	3	5.4	3.8
01.10 - 07.10	40	30.7	22.7	92	75	1.6	0.2	0	8.9	4.0
08.10 - 14.10	41	31.7	19.8	94	71	1.3	29.8	2	7.6	3.7
15.10 - 21.10	42	31.7	23.0	89	73	0.5	63.4	3	4.7	2.9
22.10 - 28.10	43	28.8	21.9	94	79	1.9	61.2	5	2.6	2.1

Period	MW	Tmax.	Tmin.	RH-I	RH-II	Wind speed	Rainfall	RD	BSS	Epan
		(oC)	(oC)	(%)	(%)	(Kmph)	(mm)	(day)	(hrs.)	(mm)
29.10 - 04.11	44	31.9	22.0	90	67	2.3	2.6	1	8.3	3.8
05.11 - 11.11	45	31.0	21.5	94	71	2.5	9.6	1	8.4	3.6
12.11 - 18.11	46	33.3	20.6	89	55	2.3	0.0	0	7.8	3.3
19.11 - 25.11	47	33.0	19.1	93	55	2.1	0.0	0	7.2	3.5
26.11 - 02.12	48	33.3	18.9	90.9	51.4	2.2	0.0	0	7.6	3.8
03.12 - 09.12	49	31.4	20.1	91	57	2.7	0.0	0	6.1	3.2
10.12 - 16.12	50	31.8	17.4	92	58	2.4	0.0	0	9.2	3.4
17.12 - 23.12	51	32.1	17.1	93	56	2.3	0.0	0	7.9	3.9
24.12 - 31.12	52	31.8	18.8	92	60	2.2	0.0	0	7.3	3.5
01.01 - 07.01	1	29.4	13.9	91	55	3.0	0.0	0	9.4	3.2
08.01 - 14.01	2	31.1	16.6	92	58	2.9	0.0	0	8.8	3.3
15.01 - 21.01	3	29.5	12.7	94	57	3.4	0.0	0	9.5	3.6
22.01 - 28.01	4	33.4	15.7	92	51	2.9	0.0	0	9.7	3.7
29.01 - 04.02	5	28.3	12.7	94	54	3.1	0.0	0	9.5	3.5
05.02 - 11.02	6	30.1	13.1	93	55	3.3	0.0	0	9.0	3.7
12.02 - 18.02	7	34.4	16.0	92	45	3.0	0.0	0	7.2	4.4
19.02 - 25.02	8	34.6	15.2	90	45	3.0	0.0	0	9.5	4.6
26.02 - 04.03	9	34.9	14.3	89	48	3.4	0.0	0	10.1	4.7
05.03 - 11.03	10	29.9	15.2	89	54	4.1	0.0	0	10.3	5.2
12.03 - 18.03	11	33.1	15.6	87	49	4.3	0.0	0	10.5	5.8
19.03 - 25.03	12	33.2	17.3	84	52	4.5	0.0	0	10.3	5.9
26.03 - 01.04	13	33.7	19.9	82	51	4.1	0.0	0	9.6	6.0
02.04 - 08.04	14	33.5	19.0	81	52	4.4	0.0	0	10.2	6.3
09.04 - 15.04	15	34.2	21.2	90	52	4.6	0.0	0	8.5	6.2
16.04 - 22.04	16	34.5	21.3	91	49	4.6	1.2	0	7.4	5.7
23.04 - 29.04	17	33.9	21.6	88	53	5.3	0.0	0	11.0	6.4
30.04 - 06.05	18	33.9	23.0	87	61	5.4	1.0	0	9.1	6.1
07.05 - 13.05	19	34.6	21.7	87	58	5.3	0.0	0	11.4	6.7
14.05 - 20.05	20	34.0	24.0	86	59	6.1	6.0	1	8.2	5.6
21.05 - 27.05	21	34.1	23.6	84	62	6.1	0.0	0	10.7	6.7
28.05 - 03.06	22	33.7	24.5	85	77	6.0	27.0	1	7.2	5.2

APPENDIX II

Abbreviations

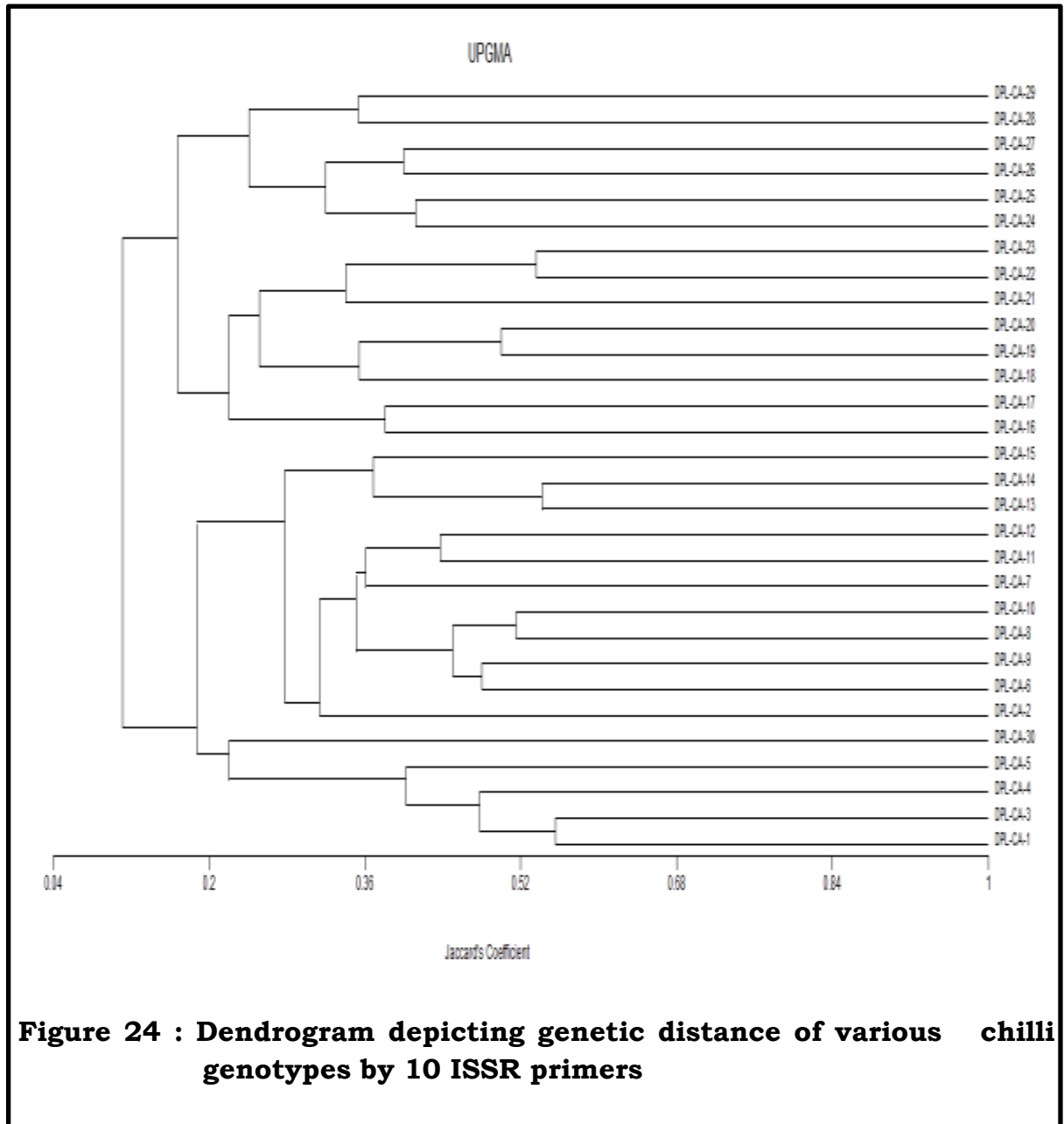
cm	:	centimeter
cm ²	:	square centimeter
C. D.	:	Critical difference
C. V.	:	Coefficient of variation
FYM	:	Farm Yard Manure
g	:	gram
DAP	:	Days after planting
ha	:	hectare
kg	:	Kilogram
l	:	litre
ml	:	milli litre
m	:	metre
mm	:	milli meter
mg	:	milli gram
MT	:	Metric tonne
ppm	:	parts per million
t/ha	:	tonnes per hectare
%	:	per cent
°C	:	degree Celsius
EC	:	Electric conductivity
<i>et al.</i>	:	and others
<i>i.e.</i>	:	that is
MSL	:	Mean sea level
pH	:	potential of hydrogen
pl	:	plant
S. E.	:	Standard error
<i>viz.</i>	:	namely
t	:	tonne
q	:	quintal
μl	:	microliter
μg	:	microgram
μM	:	micromolar

$\mu\text{g } \mu\text{l}^{-1}$:	microgram per microliter
$\mu\text{g ml}^{-1}$:	microgram per millilitre
bp	:	base pair
AFLP	:	Amplified fragment length polymorphism
DNA	:	Deoxyribose Nucleic acid
dNTPS	:	Deoxyribo Nucleotide Triphosphates
EDTA	:	Ethylene Diamine Tetra Acetic Acid
EtBr	:	Ethidium bromide
ISSR	:	Inter simple sequence repeats
Kb	:	Kilobases
M	:	molar
mM	:	millimolar
MgCl_2	:	Magnesium chloride
$\text{ng}/\mu\text{l}$:	nano gram per microlitre
nm	:	nanometer
min	:	minutes
OD	:	Optical density
PCR	:	Polymerase Chain Reaction
PIC	:	Polymorphic Information Content
PVP	:	Polyvinyl Pyrrolidone
RNA	:	Ribose nucleic acid
RNase	:	Ribonuclease enzyme
RAPD	:	Random Amplified Polymorphic DNA
sec	:	seconds
SDS	:	Sodium Dodecyl Sulphate
Tris HCl	:	Tris-Hydrochloride
UV	:	Ultra Violet
UPGMA	:	Unweighted Pair Group Method with Arithmetic Mean
UBC	:	University of British Columbia

Appendix III

Chemical properties of soil of the experimental plot

S. N.	Chemical properties	Value
1	pH	5.33
2	EC (dSm ⁻¹)	0.049
3	Nitrogen (kg/ha)	382.7
4	Phosphorus (kg/ha)	12.57
5	Potassium (kg/ha)	281.5



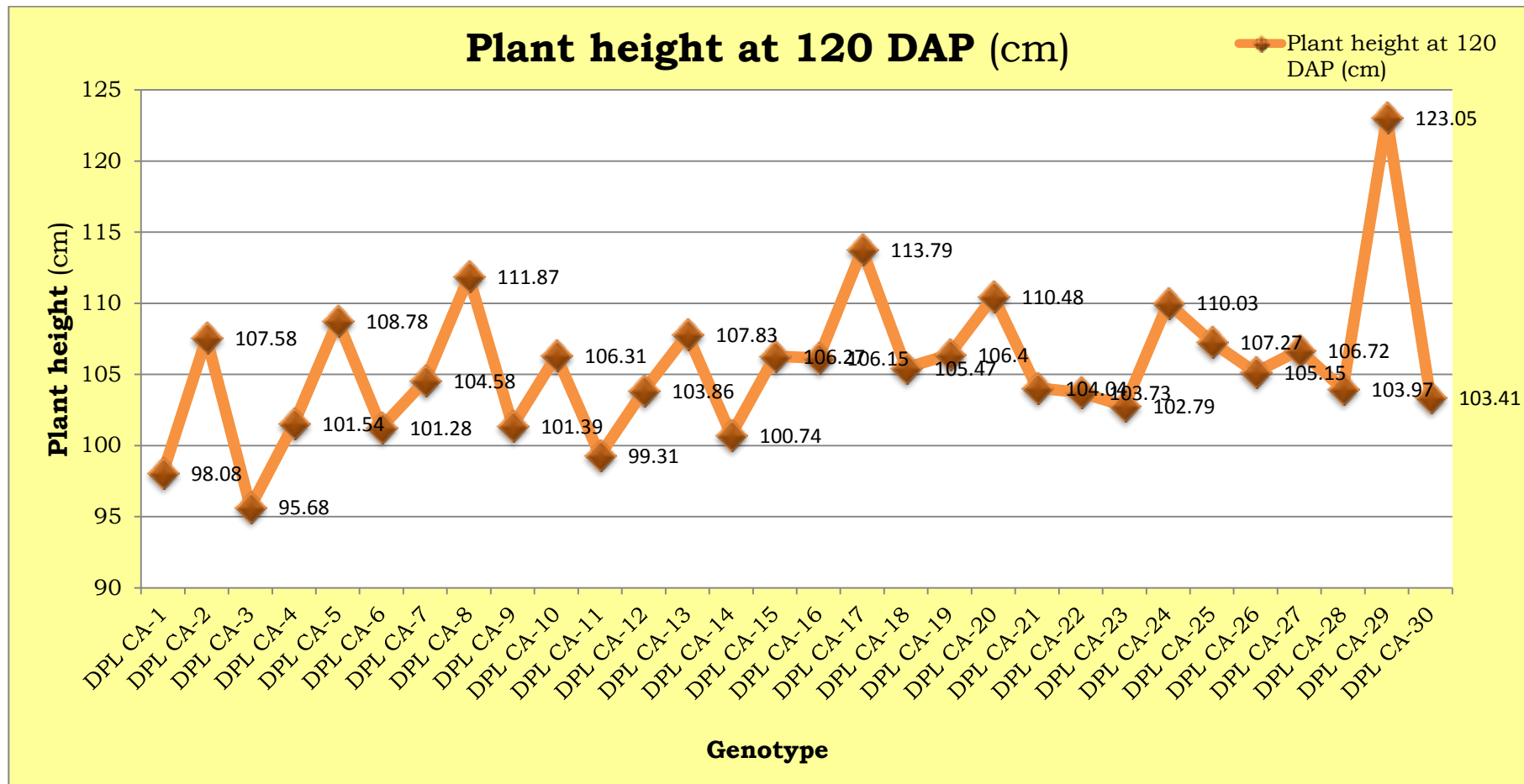


Figure 13 : Variation in plant height among chilli genotypes during *kharif* and *rabi* seasons (120 DAP)

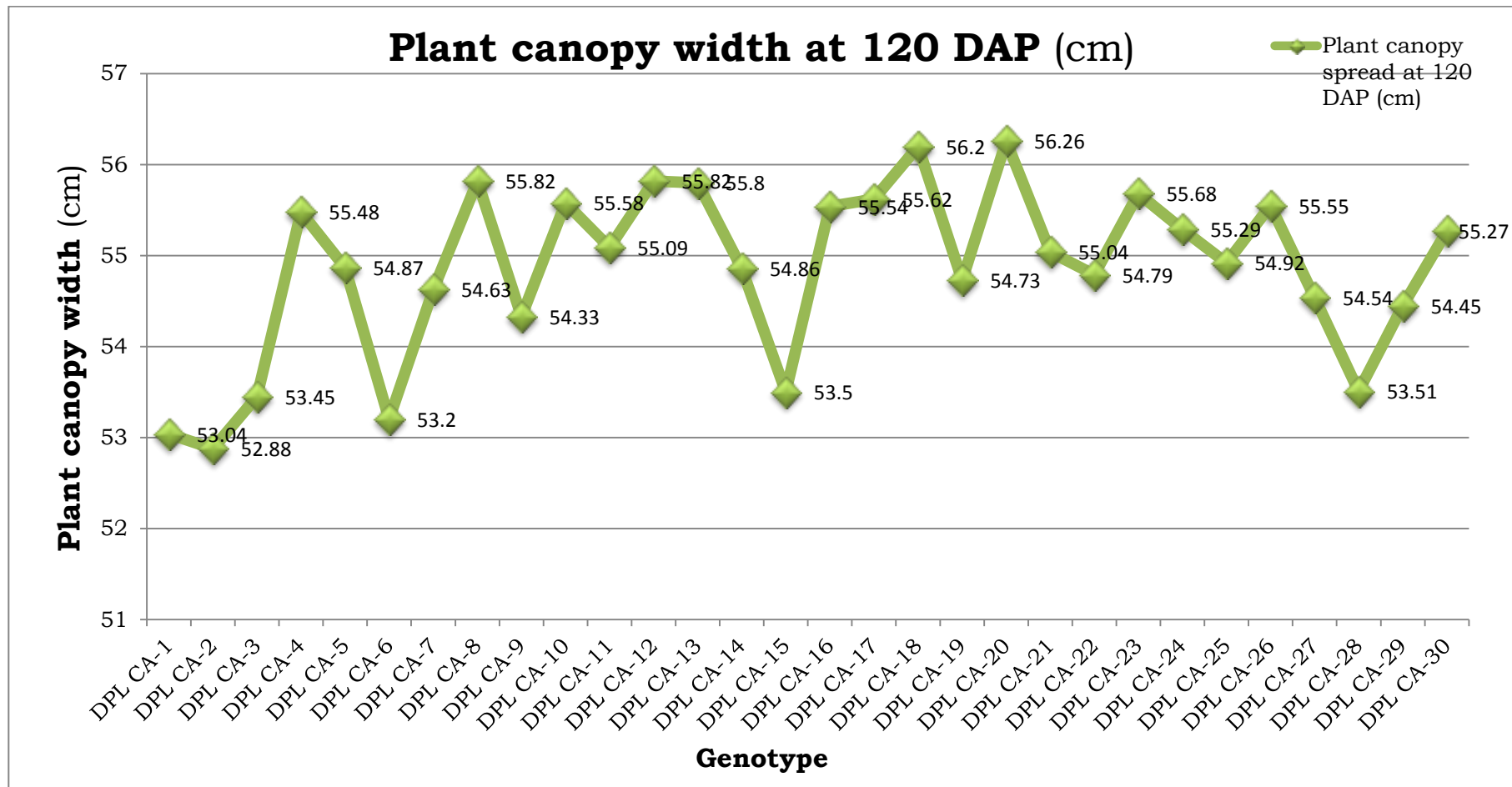


Figure 14 : Variation plant canopy width among chilli genotypes during *kharif* and *rabi* seasons (120 DAP)

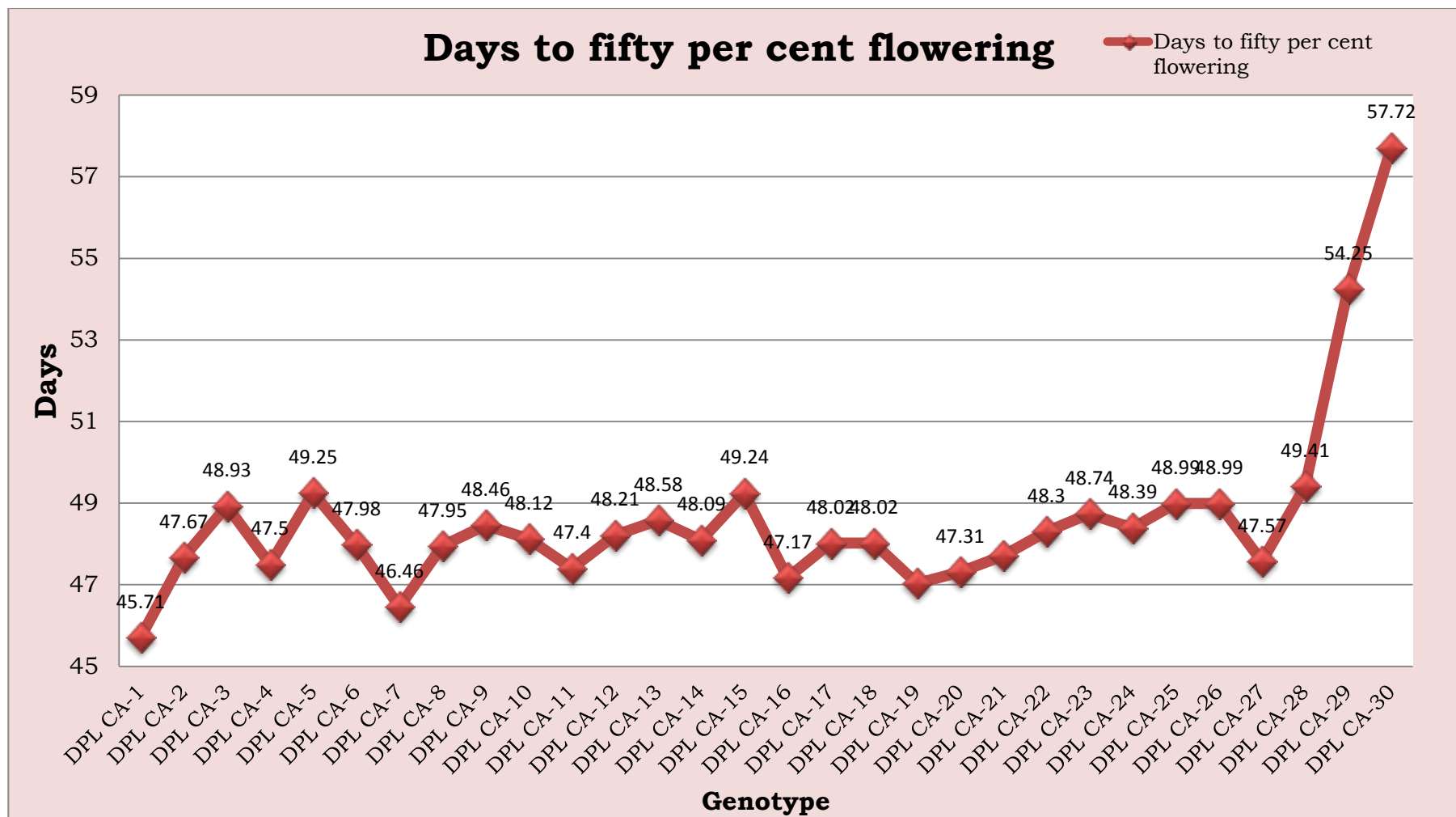


Figure 15 : Variation in days to fifty per cent flowering among chilli genotypes during *kharif* and *rabi* seasons

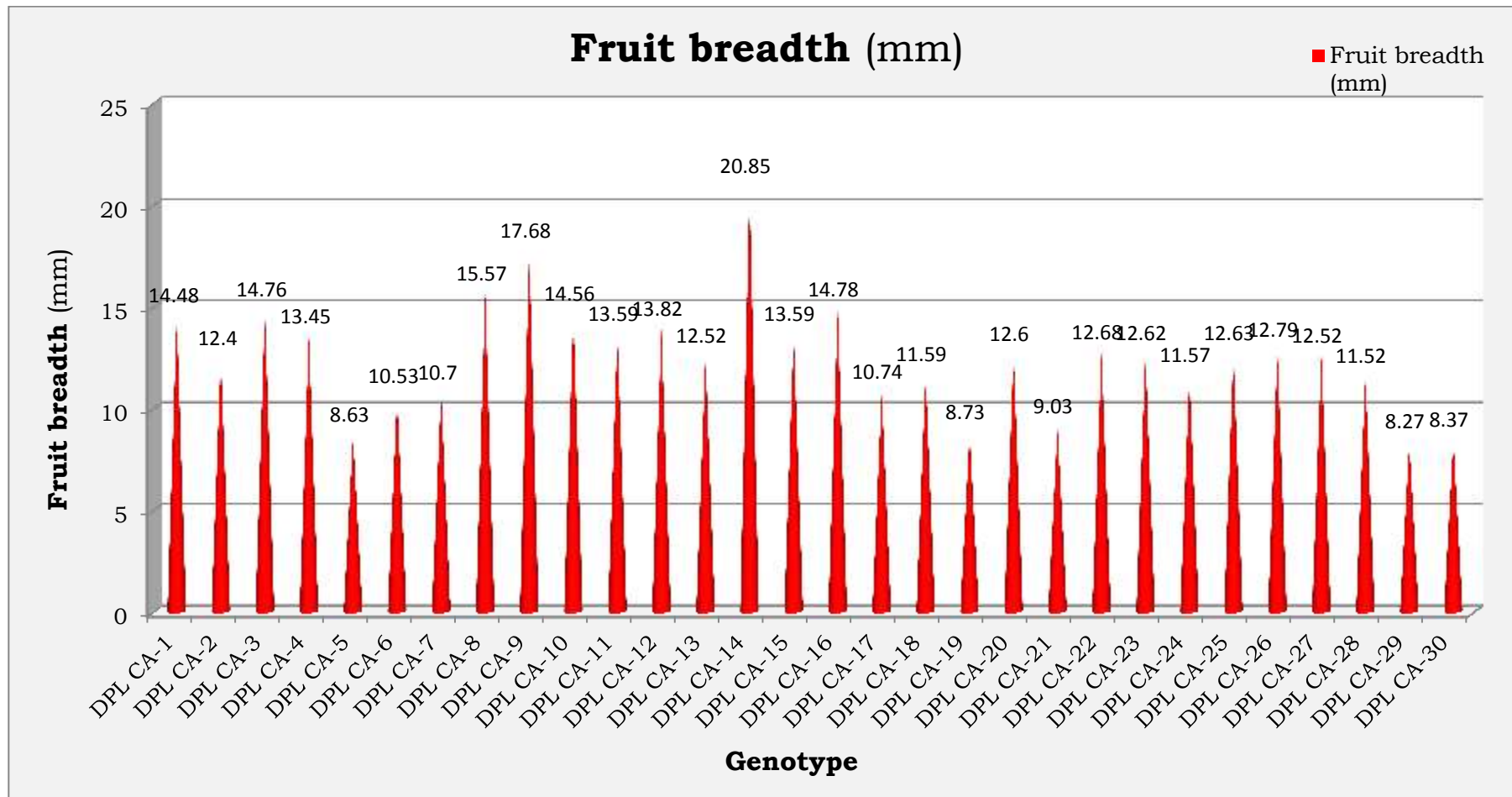


Figure 16 : Variation in fruit breadth among chilli genotypes during *kharif* and *rabi* seasons

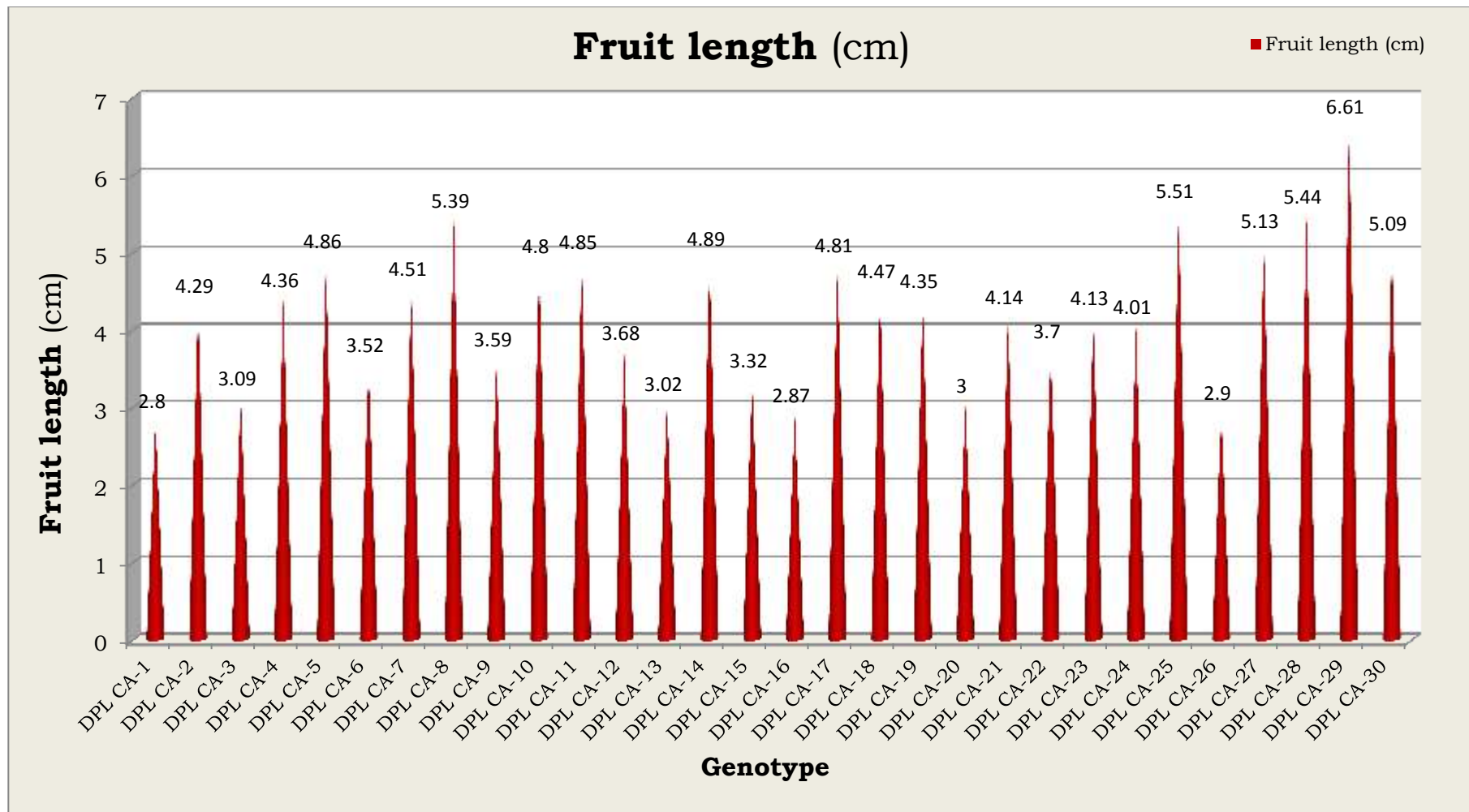


Figure 17 : Variation in fruit length among chilli genotypes during *kharif* and *rabi* seasons

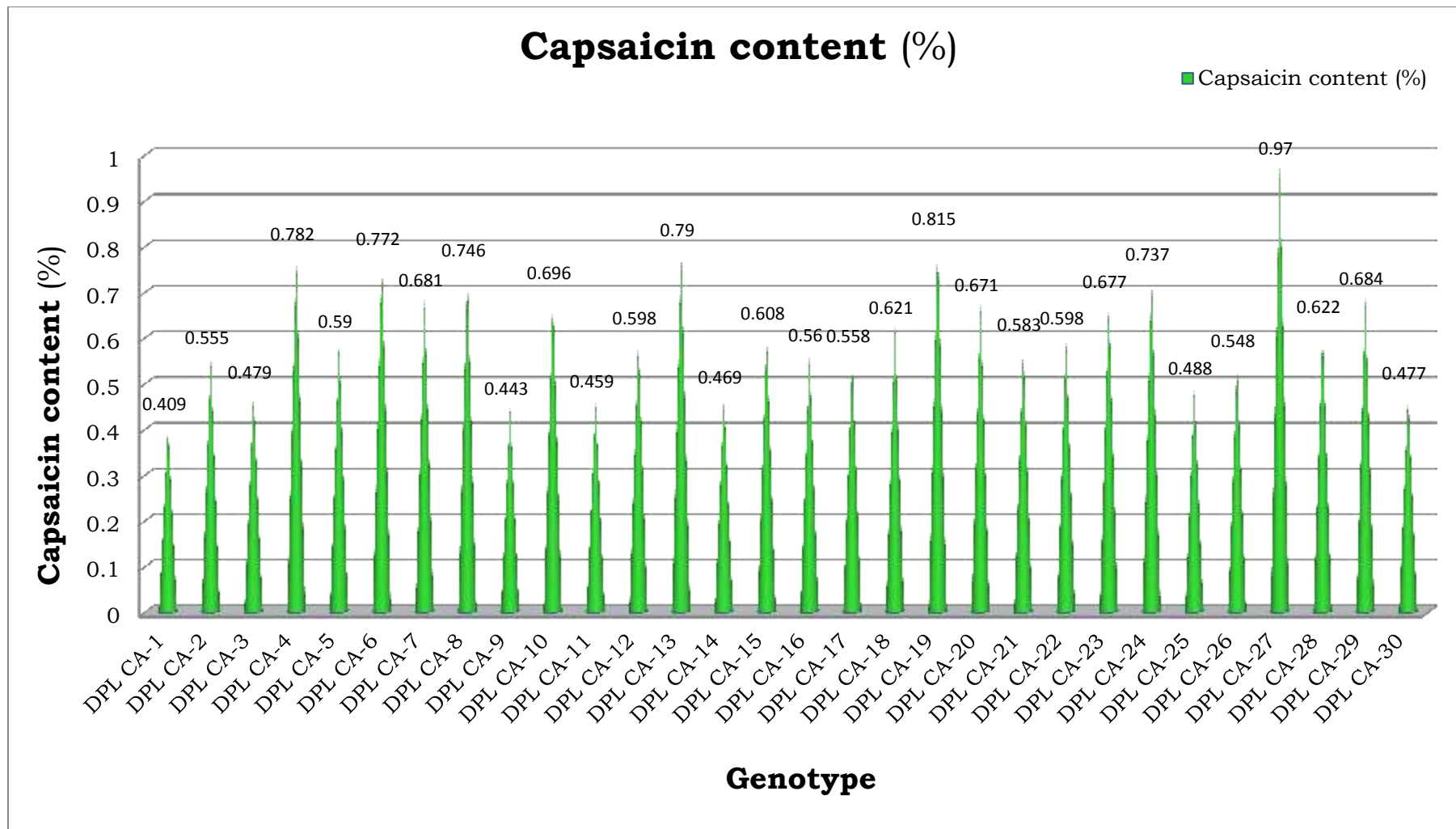


Figure 18 : Variation in capsaicin content among chilli genotypes during *kharif* and *rabi* seasons

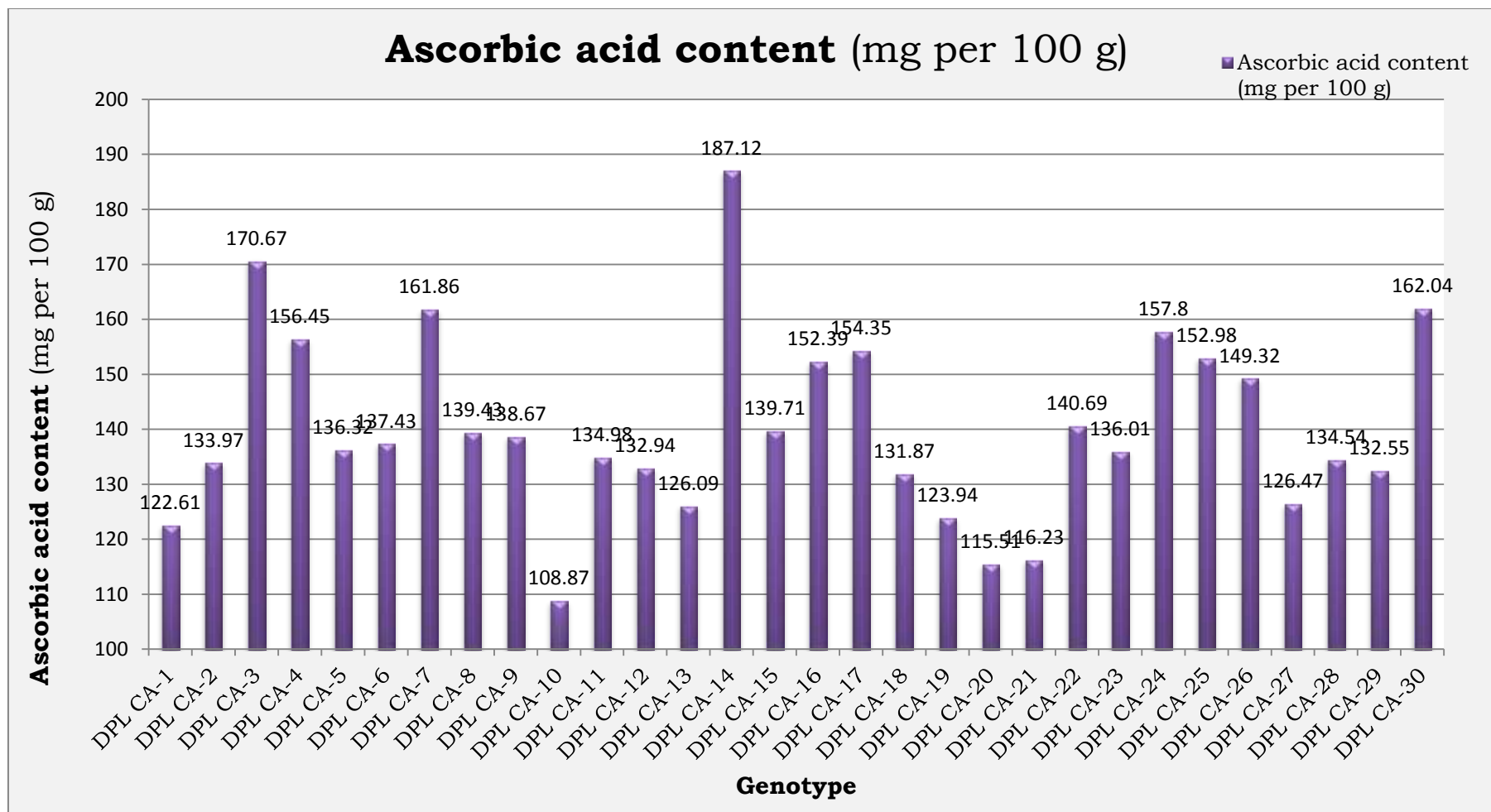


Figure 19 : Variation in ascorbic acid content (mg per 100 g) among chilli genotypes during *kharif* and *rabi* seasons

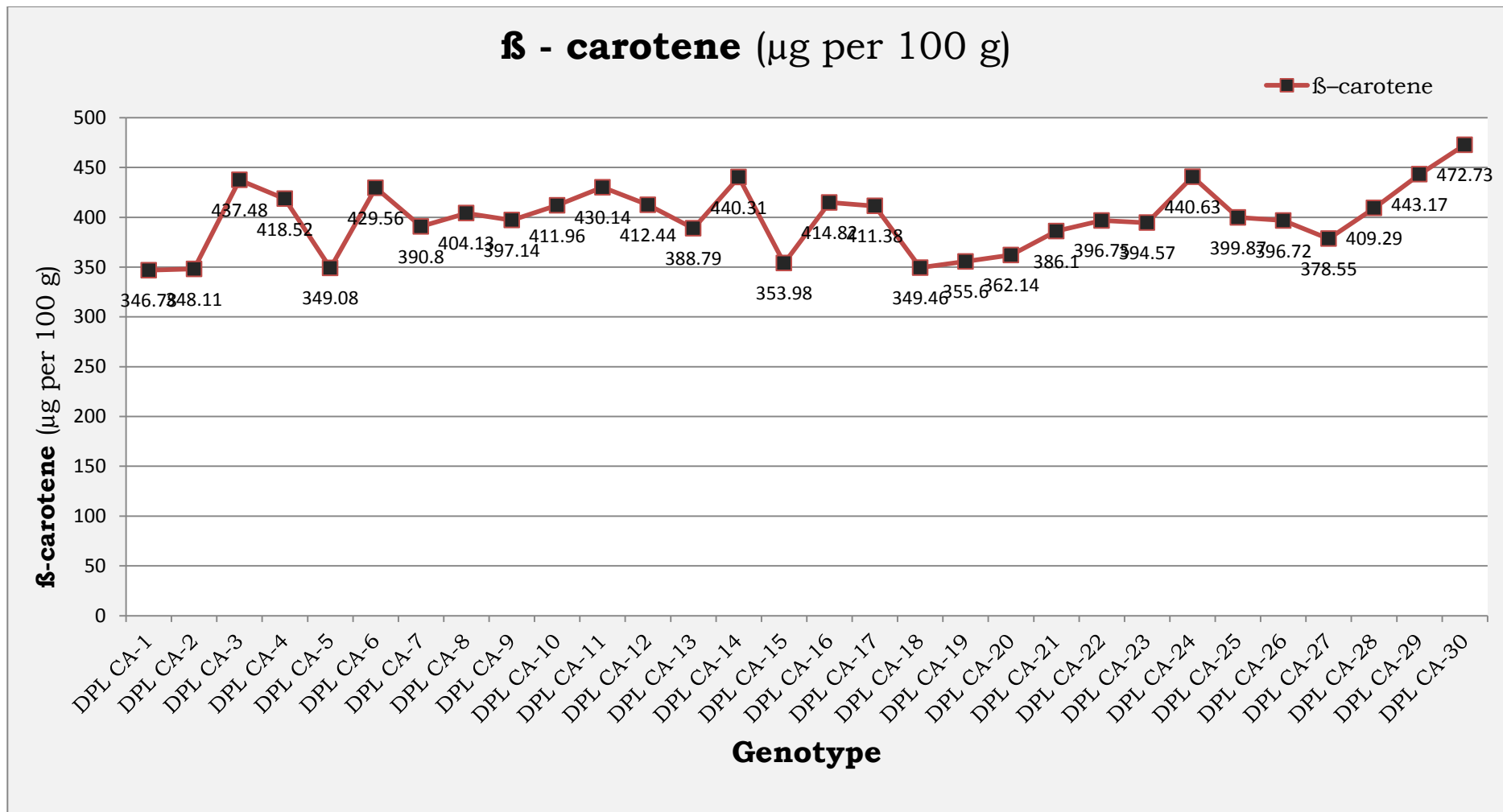


Figure 20 : Variation in β-carotene among chilli genotypes during *kharif* and *rabi* seasons

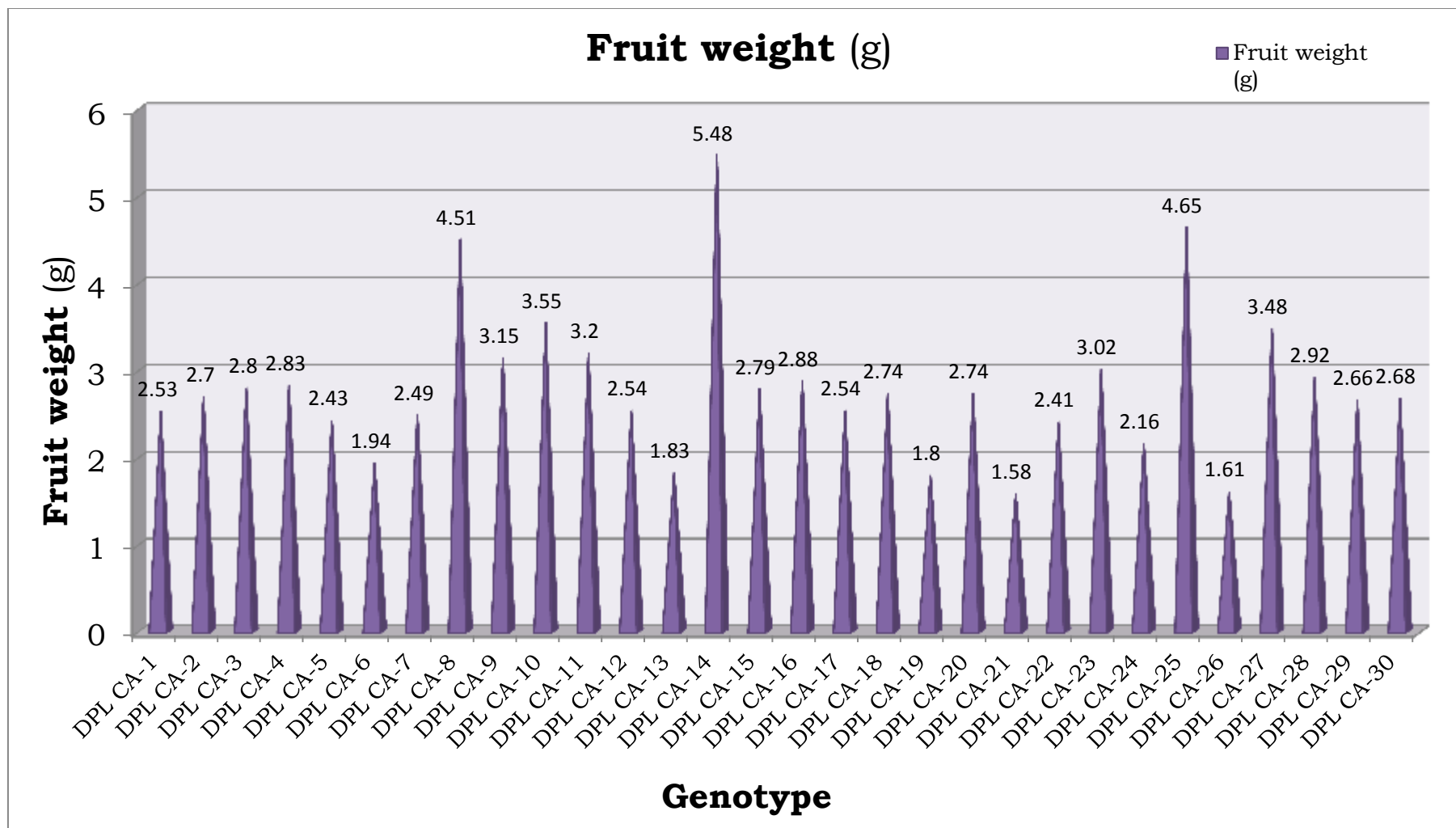


Figure 21 : Variation in fruit weight among chilli genotypes during *kharif* and *rabi* seasons

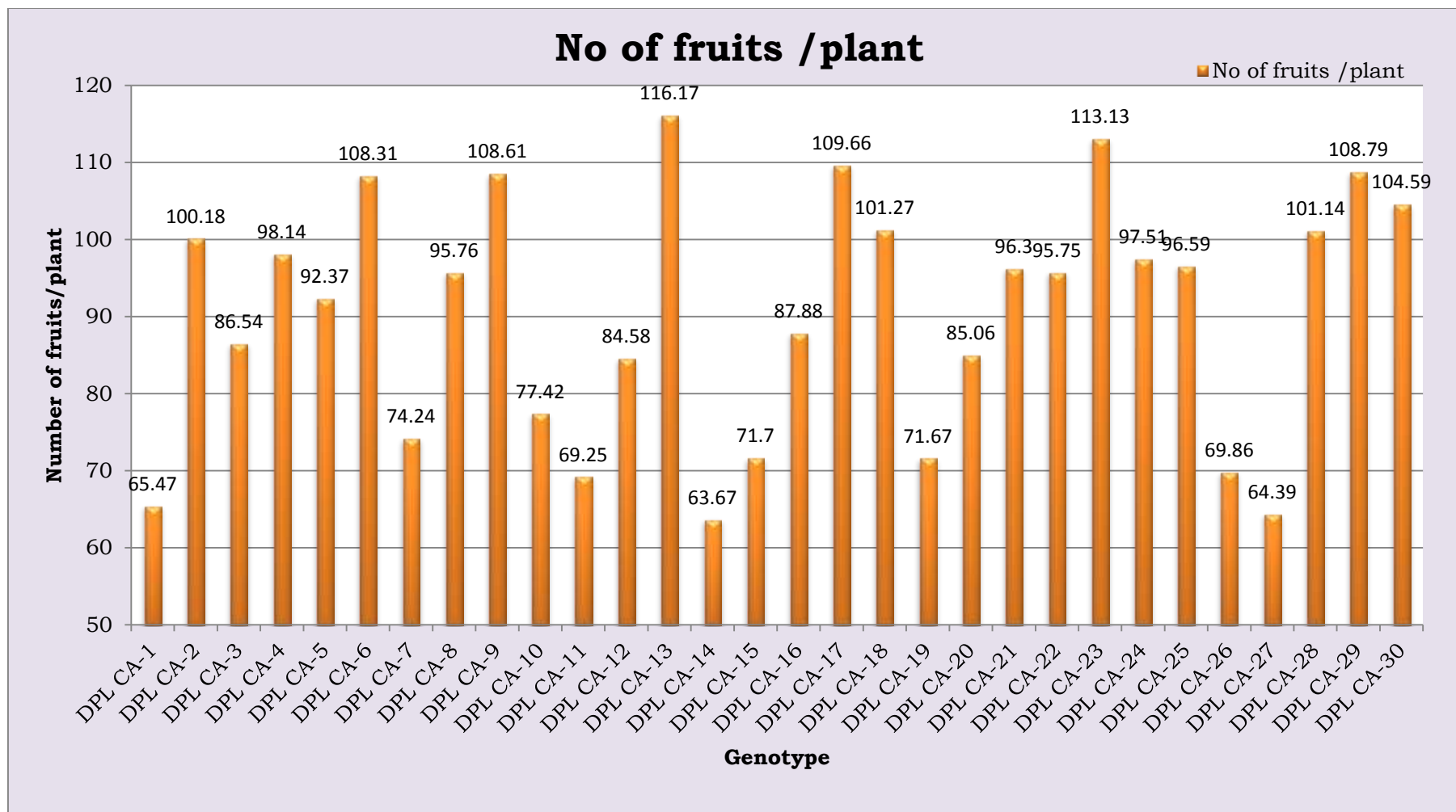


Figure 22 : Variation in number of fruits per plant among chilli genotypes during *kharif* and *rabi* seasons

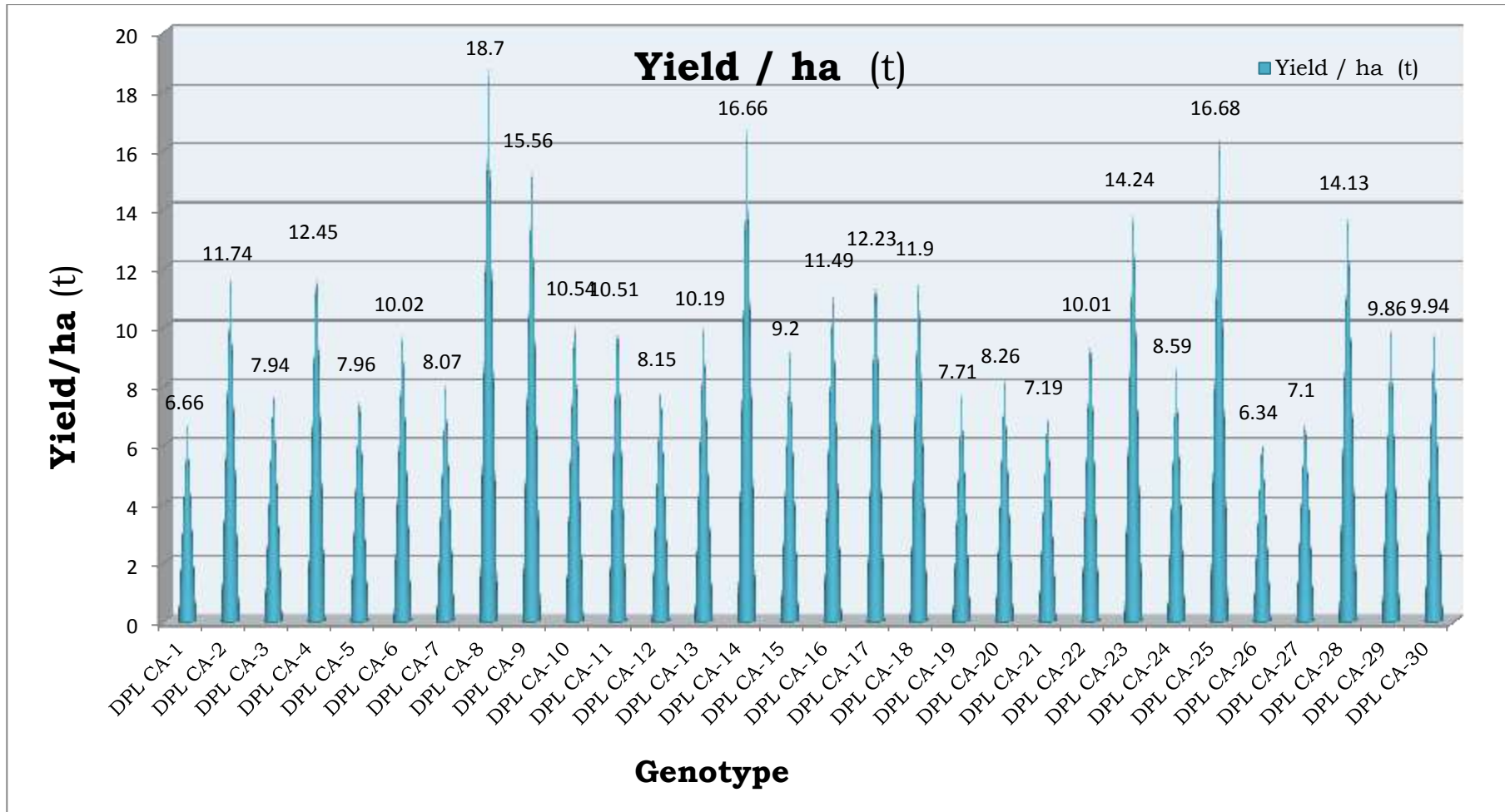


Figure 23 : Variation in yield per hectare among chilli genotypes during *kharif* and *rabi* seasons



Plate 1 : General View of the experimental plot

DPL-CA-8



DPL-CA-4

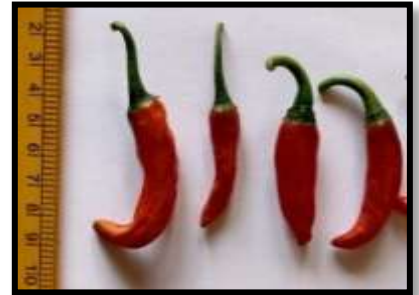


DPL-CA-14



Plate 2a : Plant type and fruits of elite genotypes

DPL-CA-25



DPL-CA-9



DPL-CA-23



Plate 2b : Plant type and fruits of elite genotypes

DPL-CA-2



Arka Lohit



Konkan Kirti



Plate 2c : Plant type and fruits of elite genotypes