

**GENETIC ANALYSIS FOR YIELD AND ITS
COMPONENT IN LONG MELON (*Cucumis melo*
var. *utilissimus*)**

Thesis

Submitted to the



**A.N.D. University of Agriculture & Technology
Ayodhya – 224229, Uttar Pradesh, India**

By

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**IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF**

**Doctor of Philosophy Horticulture
(Vegetable Science)**

July, 2025

CERTIFICATE - I

This is to certify that the thesis entitled “Genetic analysis for yield and its component in Long melon (*Cucumis melo* var. *utilissimus*).” submitted in partial fulfilment of the requirements for the degree of ‘Doctor of Philosophy (Horticulture)’ with major in Vegetable Science of the College of Horticulture & Forestry Post Graduate Studies, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya is a record of *bonafide* research work carried out by Ms. Suman Poonia, I.d. No. H-14109/22 under my supervision and that no part of this thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of investigation has been acknowledged.

Kumarganj, Ayodhya

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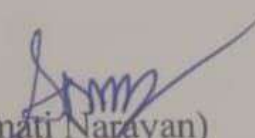
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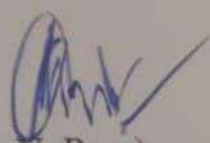
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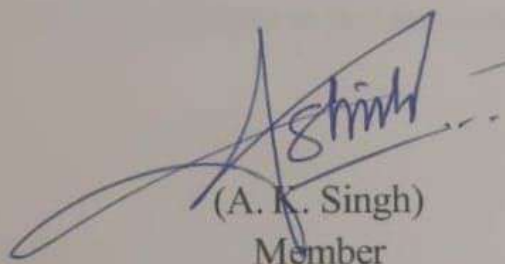
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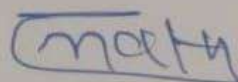
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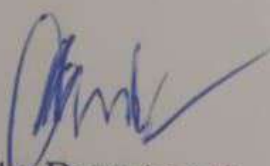
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I, Suman Poonia, I.D. No. H-14109/22 certifies that the thesis entitled "Genetic analysis for yield and its component in Long melon (*Cucumis melo* var. *utilissimus*)" submitted in partial fulfilment of the requirements for the degree of **Doctor of Philosophy (Horticulture)** with major in **Vegetable Science** to College of Horticulture & Forestry, Acharya Narendra Deva University of Agriculture and technology, Kumarganj, Ayodhya (U.P.) is original work and has similarities with published work not more than minor similarities as per the UGC (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018, adopted by the university. I Declare that I have faithfully acknowledged given credit to and referred to the research workers wherever their works have been cited in the text and body of the thesis. I further certify that I have not wilfully lifted up some others work, para, text, data, results etc. reported in the journals, books, magazines, reports, dissertations, thesis etc., or available at web-sites and included them in this thesis and cited as my own work.

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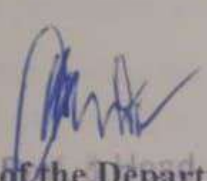
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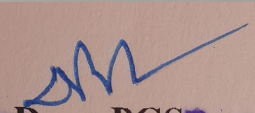
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Every beginning has an end to it but still, I believe that friends can scatter but friendship cannot. So, the time spent on the university campus will always remain in my mind.

Kumarganj, Ayodhya

15, July, 2025

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ABBREVIATIONS

<i>et al.</i>	et all (and others)
%	Percent
/	per
°C	Degree Celsius
°B	Brix
BP	Better parent
SV	Standard variety
CD	Critical difference
CV	Coefficient of variation
d.f.	Degree of freedom
F	The mean of F1 over the arrays
GA	Genetic advance
GCA	General combining ability
SCA	Specific combining ability
Kg	Kilogram
h_2	Dominant effects
h^2	Heritability
H^2	Dominance
K	Selection differential
M	Mean
Me	Error mean of square
MSR	Mean square due to replication
MST	Mean square due to treatment
MSE	Mean square due to error
R	Replication(s)
T	Treatment
RBD	Randomized block design
SE	Standard error
Sel.	Selection
SEm($\pm$)	Standard error of mean
Sp.	Species
TSS	Total soluble solids
<i>etal.</i>	And coworkers
etc.	(etcetera) and the others
Fig.	Figure
G	Gram
Ha	Hectare
<i>i.e</i>	(i.e.) that is
m ²	Square meter
Mg	milligram
Sr.No	Serial number
<i>viz.</i>	(Vide licit) namely

INTRODUCTION

India is the center of origin for many cucurbits and they constitute the largest group of summer vegetables. Among these cucumber, water melon, musk melon and bitter gourd etc. are the most widely cultivated. Melons are believed to have originated in tropical Africa, while India represents a key secondary center where evolutionary processes have led to the development of numerous cultivated and wild botanical forms. *Cucumis melo* L. is among the most diverse and highly polymorphic species in the *Cucurbitaceae* family (Danin-Poleg *et al.* 2001, Decker Walters *et al.* 2002) and it includes a large number of botanical varieties or horticultural groupings which may be a consequence of higher genetic diversity in this species (Mliki *et al.*, 2001), (Pitrat *et al.*, 2000) divided melon into 16 cultivar groups within two subspecies, *agrestis* and *melo*. Whereas, numerous systematic groups have considered the classification of *Cucumis melo* as horticultural groupings based on fruit characteristics and uses and not botanical classification based on phylogeny (Munger and Robinson, 1991; Robinson and DeckersWalters, 1997) and 6 horticultural groups *cantaloupensis* (Cantaloupe and muskmelon), *inodorous* (Winter melon), *flexuosus* (Long melon), *conomon* (Pickling melon), *dudaim* (Pomegranate melon) and *momordica* (Sanpmelon) are widely accepted. Long melon (*Cucumis melo* var. *utilissimus* Duthie & Fullar) is an under-exploited crop belonging to the *Cucurbitaceae* family are characterized by having 24 chromosomes in its diploid state ($2n=24$). It is an annual plant widely grown in the Old World tropical and subtropical regions, especially in the Mediterranean. It is popular in North India, especially in Uttar Pradesh and Punjab (Nadkarni, 2002). It is commonly known as long melon, serpent melon (English) and 'Kakri' or 'Tar' or Sara or Kachari (Hindi). The high nutrient concentration in snake melon fruits has sparked rising attention in recent years.

India occupies the second position globally in vegetable production, trailing only China, by producing about 212.55 million metric tonnes annually across 11.29 million hectares at a productivity level of 18.79 MT/ha (Anonymous, 2023). Adequate infrastructural support, good marketing potential, open seed policy, increasing demand for quality produce, development of high yielding hybrids contributed significantly towards growing popularity of vegetables. Our country has achieved notable breakthroughs in developing enhanced vegetable varieties and hybrids with superior yields and quality traits during recent decades.

Long melon is rich in water around 96% water, 1.2% protein, 4.5% carbohydrate, 0.7% fat and 2% fiber. Snake melons can also be considered as a significant source of many essential minerals, likely potassium (264 mg/100 g), phosphorus (37 mg/100 g), calcium (33 mg/100 g), magnesium (27 mg/100g) and sodium (11 mg/100g). Snake melon fruits harvested at an immature stage of ripeness offer a diverse mixture of nutrients as well as valuable bioactive secondary metabolites such as polyphenols. However, research in this area is very sparse and not complete (Ilahy *et al.*, 2020). Long melon is mostly consumed fresh and preserved as pickles for out-of-season use. Snake melons contain different carotenoid components such as lutein (165 mg/100 g) and β -carotene (144 mg/100 g) (Ilahy *et al.*, 2019). It is used as a salad and also for pickling fruits are diuretic, antihelminthic and cooling effect (Nadkarni, 2002). The seeds are small, edible and are used in confectionery. Seeds possess cooling, diuretic, antioxidant properties and are used in micronutrition, suppression of urine and have therapeutic potential. The Ayurvedic pharmacopoeia of India recommends the seeds for curing dysuria and lithiasis (Gill *et al.*, 2010).

Long melon is characterized by extensive cross-pollination and usually displays monoecious traits, needing a warm climate and strong light exposure for improved growth and development. The fruits are slender and elongated with length varying from a few inches to about 3ft. They are green and dark green, smooth or ridged, with soft downy hairs covering the skin when tender (Venkateshwarlu, 2010). It is cultivated as a summer season crop in North India. It grows well in all kinds of soil but thrives best on rich loamy soils with an ample water supply (Venkateshwarlu, 2010). The objective of all plant breeding efforts is to improve established important genotypes or generate new varieties that outperform current commercial cultivars. Developing high-producing melon varieties with superior fruit characteristics, prolonged shelf life, and elevated phytonutrient content necessitates knowledge about genetic variation for these traits in the germplasm resources designated for breeding programs. The presence of variability constitutes an essential prerequisite for breeding programs; existing natural diversity can be harnessed when sufficient, but when inadequate, variation must be generated through multiple plant breeding approaches, with hybridization continuing as the primary method for breeders.

Abundant variability improves prospects for developing new variants that could surpass current cultivars. Key genetic parameters including coefficients of variation, heritability estimates, anticipated genetic advancement, genetic diversity indices, and inter-

trait relationships are of fundamental importance in formulating suitable breeding strategies designed to exploit the natural variability within breeding populations. Creating effective and practical breeding programs demands thorough information about the nature and scope of variation existing in the breeding material (Pandey *et al.*, 2010). Parent selection stands as a pivotal element in hybridization programs and the synthesis of new genetic variants. Choosing parents solely on phenotypic merit is an unreliable strategy, since lines displaying superior traits may generate poor recombinants during segregation phases. Selection should be based on genetic assessment rather than observable characteristics alone. Information about the genetic control of various quantitative and qualitative features is extremely beneficial for breeding program formulation. As yield constitutes a complex quantitative attribute, direct selection approaches for yield may fail to produce meaningful improvement. Information regarding trait associations and the direct and indirect impacts of yield components would greatly facilitate the development of selection standards and their effective implementation in crop breeding programs. Thus, it becomes essential to separate the observed variation into genetic and environmental components through estimation of genetic parameters including genotypic and phenotypic variation coefficients, heritability, and genetic gain. Combining ability studies represent a valuable methodology that provides estimates of combining ability values and assists in identifying superior parents for subsequent breeding efforts. A thorough understanding of genetic parameters, including combining ability, heterosis, and the underlying gene action controlling the inheritance of key economic traits, is essential for selecting appropriate parental lines and devising efficient crop improvement strategies. Several biometrical mating designs have been developed to evaluate the genetic architecture of traits, among which diallel, partial diallel, and line $\times$ tester analyses are the most commonly employed. These methods enable the estimation of general and specific combining abilities and assist in deciphering the genetic control of complex traits, thereby supporting informed decision-making in breeding programmes.

Among various mating designs, the line $\times$ tester analysis proposed by Kempthorne (1957) has proven to be particularly effective in assessing genetic divergence among parental lines for quantitative traits. This design is essentially an extension of the top cross method, wherein multiple testers are used instead of a single one. In the line $\times$ tester scheme, selected lines (f) are systematically crossed with diverse, genetically broad-based testers (m), resulting in a total of $f \times m$ hybrid combinations. This design is advantageous

as it simultaneously generates both fullsib and half-sib progenies, unlike the conventional top cross which yields only half-sibs. Furthermore, it facilitates the estimation of general combining ability (GCA) of the parents and specific combining ability (SCA) of the resultant hybrids, offering valuable insights into the nature and magnitude of gene action controlling the traits under investigation (Sharma, 2006). In addition, it is used in estimating various types of gene actions important in the expression of quantitative traits (Rashid *et al.*, 2007).

Among the cucurbitaceous vegetables, long melon (*Cucumis melo* var. *utilissimus*) remains an underutilized crop that has received limited attention in systematic crop improvement programmes. Considering the above-mentioned facts, the research work entitled “**Genetic analysis for yield and its component in Long melon (*Cucumis melo* var. *utilissimus*)**” has been planned with the following objectives:

1. To work out the component of genetic variance and their ratios.
2. To estimate general and specific combining ability variances and their effects.
3. To estimate heterobeltiosis and relative heterosis.
4. To study the morphological characters of twelve genotypes and their crosses based on minimal descriptors of NBPGR.

REVIEW OF LITERATURE

The review of literature pertaining to the “**Genetic analysis for yield and its component in Long melon (*Cucumis melo* var. *utilissimus*)**” is presented under the relevant headings:

- 2.1 Line $\times$ tester cross analysis
- 2.2 To determine the component of variance for all the economic traits.
- 2.3 To estimate the general and specific combining ability variances and their effects.
- 2.4 To estimate extent of heterosis for yield and quality traits.
- 2.5 Morphological characterization of twelve genotypes and their crosses of long melon based on minimal descriptors of NBPGR

2.1 Line $\times$ Tester:

Line $\times$ tester cross is a modified form of the top-cross scheme proposed by Davis in 1927 for inbred valuation. The line $\times$ tester technique was developed by Kempthorne in 1957. It is a good approach for screening germplasm based on GCA and SCA variances and effects. The total number of crosses to be made equals to $n.t$, where n is the number of lines and t is the number of testers. Thus, with 9 lines and 3 testers, the total number of crosses will be 27. Different authors have suggested several types of testers. Some feel that heterozygous testers are superior to homozygous ones. The best inbred line has a masking effect due to its desirable dominant alleles; therefore, it should not be used as a tester. Therefore, in order to obtain the real expression of a line, low performing testers should be used. An inferior synthetic developed by crossing together poor lines may be used as a tester. Thus, a synthetic susceptible to lodging should be used to test the capacity of lines to withstand lodging. In general, a tester should be poor in the traits for which the lines are to be analyzed, and they should be highly adaptable to environmental fluctuations.

This technique measures GCA and SCA variances and effects, and the genetic components of variance (σ^2_A and σ^2_D). It however, fails to detect and estimate the epistatic variance. The line $\times$ tester technique has been extensively used in almost all the major field crops to estimate GCA and SCA variances and effects, and to understand the nature of gene action for various quantitative traits.

Kempthorne (1957) proposed line $\times$ tester analysis, which is analogous to design II of Comstock and Robinson (1952). In this procedure the covariance of half-sibs and full-sibs are related to the variances due to general and specific combining ability.

2.2 Estimation of genetic components of variance

In breeding programme knowledge about gene action, which governs a trait, is very much essential so as to proceed with the right breeding technique. Studies on gene action reveals the genetic mechanism and the inheritance of quantitative traits, particularly in respect to gene actions including epistatic and additive gene effect, the order of dominance in the parents, degree of dominance, distribution of positive and negative alleles and their linkage and the estimation of general and specific combining abilities of the parental lines involved.

The literature on the gene action of the field and its contributing traits in long melon is presented here.

Kumar and Pitchaimuthu (2016) combining ability analysis was conducted to understand the nature of gene action of quantitative traits and to identify promising parents for the breeding programme in muskmelon. Six female and five male parents were crossed in line $\times$ tester mating fashion to produce thirty F₁'s. Analysis of variance showed a high magnitude of GCA over SCA variance indicating the predominance of additive gene effects for all the traits. RM 43 and IIHR122 were the best general combiners for most of the quantitative traits.

Butia *et al.* (2017) a trial was conducted to assess the general combining ability of 8 parents and the specific combining ability of 28 crosses of cucumber for nine quantitative traits in 8 $\times$ 8 half-diallel mating design excluding reciprocals. The results observed that the magnitude of σ^2_s was higher than the σ^2_g indicating the predominance of non-additive gene action and the scope of heterosis breeding in the improvement of different traits.

Simi *et al.* (2017) studied the genetic variance for quantitative characters of 39 cucumber genotypes (19 parents and 20 F₁'s). Analysis of variance showed highly significant differences among the parents and hybrids for 19 characters studied. Considerable coefficient of variation was studied for branches per plant, flesh thickness, placental thickness, fruit length, fruit width, male and female flowers per plant, leaf length, leaf breadth, vine length, fruits per plant and fruit yield per plant for those characters.

Hassan *et al.* (2018) conducted a trial on six parental genotypes "673 (P1), 3M637D (P2), 3M673EB (P3), 86E2143 (P4), 86E2147 (P5) to study the important economical traits of muskmelon as fruit width, fruit length, flesh thickness, cavity diameter, total soluble solids, ascorbic acid content, carotenoids content, fruit weight, total yield/vine and fruit number/vine. A greater ratio of GCA/SCA than unity was detected for most studied traits, revealing that the inheritance of these traits was mainly controlled by additive gene effects.

Kamagoud *et al.* (2018) evaluated genetic variability for yield and its attributing traits of forty oriental pickling melons. Analysis of variance observed that highly significant ($P = 0.01$) difference among genotypes for all twenty traits related to growth and yield traits except for the number of primary branches. High heritability coupled with high GAM noted for 16 characters indicates the predominance of additive components and hence, these traits can be improved by following simple selection.

Saha *et al.* (2018) revealed seven parents with twenty-one F₁ hybrids of muskmelon (*Cucumis melo* L.) in a half-diallel. The result observed overdominance and low narrow-sense heritability for all the characters except node no of the first female flower, average fruit weight, first fruit harvest and yield per plant. In all traits, the dominance component of genetic variance (H₁) was higher than the additive component of genetic variance (D).

Naik *et al.* (2018) evaluated the combining ability for yield and its components was carried out in a set of 27 F₁ hybrids of cucumber developed from a line $\times$ tester method including 12 diverse lines. The ratio of the genetic variance was less than unity, which indicated the predominance of the non-additive gene action.

Quamruzzaman *et al.* (2020) experiment was conducted to study the genetic architecture of yield in a seven-parent half diallel cross of bottle gourd. Analysis of genetic components of variation observed that additive components were more important in the inheritance of fruit yield. This character was observed to be controlled by two to three pairs of gene or groups of genes.

Esmaili *et al.* (2020) studied to estimate heritability, general and specific combining ability and the relationship between traits in five parental genotypes and the hybrids. Investigated traits were fruit number per plant, total yield per plant, average fruit weight, flesh thickness, flesh firmness, seed cavity size, total soluble solids, fruit length in

melon. Analysis of variance of traits recorded a significant difference between hybrids. The specific combining ability of yield per plant was higher than the general combining ability, which indicates the dominance and non-additive actions of genes. The role of non-additive effects of genes in controlling yield and flesh firmness traits was greater than the additive effects.

Praneetha *et al.* (2021) studied combining ability for 34 traits in 36 hybrid combinations (including parents) in snap melon. GCA and SCA variances were found to be significant for all the characters. The parent P6 was the best combiner for the number of fruits per plant, fruit yield per plant, flavonoid and calcium content.

Handayani *et al.* (2022) evaluated the combining ability and heterosis of the genotypes of the parent and their hybrids. Ten genotypes of melons were grown and crossed in full diallel to produce F1 hybrids of melon (*Cucumis melo* L.) for yield and quality-related traits. Analysis of variance found significant ($P < 0.01$) differences among the melon genotypes for fruit diameter, fruit weight, fruit flesh thickness fruit total soluble solids. The research results showed that all characters' GCA: SCA ratio was less than 0.50, meaning mostly traits were controlled by nonadditive gene action and promising that the breeding material could be efficiently used to produce hybrid cultivars based on heterotic effects.

Harsh and Pal (2022) conducted a research trial to examine different contributing characters of 26 genotypes of muskmelon (*Cucumis melo* L.) to understand the genetics of yield formation characteristics with yield improvement potentials. Analysis of variance studied the presence of significant differences among all genotypes for almost all the characters observed that the range of variation was documented extensive for the characters like; fruit weight (179.7 to 777.1 g), yield of fruit per plant (360.3 to 3109.5 g), pulp weight (107.0 to 557.2 g) and seeds per fruit (183.6 to 477.3).

Saha *et al.* (2022) evaluated the seven parental lines with twenty-one F1 hybrids of muskmelon (*Cucumis melo* L.) from two horticultural groups, viz., inodorous and cantalupensis through half-diallel mating system. The component of variance for sca (σ^2_s) was higher than gca component of variance (σ^2_g) for all the characters, except average fruit weight which indicated the importance of non-additive gene action for improvement of traits. The predictability ratio and average degree of dominance were less than 0.5 and

more than 1 for all the yield-related traits, except average fruit weight, which further confirmed the predominant role of the non-additive component of variance.

Singh *et al.* (2022) determined the variance of ten diverse lines and four testers with their forty-one F1 hybrids by using line $\times$ tester mating design for yield and component traits of watermelon. The analysis of variance indicated significant variability among all the genotypes for all the traits. The ratio of $\sigma^2_{SCA}/\sigma^2_{GCA}$ showed the predominance of non-additive gene effects for internode length, days to first female flower appearance, fruit length, fruit width, yield/ plant, number of fruits per plant, average fruit weight, vine length, TSS and vitamin C.

El-Shoura *et al.* (2023) evaluated five genotypes of melon and crossed them in a half diallel mating. The results revealed that the genotypes in the study possessed high variability for all the studied traits. Heritability in the broad sense was larger in values than their corresponding heritability in the narrow sense, which indicates the large effects of the genetic variance on the expression of these traits. The obtained results of the heritability evaluation presented additional evidence about the predominance of the dominance gene effect in the inheritance of the studied traits. Therefore, the hybridization programme could be used for producing superior promising melon hybrids.

2.3 Combining ability analysis

In breeding programmes, the common method of selecting the parents on the basis of per se performance does not necessarily lead to fruitful results. Besides their special attributes, the potential parents have to be selected based on their genetic architecture and combining ability. Hence, the concept of combining ability is of great importance in crop improvement to identify the best combiners and utilizing in hybridization, either in exploitation for heterosis or to combine the favourable genes. Combining ability is the term defined as the relative ability of a genotype to transmit its desirable traits to its progeny. It is generally considered in two aspects *viz.*, general combining ability (gca) and specific combining ability (sca).

Griffing (1956a), Matzinger *et al.* (1959) and Carnation *et al.* (1960) confirmed that gca involved both additive effects as well as additive $\times$ additive interactions. Griffing (1956b) derived the method for estimation of gca and sca effects and variances from diallel set of various compositions. The importance of study of combining ability in self-pollinated crops was realized by Allard (1960).

Hayman (1957) observed that in the absence of epistasis gca involves both additive and dominance portions, while sca involves only dominance effects of genes. He also reported that with epistasis, both these combining abilities would contain epistatic portions. Further, he observes that sca was mainly a measure of dominance and epistasis in unselected and selected materials, respectively.

A brief review of work done on combining ability variances and their effects in melon given as follows:

Kumar *et al.* (2016) assessed heterosis and combining ability for quantitative and qualitative traits in muskmelon. Analysis of variance observed high magnitude of GCA over SCA indicating the predominance of additive gene effects for all the traits. RM 43 and IHR122 were the best general combiners for most of the quantitative traits. Strong phenotypic correlation between gca effects and parent per se performance was observed for all traits except for the number of primary branches per vine and fruit yield per vine. This indicated the possibility of selection of traits at the level of parents.

Naik *et al.* (2018) the study was carried out on combining ability for yield and its components in twenty-seven F1 hybrids of cucumber developed from a line $\times$ tester method involving twelve diverse parents. The analysis revealed that none of the parents were found good general combiners for all the traits while parents US-640, Himangi and Haveri Local were good combiners for fruit yield and its contributing traits. The hybrids DWD $\times$ Haveri Local, US-640 $\times$ Haveri Local and Sabra $\times$ Bagalkot Local showed the significant positive specific combining ability effect for yield attributing traits. These crosses involved poor $\times$ average and poor $\times$ good combiner parents.

Singh and Vashisht (2018) conducted a trial to assess the extent of heterosis and combining ability of muskmelon in a half diallel mating design. 45 F1 hybrids and ten inbred lines were studied for 14 different characters. The combining ability analysis observed that general combining ability effects and specific combining ability effects were significant for all the traits. For days to fruit maturity, fruit yield per plot and TSS content along with other important traits inbred lines, MS-5 and MM-311 were found to be the best general combiners. Cross combination MM-309 $\times$ MM-311 observed maximum specific combining ability for total fruit yield per plot, while cross combinations, MS-5 $\times$ MM 2008-8 and MS-5 $\times$ MM-308 were best specific combiners for TSS content and days to fruit maturity, respectively. Cross combinations namely, MS-5 $\times$ MM 308 and MS-5 $\times$

MM-304 were significantly better for days to fruit maturity, total fruit yield per plot and TSS content along with other important fruit traits over standard checks (Punjab Hybrid and Farmers' Glory).

Alabboud *et al.* (2020) conducted an experiment for improving postharvest and cold storage-related indices is one of the main purposes of melon breeding programs. Six melon inbred lines were used to develop F1 population full diallel design. General combining ability (GCA) analysis showed that “Khatouni” inbred line revealed as a promising parent in breeding programs to produce melon hybrids with firmness, less cold storage losses and a longer postharvest life.

Badami *et al.* (2020) estimated combining ability and heterosis of parental genotypes and their hybrids of melon (*Cucumis melo* L.) for yield- and quality-related traits. Seven melon (*C. melo* L.) genotypes were crossed in a complete diallel fashion to produce 49 F1 hybrids. Combining ability analysis found that mean squares due to general combining ability (GCA) were significant for fruit diameter and non-significant for all other traits. while, mean squares due to specific combining ability (SCA) were significant for all traits. The highest and desirable GCA effects for yield and quality traits were found in genotypes PK-165, PK-464 and PK-669.

Neto *et al.* (2020) determined general combining ability and specific combining ability of 24 hybrids developed by crosses among 3 lines used as female parents (AF-01, AF-02 and AF-03) and 8 lines used as male parents (LAM-01, LAM-02, LAM-03, LAM-04, LAM-05, LAM-06, LAM-07 and LAM-08) for yield and fruit quality traits by partial diallel analysis. The lines AF-02, LAM-02 and LAM-03 are the promising parents with the most favorable alleles. The most prominent hybrids in diallel analysis were AF-02 × LAM-02, AF-02 × LAM-03, AF02 × LAM-04 and AF-03 × LAM-06.

Napolitano *et al.* (2020) conducted an experiment in melon in a half diallel design based on eight genetically distant breeding lines in six environments to assess commercially important traits like yield, total soluble solids (TSS) and days to ripening (DTR). To determine the additive general combining ability (GCA) and specific combining ability (SCA), yield was analyzed by Griffing's methods (2 and 4) and the results were

compared to the GGE (Genotype plus Genotype by Environment interaction) biplot methodology. TSS and earliness were revealed only by Griffing's method four. Overall, GCAs were significantly more relevant than SCAs for all studied traits.

Praneetha *et al.* (2021) studied combining ability for 34 traits in 36 hybrid combinations (including parents) in snap melon. The parent P2 was found best for fruit length, fruit girth, fruit weight, total carotene, fiber and alkaloid content. The parent P5 observed positive and significant general combining ability effects for days to first female flower appearance. The hybrid P2xP4 found positive and significant SCA effects for the traits fruit length, fruit width, fruit weight and fruit yield per plant.

Duradundi *et al.* (2022) a trial was conducted to study the combining ability in muskmelon (*Cucumis melo* L.) for quantitative and qualitative traits. Combining ability analysis was studied to understand the nature of gene action of quantitative traits and to identify the best parents for the breeding programme in muskmelon. The 10 lines and 3 testers were crossed in a line X tester mating system to develop 30 F1 hybrid combinations. Among the lines KM-1, KM2 and KM-10 were the best general combiners for fruit yield per hectare and for mostly quantitative traits. The crosses like KM-2 x PS, KM-1 x DK and KM-3 x PS found significant SCA effects for fruit yield per hectare and mostly characters.

Esmaeili *et al.* (2022) revealed heritability, general and specific combining ability and the relationship between traits. Studied traits were fruit number per plant, total yield per plant, average fruit weight, flesh thickness, flesh firmness, seed cavity size, total soluble solid and fruit length in melon. Five parental genotypes were crossed to develop hybrids in a complete diallel design. Analysis of variance of traits showed a significant difference between hybrids, hence the first Griffing method was used to analyze the combining ability. The general combining ability effects were significant for all parents in the studied traits. The specific combining ability of yield per plant was higher than the general combining ability which indicates the dominance and non-additive actions of genes.

Handayani *et al.* (2022) evaluated the combining ability and heterosis of the genotypes of the parent and their hybrids. Ten genotypes of melons were grown and crossed in a full diallel to produce F1 hybrids of melon (*Cucumis melo* L.) for yield and quality-related traits. Combining ability analysis showed that mean squares due to general

combining ability (GCA) were found significant for fruit diameter, fruit weight, flesh thickness and total soluble solids. The specific combining ability (SCA) was significant for the characters of fruit diameter, fruit weight, flesh thickness and fruit total soluble solids. This genotype can be used to produce highyield hybrid cultivars. The research results showed that all characters' GCA: SCA ratio was less than 0.50, meaning mostly traits were controlled by non-additive gene action and promising that the breeding material could be efficiently used to produce hybrid cultivars based on heterotic effects.

Kaur *et al.* (2022) studied ten genetically diverse inbred lines with two genic male sterile lines of muskmelon (*Cucumis melo* L.) were crossed in a half-diallel to produce 45 F1 hybrids, were evaluated for their fruit yield, level of phytochemicals and Fusarium wilt resistance. The parental line MM-625 was the promising general combiner for fruit yield, rind thickness and β carotene content (mg/100 g). The exotic line Riogold was the best combiner for flesh thickness and firmness. The netted inbred line MM-610 was the best general combiner for fruit weight, ascorbic acid and reaction to Fusarium wilt. The inbred lines KP4HM-15 and MM-916 were the best general combiners for the number of fruits per vine and TSS. The best cross-combinations for fruit yield ha⁻¹ and TSS were MS-1×M-610 and Kajri×MM-904, respectively.

Saha *et al.* (2022) evaluated the seven parental lines with twenty-one F1 hybrids of muskmelon (*Cucumis melo* L.) from two horticultural groups, viz., inodorous and cantalupensis, through a half-diallel mating system. The parent DHM-163 (P1) was found as the best general combiner for earliness while parent DCM-31 (P4) was found for fruit length, average fruit weight and yield per plant. The parent Pusa Madhuras (P5) also reported the highest gca effects for the number of fruits per plant, number of primary branches per plant, fruit diameter and negative gca effects for days to first fruit harvest.

El-Shoura *et al.* (2023) evaluated five genotypes of melon and crossed them in a half diallel mating. The results revealed that the genotypes in the study possessed high variability for all the studied traits. The magnitudes of GCA and SCA effects were found to be significant which indicated the presence of both additive and dominance gene effects in governing all the studied characters. The GCA/SCA ratio was more than one which indicates that the additive gene effect was more important in the inheritance of the studied traits. General combining ability analysis showed that P3 and P4 could be considered as the best parents in breeding programs to produce melon hybrids.

Patel *et al.* (2024) studied of ten melon accessions including eight resistant lines with one snap melon line (*Cucumis melo* var. *momordica*) and two susceptible lines with one genetic male sterile line were crossed to develop 45 F1's through half-diallel design. The results showed that parents Punjab Sunehri was a good combiner for seed cavity area (-8.80), flesh thickness (0.12), rind thickness (0.42), firmness (0.61), dry matter (1.02) and β carotene (0.80) however SM-2012-12 for fruit yield (4.74), number of fruits vine-1 (3.43), average fruit weight (0.06) and fusarium wilt incidence (-0.51) whereas, KP4HM-15 was good for average fruit weight (0.01), days to first fruit ripening (-2.31), TSS (1.21), pH (0.13), titrable acidity (-3.13), ascorbic acid content (5.89) and β -carotene (0.06). Hybrids KP4HM-15 $\times$ Kajri Sel. 1, Kajri Sel.1 $\times$ MM202 and MM-314 $\times$ KP4HM-15 were found as best based on phenotypic performance, SCA effects and resistance to fusarium wilt disease. These hybrids can be studied further at multiple locations to assess their suitability for commercial release.

2.4 Estimates of heterosis

Heterosis term refers to the phenomenon in which a population evolves through the crossing of two homozygous inbreds of genetically unlike parental constitution showing either an increase or decrease in F1 values over the mean parental value. These values may be qualitative or quantitative such as growth, vigour, vitality, reproducing capacity, stress resistance, fruit yield and fruit quality. On the basis of the comparison used, heterosis has been defined as the improvement of F1 over the mid-parent (Relative Heterosis), the better parent (Heterobeltiosis) and the check parent (Standard Heterosis). Various research achievements of heterosis on long melon are furnished as follows:

Tomar and Bhalala (2016) revealed ten parental lines and 45 F1 hybrids of muskmelon developed from a half diallel. The maximum heterosis was observed for fruits per plant, fruit weight and fruit yield per plant. The hybrids AMM-01-18 $\times$ AMM-02-26, Hara Madhu $\times$ RM50, AMM-00-25 $\times$ AMM -00-11 and AMM-01-18 $\times$ DM-1 were found to be highest yielding and heterotic in both the seasons observations along with other yield attributes and quality traits.

Kaur and Dhall (2017) evaluated 28 non-reciprocal F1 hybrids developed from eight diverse cucumber genotypes including one gynoeceious to study the heterosis for yield and yield attributing traits. The hybrid combination JLG $\times$ Summer Kheera and JLG $\times$ NCH-1 were best for marketable yield and fruit weight on the basis of mean and heterosis

over check whereas Swarna Sheetal x EC-27075 and Pant Kheera-1 x EC-27075 were found better for fruit length and diameter.

Simi *et al.* (2017) observed heterosis in 39 cucumber genotypes (19 parents and 20 F₁ s) for quantitative characters. Heterosis study revealed that the crosses Sobujsathi x Baromashi, Sobujsathi x Khira, Himaloy x Khira, exhibited significant positive heterosis for 50 % female flowering where Sobujsathi x Baromashi, Shila x Khira, Modhumoti x Hero and Modhumoti x Khira showed significant positive heterosis and heterobeltosis for yield per plant. Four crosses showed a significant positive better parent heterotic effect for this trait and the combination Sobujsathi x Baromashi was found the maximum heterosis on yield (47.6%). The maximum heterobeltosis effect was observed in Shila x Khira (27.73 %) followed by Modhumoti x Hero (15.14%) and Modhumoti x Khira (10%) for fruit yield.

Duradundi *et al.* (2018) studied the heterosis in muskmelon (*Cucumis melo* L.) for growth, earliness and yield traits. 30 F₁ hybrid combinations were obtained by crossing of ten lines and three testers in a line X tester mating system. Heterosis values were significant over better parents and over the check in the required direction in most crosses for growth, earliness and yield characters under study. The maximum positive and significant heterosis over the commercial check (56.96%) was observed in KM-2 X PS for fruit yield per vine and fruit yield per hectare.

Hassan *et al.* (2018) revealed six parental genotypes along with their crosses for various traits in muskmelon. Maximum significant heterobeltiosis was observed for ascorbic acid, number of fruits per vine, TSS (%), cavity diameter and total yield per vine. The cross 3M-637D (P₂) × 86E2143 (P₄) was showed the maximum heterosis for yield.

El- Sayed *et al.* (2019) a study was conducted to revealed heterosis, general and specific combining ability in melon hybrids to identify the best combinations. Six parents and their hybrids were studied. The traits were assessed like stem length, number of leaves, average fruit weight, fruit length, fruit diameter, flesh thickness, fruit cavity, fruit shape index, TSS and total yield. The heterotic expression for total yield was the most important trait in this study. The range of both types of F₁ heterosis for the studied characters indicated that the expression of heterosis varied according to different crosses and characters.

Omprasad *et al.* (2021) evaluated the heterosis for fruit, yield and quality parameters of 45 hybrids and 6 parents along with two standard checks were developed by half diallel design in muskmelon. Four crosses C10 (AM Sel-3 × AM Sel-4), C11 (AM Sel-3 × AM Sel-5), C14 (AM Sel-4 × AM Sel-6) and C15 (AM Sel-5 × AM Sel-6) observed superior performance of the yield and quality traits.

Yadav *et al.* (2021) an experiment was carried out to assess the heterosis over better parent in muskmelon (*Cucumis melo* L.). The maximum heterosis was found in Hara Madhu x Punjab Sunehari, Pusa Madhuras x Kajri, Kajri x Punjab Sunehari and Punjab Sunehari x Arka Rajhans for most of the yield contributing characters.

Chaithra *et al.* (2022) evaluated heterosis for various traits in long melon. 18 cross combinations of long melon were developed by crossing 6 female lines with 3 male lines by L×T mating design. The F₁ combinations were studied along with nine parental lines to study heterosis for earliness, growth, yield and yield attributing traits. The F₁ LM3×Arka Sheetal showed maximum negative heterobeltiosis (-3.75%) for the minimum number of days for 50% female flower anthesis. 6 out of 18 cross combinations observed significant negative heterosis over the better parent for the days to first harvest with the cross LM3 × JK Special showing highest value (-5.18%). High values of heterosis for male to female flower ratio were observed in LM11×Punjab Long melon-1 (-12.99%) and LM10×Arka Sheetal (-22.08%). LM 3×Arka Sheetal showed extent of heterosis over better parent high as 59.44 % for fruit yield per vine. This crosses LM 9×Punjab Long melon-1, LM 15×Arka Sheetal and LM 3×J K Special exhibited highest heterobeltiosis for yield and contributing traits.

Handayani *et al.* (2022) evaluated the effects of heterosis and combining ability on the diallel crosses of melon (*Cucumis melo* L.) for yield and quality-related traits. Ten genotypes of melons were grown and crossed to produce F₁ hybrids in a full diallel design. The results showed that the all-character GCA: SCA ratio was less than 0.50, meaning most of the traits were controlled by non-additive gene action and verifying that the breeding material could be efficiently used to produce hybrid cultivars based on heterotic effects.

Saha *et al.* (2022) a research trial was conducted on 21 F₁ hybrids developed by seven diverse parental lines of muskmelon (*Cucumis melo* L.) from two horticultural groups, viz., inodorous and Cantalupensis through a half-diallel mating system. The

maximum heterosis was observed in hybrid DCM-31 $\times$ Kashi Madhu (P4 $\times$ P6) for days to first male flower anthesis, days to first female flower anthesis and days to first fruit harvest. Three crosses, DMM-159 $\times$ Pusa Madhuras (P3 $\times$ P5), DHM-163 $\times$ Kashi Madhu (P1 $\times$ P6) and DMM-159 $\times$ DCM-31 (P3 $\times$ P4) were studied to be best heterotic combinations for yield-related traits. These promising heterotic hybrid combinations were tested under multi-location trials to assess their potential as commercial hybrids.

El-Shoura *et al.* (2023) studied five genotypes of melon crossed in a half diallel mating design and evaluated high differences between the crosses for mid-parent and better parent heterosis in all the traits. F1 hybrids (P3 $\times$ P4) and (P4 $\times$ P5) gave the highest means for yield and yield attributes. Thus, a hybridization program could be used for producing superior promising melon hybrids.

Mamatha *et al.* (2023) conducted a study on 5 lines with 6 testers and 30 hybrids in a line-tester design in muskmelon. The maximum heterosis over the better parent was observed in crosses UHSCS-9 $\times$ Mudicode Local and UHSCS-12 $\times$ Arka Siri hybrids for the yield and yield-related traits. These crosses can be exploited in crop improvement by generating transgressive segregants.

Patel *et al.* (2024) conducted a study on sterile and snap melon lines. 45 F1's developed through 10 melon accessions including eight resistant lines involving one snap melon line (*Cucumis melo* var. *momordica*) and two susceptible lines with one genetic male sterile line by half-diallel design. The genotypes were studied for yield, quality and disease resistance traits. The heterobeltosis ranged from -87.2 to 927.08% for the yield and quality traits while for fusarium wilt incidence has -100 to 69.23%.

2.5 Morphological Characterization of Long melon genotypes/hybrids

The Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) developed the DUS (Distinctiveness, Uniformity, and Stability) guidelines as a standardized framework for assessing and distinguishing crop varieties according to their morphological traits. According to these principles, attributes are divided into two primary categories: quantitative features, like plant height or fruit size, and qualitative traits, such as flower colour or leaf form. To ensure objective assessment, genotypes are routinely compared to reference varieties for each particular attribute throughout evaluation. This methodical approach protects varietal purity and intellectual property rights in plant breeding by facilitating precise identification and classification of plant varieties and

ensuring uniformity in the registration and protection procedure. DUS criteria are essential for varietal identification, seed certification, and the maintenance of genetic variety in agricultural systems because they offer a consistent testing approach.

Szamosi *et al.* (2010) evaluated morphological evaluation and comparison of fifty-eight Hungarian and Turkish melon genotypes and observed a wide range of diversity among melon genotypes belonging to these regions. Among Hungarian melon, the average fruit weight was observed from 734.0 to 1333.7 g, fruit diameter from 8.5 to 24.5 cm, fruit length from 7.9 to 29.8 cm, however, among Turkish melon the average fruit weight observed from 653.50 to 1017.70 g, fruit girth from 4.2 to 16.7 cm, fruit length from 5.5 to 26.7 cm.

Ajuru and Okoli (2013) studied the vegetative and floral parts of the melon species belonging to the family, Cucurbitaceae, found in Nigeria was conducted in search of intergeneric and intraspecific characters that may be of taxonomic value in the species identification. Significant diagnostic characters were observed. Morphological characters that may be of taxonomic value are variations in the fruit colour, seed color and seed sizes. Branched tendrils were found in the *C. lanatus* species and *C. moschata* (Duch. Ex Lam.) Duch. Ex Poiret, while *Cucumis melo* L. (sweet melon) have simple tendrils. The morphological differences existing between watermelon and brown-seeded melon in particular and among the melons as a whole are presented.

Shtayeh *et al.* (2015) Studied Genetic diversity in 50 snake melon accessions collected from Palestine by examining variation in 17 phenotypic characters. These accessions belonged to four important landraces of *Cucumis melo* var. *flexuosus*: Green “Baladi” (GB), white Baladi (WB), green Sahouri (GS) and white Sahouri (WS). Principal component analysis (PCA) and a dendrogram were performed to determine relationships among populations and to obtain information on the usefulness of those characters for the definition of cultivars. PCA revealed that secondary fruit skin color, flesh color, primary fruit skin color and secondary skin color pattern were the principal characters to discriminate melon accessions examined in the present study. According to the scatter diagram and dendrogram, landraces of *C. melo* var. *flexuosus*: GB, WB, GS and WS formed different clusters. However, based on Euclidean genetic coefficient distances, GB and WB had the least degree of relatedness with GS and WS, indicating distantly related landraces (Baladi and Sahouri). On the other hand, the highest degree of relatedness was

detected between WS on one hand and both GS and WB on the other indicating closely related cultivars. Fruit traits variability among the different snake melon landraces was evaluated and discussed in this study. This evaluation of fruit trait variability can assist geneticists and breeders to identify populations with desirable characteristics for inclusion in cultivar breeding programs.

Omari *et al.* (2018) evaluated a collection of landraces from 42 grower fields in Israel and the Palestinian territories were grown and characterized in a “Common Garden” rain-fed experiment, at the morphological-horticultural and molecular level using seq-DArT markers. The different landraces showed extensive variation in morphology and quantitative traits such as yield and femaleness and clustered into four horticultural varieties. Yield was assessed by five harvests along the season, with middle harvests producing the highest yields. Yield correlated with early vigor and with femaleness, but not with late vigor. At the molecular level, 2784 SNP were produced and >90% were mapped to the melon genome. Populations were very polymorphic (46–72% of the markers biallelic in a 4 individual sample and observed heterozygosity was higher than expected, suggesting gene flow among populations and extensive cross-pollination among individuals in the field. Genetic distances between landraces were significantly correlated with the geographical distance between collecting sites and with long term March precipitation average; variation in yield correlated with April temperature.

Merhab *et al.* (2020) studied on snake melon (*Cucumis melo* var. *flexuosus* (L.) Naudin) is an ancient and traditional crop in the Mediterranean region. Nevertheless, there has been poor interest in assessing snake melon germplasm where its genetic resources have not been surveyed before despite their potential in adaptation to environmental changes. Morphological characterization using a set of 18 descriptors revealed an important phenotypic variability among the landraces studied. Based on the scatter plot diagram, landraces of snake melon formed five different groups with one being defined as typical var. *flexuosus*. Ten simple sequence repeat (SSR) markers were used for the molecular characterization. Fifty-six different alleles were detected, with an average of 5.6 alleles per locus. Polymorphism information content of SSR markers ranged from 0.06 to 0.84 (average 0.38). Cluster analysis based on molecular markers showed high genetic diversity and divided the landraces into five distinct genetic groups, thereby confirming the morphological variability

Yousif *et al.* (2022) experiment was conducted to study variability in the local germplasm of snake melon (*Cucumis melo* var. *flexuosus*) and correlation among different morphological, vegetative, fruit and yield parameters of snake melon. Results showed high variability among these inbred lines for earliness (29-45 days), stem length (80.4-152.5 cm), number of secondary branches (7.0-13.5), fruit length (33-90 cm) and leaf pubescence (153-189 hairs/cm²). Results also concluded that yield parameters were much affected by the variation in both genotypes and seasons. Combined analysis of the two seasons indicated positive and significant association for number of primary branches with number of secondary branches (0.43) and stem length (0.35); and number of secondary branches with stem length (0.35), fruit color with sex ratio (0.37); fruit length with groove width (0.43) and female/male ratio (0.42); groove width with stem pubescence (0.43) and sex ratio (0.41). Sex ratio was found to be highly associated with stem pubescence (0.69). In contrast, a negative and significant association was found for edible portion with number of primary branches (-0.27) and stem pubescence (-0.38) and groove width with number of straight fruits (-0.28).

MATERIALS AND METHODS

The present research work entitled “**Genetic analysis for yield and its component in Long melon (*Cucumis melo* var. *utilissimus*).**” was conducted during *Summer* seasons of 2024 (Y₁) and 2025 (Y₂) to study the nature and magnitude of gene action, combining ability, heterosis and morphological characterization of long melon using line × tester mating design at the Main Experiment Station (MES) of the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) India. The observations were recorded on twenty-two characters including seven qualitative traits. The material and methods used are elaborated in the following paragraphs:

3.1 Experimental site

The experiment was move around at Main Experimental Station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya. Geographically, experimental site falls under humid, sub-tropical climate and is located in between 24.47⁰ and 26.56⁰ N latitude and 82.12⁰ and 83.98⁰ E longitude at an altitude of 113m above the mean sea level in the Gangetic Alluvial Plains of Eastern Uttar Pradesh. The soil type of experimental site was sandy loam with average fertility level and pH in the range of 7.5-8.5.

3.2 Environmental conditions

This area falls under the humid subtropical zone and received average annual precipitation of about 1200 mm. The maximum rainfall received during the period between June to the end of September. Sometimes, continuous cloudy weather with heavy rains for longer period drastically affects the agricultural production. However, occasional showers are also very common in the month of winter season. The winter months are usually cool and dry. The summer is hot and dry, western hot winds, start from April and end at onset of monsoon. The weather data recorded at meteorological observatory of university for the period during which experiments were conducted have been given in Table-3.1 (a) & 3.1 (b).

Table 3.1 (a): Meteorological data (weekly average) during the crop grown period [February to June 2023-24 (Y₁)]

Months		Standard Mean Weeks	Mean temperature (°C)		Mean Relative Humidity (%)	Total Rainfall (mm)	Sunshine (hrs/day)
			Max.	Min.			
Y ₁	February	6	22.5	6.2	70.4	0.0	8.2
		7	24.9	9.6	67.4	0.0	8.5
		8	25.6	12.4	77.0	53.0	4.3
		9	26.8	13.9	72.8	0.0	7.6
	March	10	26.0	13.9	74.0	68	6.5
		11	27.1	14.7	72.4	9.0	5.8
		12	29.7	15.7	68.5	2.0	8.1
		13	32.1	16.6	54.3	0.0	8.9
		14	34.8	16.1	46.1	0.0	10.0
	April	15	36.9	18.7	50.4	0.0	9.2
		16	36.6	21.5	56.0	1.0	9.4
		17	33.4	22.0	64.6	0.0	8.7
		18	32.6	21.1	69.3	0.0	9.1
	May	19	34.1	22.1	62.4	10	9.5
		20	39.1	22.8	49.1	0.0	10.2
		21	40.4	25.1	52.1	0.0	9.8
		22	35.2	25.1	63.6	12.2	6.9
	June	23	34.4	25.5	70.4	9.2	5.4
		24	35.8	28.4	69.4	47.4	8.0
		25	31.5	26.3	84.9	96.2	1.7
		26	31.6	25.6	86.7	77.6	1.6

(Source: Department of Agro-meteorology, ANDUA&T, Kumarganj, Ayodhya (U.P.) India)

Table 3.1 (b): Meteorological data (weekly average) during the crop grown period [February to June 2024-25 (Y2)]

	Months	Standard Mean Weeks	Mean temperature (°C)		Mean Relative Humidity (%)	Total Rainfall (mm)	Sunshine (hrs./day)
			Max.	Min.			
Y2	February	6	25.5	9.0	67.1	0.0	6.3
		7	27.2	9.5	68.1	0.0	6.8
		8	28.2	11.7	66.3	0.0	7.6
		9	30.2	13.2	58.8	0.0	7.0
	March	10	31.8	14.2	64.3	0.0	6.6
		11	32.3	15.2	66.4	0.0	6.2
		12	34.6	16.5	57.0	0.0	6.8
		13	35.6	16.4	56.3	0.0	7.5
		14	37.5	17.0	44.3	0.0	6.7
	April	15	38.9	18.8	47.3	0.0	6.2
		16	37.8	20.1	56.1	0.0	7.6
		17	33.4	22.0	64.6	0.0	8.7
		18	32.6	21.1	69.3	0.0	9.1
	May	19	34.1	22.1	62.4	10	9.5
		20	39.1	22.8	49.1	0.0	10.2
		21	40.4	25.1	52.1	0.0	9.8
		22	35.2	25.1	63.6	12.2	6.9
	June	23	34.4	25.5	70.4	9.2	5.4
		24	35.8	28.4	69.4	47.4	8.0
		25	31.5	26.3	84.9	96.2	1.7
		26	31.6	25.6	86.7	77.6	1.6

(Source: Department of Agro-meteorology, ANDUA&T, Kumarganj, Ayodhya (U.P.) India)

3.3 Experimental materials

The experimental materials for the present investigation comprised of nine promising and diverse pure lines/varieties with three testers of long melon selected on the basis of genetic variability from the germplasm stock maintained in the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) India. The selected parental lines *i.e.*; NDLM-23-1 (L₁), NDLM-23-2 (L₂), NDLM-23-3 (L₃), NDLM-23-4 (L₄), NDLM-23-5 (L₅), NDLM-23-6 (L₆), NDLM-23-7 (L₇), NDLM-23-8 (L₈), NDLM-23-9 (L₉) and testers Kashi Santusthi (T₁), Punjab Long Melon (T₂), Kashi Vidhi (T₃) were crossed in the all possible combination to get 27 F₁ seed for the study of heterobeltiosis and standard heterosis, combining ability effects, gene action, combining ability effects, heterobeltiosis and relative heterosis, morphological characterization among F₁'s and parents for 22 fruit yield and quality attributing traits. Distinguishing features of the parental lines are given in (Table-3.2).

Table 3.2: List of genotypes and their source of collection

S. No.	Symbol	Name of Parents	Source
1.	L ₁	NDLM-23-1	A.N.D.U.A.T., Ayodhya
2.	L ₂	NDLM-23-2	A.N.D.U.A.T., Ayodhya
3.	L ₃	NDLM-23-3	A.N.D.U.A.T., Ayodhya
4.	L ₄	NDLM-23-4	A.N.D.U.A.T., Ayodhya
5.	L ₅	NDLM-23-5	A.N.D.U.A.T., Ayodhya
6.	L ₆	NDLM-23-6	A.N.D.U.A.T., Ayodhya
7.	L ₇	NDLM-23-7	A.N.D.U.A.T., Ayodhya
8.	L ₈	NDLM-23-8	A.N.D.U.A.T., Ayodhya
9.	L ₉	NDLM-23-9	A.N.D.U.A.T., Ayodhya
10.	T ₁	Kashi Satusthi	IIVR, Varanasi
11.	T ₂	Punjab Long melon	P.A.U., Ludhiana
12.	T ₃	Kashi Vidhi	IIVR, Varanasi
13.	Check	Thar Sheetal	CIAH, Bikaner

3.4 Cultural practices:

3.4.1 Sowing of seed

The seed of all the developed F₁'s along with parents were brought up in the raised beds. Recommended cultural practices and appropriate plant protection measures were also taken up prior and after sowing of the seeds.

3.4.2 Field preparation and layout of the experiment

The field of experiment was ploughed and brought up to the fine tilth. Farm yard manure @ 25 tons per hectare and 60 kg nitrogen (N), 50 kg phosphorous (P₂O₅), 50 kg potassium (K₂O) per hectare were applied in the recommended manner (Dey *et al.*, 2011). The experiment was laid out during *summer* seasons of 2024 and 2025 in Randomized Block Design including 12 parents (9 lines and 3 tester) and 27 F₁'s.

3.4.3 Sowing and after care

The seed were sown to the main field and irrigation just after sowing. Top dressing was done at the time of earthing with 50 per cent nitrogen after one month of sowing. Timely irrigation, weeding and earthing up were given and recommended practices were followed.

3.5 Experimental design

The present experiments were conducted in a Randomized Block Design (RBD) with three replications to appraise the performance of 27 F₁ hybrids and their 12 parents (9 lines and 3 testers). The crop was sown in rows spaced at 3 meters apart with a plant to plant spacing of 0.50 meter. Sowing was done on 22 February, 2024 and 19 February, 2025. All the recommended agronomic package of practices and protection measures were followed to raise good crops.

3.6.1 Development of F₁ hybrids and their evaluation

Nine inbreds lines/varieties and three divergent testers were selected and crossed in line x tester mating design as suggested by Kempthorne (1957) to produce 27 hybrids (F₁) in season of 2023 and evaluated during the summer season of 2024 and 2025.

3.6.2 Hybridization programme

The seeds of the above said parents (9 lines and 3 testers) were sown in field separately in crossing blocks. Healthy and normal flower buds which were expected to

open in the night was selected. Pollination was done between 6.00 am to 7.00 am as the flowering taken place around am. there no need to cover the female flower prior to pollination. However just after pollination female flowers are covered with cotton and tagging was done. After pollination, crossed flower buds were covered with cotton till the fruits set and tagged. Simultaneously, flower buds of parents were also selfed/sibbed and it was ensured by covering the female flower buds with cotton just after pollination. Seeds were extracted from matured fruits by hand, dried and packed with appropriate label.

3.6.3 Evaluation of parents and their hybrids

The evaluation of 12 parents along with their 27 F₁ hybrids and commercial check variety Thar Sheetal for various characters was done in *summer* season of 2024 and 2025. The details of experiment are as follows,

Treatments : 27 hybrids + 12 parents (9 lines + 3 testers) one check (Thar Sheetal)

Replication : Three

Design : Randomized Block Design (RBD)

Spacing : 3.0 m × 0.5 m

Plot size : 3.0 m × 3.0 m

Population : 5 plants per plot

3.7 Observations recorded

Observations were recorded on five plants in each of parents and F₁s for each treatment in each replication, selected randomly for the following characters. The observations recorded on the five plants were averaged and got mean value. The procedure is described under the respective sub-heads:

3.7.1 Quantitative characters:

3.7.1.1 Days to first male flowering

Number of days taken from sowing of seed to the opening of first male flower of five selected plant was recorded and averaged to get mean value.

3.7.1.2 Days to first female flowering

Number of days taken from sowing of seed to the opening of first female flower of selected plant was recorded and averaged to get mean value.

3.7.1.3 Days to 50 % female flowering

The number of days was counted from the date of sowing till the date of 50% appears of flower in each replication and mean values were recorded.

3.7.1.4 Node number at which first male flower appears

The node number from the base of the plant at which first male flower appeared of the selected plant was recorded and mean value was worked out.

3.7.1.5 Node number at which first female flower appears

The node number from the base of the plant at which the first female flower appeared of selected plant was recorded and mean value was worked out.

3.7.1.6 Days to first fruit harvesting (Edible stage)

It was recorded as number of days taken from the date of sowing to the date of first picking of edible fruits of a plot and averaged.

3.7.1.7 Number of primary branches per plant

Total number of branches emerged from main vine was counted at final harvesting stage and the average value was calculated to get the total number of primary branches in a single plant.

3.7.1.8 Fruit length (cm)

The fruit length of edible fruits was recorded on five randomly selected fruits of a plot in each replication. The length of each fruit was measured as a perpendicular distance between the points of attachment of the stalk and centre of the blossom end with the help of measuring tape in centimeters and mean value was worked out.

3.7.1.9 Fruit breadth (cm)

The breadth of five randomly selected fruits were measured from the middle portion of the edible fruit with the help of a digital vernier calliper and then the average fruit diameter was calculated in cm

3.7.1.10 Vine length (m)

The vine length of selected plant was measured in meter from the base to the tip of the vine at the time of last picking and mean value was worked out.

3.7.1.11 Number of fruits per plant

Numbers of edible fruits was counted at each picking and summed up for all the pickings for a plot. Number of fruits per plant was calculated after dividing total number of fruits in a plot by total number of plants in that plot.

3.7.1.12 Average fruit weight (g)

The weight of five randomly selected harvested fruits was recorded and divided by five to obtain the average weight in grams.

3.7.1.13 Number of seeds per fruit (Maturity Stage)

The number of seed per fruit of five randomly selected mature fruits were counted and divided by five to obtain the number of seeds per fruit.

3.7.1.14 Fruit yield per plant (kg)

The weight of ripe fruits harvested from each picking was recorded till the final harvest and the total yield/plant was recorded in kilograms.

3.7.1.15 Fruit yield (q/ha.)

Periodical pickings until the end of the experiment were summed up to get the data on fruit yield/ha.

3.7.2 Qualitative characters:

3.7.2.1 Total soluble solids (%)

Five fruits of tomato were randomly selected from each treatment and washed with water. Then, the fruits were cut into small pieces and squeezed to obtain the juice. A drop of juice is dropped down on the prism of the digital refractometer, and the value of TSS was recorded and expressed as °Brix.

3.7.2.2 Ascorbic acid (mg/100 g fresh fruit)

The vitamin C content was estimated by following the titration procedure given by Thimmaiah (1999).

Principle

Ascorbic acid reduces the 2,6-dichlorophenol indo-phenol dye to a colourless leuco-base and itself gets oxidized to di-hydro-ascorbic acid. Though the dye is a blue coloured compound, the end point is the appears of pink colour for 5-10 seconds. The

dye is pink in acid medium. A mixture of meta-phosphoric and acetic acid is used as the titrating medium. The titre of the dye can be determined using working standard ascorbic acid solution. (Afroza Akhter, 2024).

Reagents

1. **Metaphosphoric-acetic acid mixture (3%):** Dissolve 15 g of meta phosphoric acid in a mixture containing 40 ml of glacial acetic acid and 450 ml distilled water. Stable for 10 days.
2. **Dye solution:** Dissolve 42 mg sodium bicarbonate in 50 ml of distilled water and then, add 50 mg 2, 6-dichlorophenol indo-phenol dye in it. Make up the volume to 200 ml with distilled water.
3. **Stock standard solution (1mg ml):** Dissolve 100 mg of ascorbic acid in 100 ml of 3% metaphosphoric-acetic acid mixture.
4. **Working Standard solution (0.1 mg ml⁻¹):** Dilute 10 ml of the stock solution to 100 ml with 3% metaphosphoric-acetic acid mixture.

Protocol

Standardization of Dye

5 ml of the working standard solution was pipette out into a 100 ml conical flask. Then, 10 ml of Metaphosphoric- acetic acid mixture was added to it and titrated against dye solution. End point is the appears of pink colour which persists for 5-10 seconds.

Estimation of ascorbic acid

Fruit sample (0.5-5 g) was extracted in 10 ml of Metaphosphoric-acetic acid mixture and final volume was made up to 25 ml with Metaphosphoric-acetic acid mixture. Filter the solution using Whitman filter paper and collect the filtrate. A 5 ml of the sample was taken for titration from the filtrate and 10 ml of the acid mixture was added to it.

Calculation

Ascorbic acid content of the sample was calculated according to the following formula:

$$\text{Ascorbic acid (mg100g}^{-1}\text{)} = \frac{0.5 \times V_2 \times 25 \text{ ml}}{V_1 \times 15 \text{ ml} \times \text{weight of sample taken}} \times 100$$

Where,

VI = Volume of dye used in titration of standard (ml)

V2 = Volume of dye used in titration of sample (ml)

3.7.2.3 Dry matter (%)

The dry matter content in fruit was determined on the fresh weight basis. A quantity of 100 g of fresh fruit was taken, cut into small pieces and allowed sun drying and then dried in oven at $40\pm 2^{\circ}\text{C}$ for 8-10 hours per day till the complete drying to have constant weight and dry matter percentage was calculated as:

$$\text{Dry matter (\%)} = \frac{\text{Dry matter of fruit (g)}}{\text{Fresh weight of fruit (g)}} \times 100$$

3.7.2.4 Reducing sugars (%)

Reducing sugar was estimated by Fehling 'A' and 'B' solution method given by Ranganna (1991). 10g fresh fruit was macerated in small amount of distilled water and filtered through muslin cloth and maintain volume up to 100ml. an aliquot of 5ml dilutes fruit juice was taken from 100ml as above for titration and mixed with 10ml of Fehling 'A' and 'B' solution each. This mixture was titrated against 1.0% glucose. A blank with 10ml of Fehling 'A' and 'B' was also run. The results were expressed as percent reducing sugars.

Total invert sugar, out of 100 ml sample, 5ml aliquot was taken, mixed with three drops of HCl and kept overnight. Next day 2-3 drops of phenolphthalein indicator was added and neutralized with 30 per cent sodium hydroxide (NaOH) solution containing 10ml Fehling 'A' and 'B'.

This mixture was titrated against 1.0% glucose in boiling solution using methylene blue indicator. The appears of red or black colour was marked as the end point. The results were expressed as per cent total invert sugars.

3.7.2.5 Non-reducing sugar (%)

Non-reducing sugars were calculated by deducting the quantity of reducing sugars from total invert sugar and multiplied by factor 0.95. The results were expressed as per cent non-reducing sugars.

3.7.2.6 Total sugars (%)

Total sugars were calculated by adding the quantity of reducing and non-

reducing sugars. The result was expressed as total sugars per cent.

$$\text{Total Sugars (\%)} = \text{Reducing sugars (\%)} + \text{Non reducing sugars (\%)}$$

3.7.2.7 Total carotenoids ($\mu\text{g}/100\text{mg}$ edible fresh part)

A known weight of sample (1gm) was extracted with acetone and a few drops of sodium sulphate. The extractions were repeated and the extract was totaled in a beaker and to it added 10% KOH. The extract was heated on a water bath for 30 minutes and then transferred to a separating funnel. To this 50ml of petroleum ether was added. The separating funnel was shaken and allowed to stand for at least 10 minutes till the layers got separated. The lower layer was drained and the upper layer of petroleum ether containing pigment was collected in a volumetric flask and the volume was made up to 50 ml with petroleum ether and O.D was recorded as 560 nm against petroleum ether as blank. The total carotenoids were calculated as per the formula:

$$\text{Total carotenoids (mg/100g)} = \frac{O.D \times 13.9 \times 10^4 \times \text{Volume made}}{\text{weight of sample} \times 560 \times 1000} \times 100$$

3.7.3 Morphological traits

Observations on sixteen DUS characters were recorded at the right stage as per minimal descriptor of NBPGR and UPOV guide lines. The traits considered are as follows:

3.7.3.1 Leaf length (cm)

At fully developed green leaf, the leaf length was recorded through visual assessment by a single observation of a group of plants as Absent/Weak/Medium/Strong.

3.7.3.2 Leaf Width (cm)

The leaf length was recorded through visual assessment by a single observation of a group of plants as Absent/Weak/Medium/Strong in fully developed leaves

3.7.3.3 Leaf shape

Leaf shape was observed in the fully developed leaves of a randomly selected group of plant likely Cordate/ Palmately/ Palmately lobed

3.7.3.4 Petiole length: Short/ medium/ long

Leaf petiole length was observed in the fully developed leaves of a randomly selected group of plants.

3.7.3.5 Depth of leaf lobe: Shallow/intermediate/ deep

The depth of leaf lobe was observed in the fully developed leaves of a randomly selected group of plants.

3.7.3.6 Flower colour: yellow/ dark yellow

At the first flower initiation stage, the flower colour was recorded through visual assessment by observation of individual plant.

3.7.3.7 Sex expression: Monocious

At the first flower initiation stage, the monocious nature assessed through visual assessment of individual plant.

3.7.3.8 Male sterility: Present/ absent

At the first flower initiation stage, the shriveled or absent anthers with no pollen shedding and confirmed by staining non- viable or absent pollen grains of individual plant was observed.

3.7.3.9 Ovary length: Short/ medium/ long

The length of ovary was recorded through visual assessment by observation of individual plant in randomly selected plants.

3.7.3.10 Fruit shape: Slightly elongate/ elongated curved

The shape of the randomly selected fruits from each genotype was recorded through visual assessment by observation of individual plant at edible stage.

3.7.3.11 Fruit color: Light green/ dark green/ cream

The color of the randomly selected fruits from each genotype was recorded through visual assessment by observation of individual plant at edible stage.

3.7.3.12 Fruit Strips: Absent/Present

The strips on the randomly selected fruits from each genotype was recorded through visual assessment by observation of individual plant at edible stage.

3.7.3.13 Fruit taste: bitter/non bitter

The taste of the randomly selected fruits from each genotype was recorded through visual assessment by observation of individual plant at edible stage.

3.7.3.14 Fruit creasing: Present/ absent

The creasing on the randomly selected fruits from each genotype was recorded through visual assessment by observation of individual plant at edible stage.

3.7.3.15 Seed length (cm): Short/ long

The shape of seeds was recorded through visual assessment by a single observation of a group of plants for each genotype during the mature seed stage.

3.7.3.16 Seed width (cm): Short/ long

The shape of seeds was recorded through visual assessment by a single observation of a group of plants for each genotype during the mature seed stage

3.8 Statistical methods

The data recorded for the different parameters were subjected to statistical and biometrical analysis by taking the average value of the various characters under observation in three replications.

3.8.1 Analysis of variance for design of experiment

The analysis of variance for the design of experiment was carried out according to the procedure outlined by Panse and Sukhatme (2000).

The significance of difference among treatment means was tested by 'F' test. To test the hypothesis $H_0: t_1 = t_2 = \dots = t_v$, the fixed effect model for the analysis of variance for Randomized Block Complete Design is given below:

$$Y_{ij} = \mu + t_i + b_j + e_{ij}$$

Where,

Y_{ij} = Yield of i^{th} entry in the j^{th} replication

μ = General mean

t_i = Effect of the i^{th} entry ($i = 1, 2, \dots, v$)

b_j = Effect of the j^{th} replicate ($j = 1, 2, \dots, r$)

e_{ij} = Environmental effect

The details of the ANOVA for parents and crosses are:

Source of variation	d.f.	SS	MS	F ratio
Replication	(r-1)	SSR	MSR	MSR/MSE
Treatments	(t-1)	SST	MST	MST/MSE
Parents	(P-1)	SSP	MSP	MSP/MSE
Crosses	(C-1)	SSC	MSC	MSC/ MSE
Parents vs crosses	1	SSP vs SSC	MSP vs MSC	MSP vs MSC/ MSE
Error	(r-1) (t-1)	SSE	MSE	

Where,

r = Number of replications

t = Number of treatments

p = Number of parents

C = Number of crosses

The standard error, critical difference and coefficient of variation were calculated as follows:

$$\text{S.E. of mean} = \sqrt{\frac{\text{MSE}}{r}}$$

$$\text{Critical difference} = \sqrt{\frac{2 \text{ MSE}}{r}} \times t \text{ value}$$

Where,

Table value of t distribution at error d.f. and $P \leq 0.05$

$$\text{Coefficient of variation (C.V. \%)} = \frac{\sqrt{\text{MSE}}}{\text{Gm}} \times 100$$

The pooled over seasons analysis was done as give below:

Source of variation	d.f.	SS	MS	F ratio
Seasons (S)	(S-1)	SSS	MSS	MSS/MSE
Blocks within Seasons	B (r-1)	SSB	MSB	MSB/MSE
Genotypes (G)	(t-1)	SSG	MSG	MSG/MSE
Parents	(P-1)	SSP	MSP	MSP/MSE
Crosses	(C-1)	SSC	MSC	MSC/ MSE
Parents <i>vs</i> crosses	1	SSP <i>vs</i> SSC	MSP <i>vs</i> MSC	MSP <i>vs</i> MSC/ MSE
G $\times$ S	(G-1) (S-1)	SSG $\times$ SSS	MSG $\times$ MSS	MSG $\times$ MSS/ MSE
Parents <i>vs</i> Seasons	(P-1) (S-1)	SSP $\times$ SSS	MSP $\times$ MSS	MSP $\times$ MSS/ MSE
Hybrids <i>vs</i> Seasons	(C-1) (S-1)	SSC $\times$ SSS	MSC $\times$ MSS	MSC $\times$ MSS/ MSE
Parents <i>vs</i> hybrids $\times$ Seasons	(S-1) 1	SSP <i>vs</i> SSC $\times$ SSS	MSP <i>vs</i> MSC $\times$ MSS	MSP <i>vs</i> MSC $\times$ MSS/ MSE
Error	S (r-1) (t-1)	SSE	MSE	

Where,

S = Number of seasons

B = Blocks with in seasons

G = Number of treatments

p = Number of parents

C = Number of crosses

3.8.2 Genetical analysis

Genetical analysis of quantitative and quality traits was done under following sub heads:

3.8.2.1 Components of genetic variance

3.8.2.2 Combining ability variances and their effects

3.8.2.3 Heterosis over better parent and mid-parent.

3.8.2.1 Component of genetic variance

$$\text{Cov. Half sib (line)} = \frac{M_f - M_{fm}}{rm}$$

$$\text{Cov. Half sib (tester)} = \frac{M_m - M_{fm}}{rf}$$

$$\text{Cov. Half sib (average)} = \frac{1}{r(2fm - f - m)} \left[\frac{(f-1)M_f + (m-1)M_m}{f+m-2} - M_{fm} \right]$$

$$\text{Cov. F.S. (average)} = \frac{(M_f - M_e) + (M_m - M_e) + (M_{fm} - M_e)}{3r} +$$

$$\frac{6r \text{ Cov. H.S. (average)} - r(f+m) \text{ Cov. H.S. (average)}}{3r}$$

Where,

M_f = Mean squares due to lines (females)

M_m = Mean squares due to testers (males)

M_{fm} = Mean squares due to line $\times$ tester interactions

M_e = Mean squares due to error

r = Number of replications

f = Number of lines

m = Number of testers

$$\text{gca variance } (\sigma^2_{\text{gca}}) = \text{Cov. H.S. (average)} = \left[\frac{1+F}{4} \right] \sigma^2 A$$

Therefore,

Additive genetic variance ($\sigma^2 A$) = 2 Cov. H.S. (average), if $F = 1$ and ($\sigma^2 A$) = 4
Cov. H.S. (average), If $F = 0$

$$\text{sca variance } (\sigma^2_{\text{sca}}) = \frac{(M_{fm} - M_e)}{r}$$

$$\sigma^2_{\text{sca}} = \left[\frac{1+F}{2} \right]^2 \sigma^2 D$$

Therefore,

Dominance variance ($\sigma^2 D$) = σ^2_{sca} with $F = 1$, and

$\sigma^2 D = 4\sigma^2_{\text{sca}}$, if $F = 0$

Where,

F = Inbreeding coefficient

(i) Average degree of dominance

It was calculated using formula given by Kempthorne and Curnow (1961).

$$\text{Average degree of dominance} = \sqrt{(\sigma^2 \text{sca}) / (2\sigma^2 \text{gca})} \text{ or } \sqrt{(\sigma^2 \text{D}) / (\sigma^2 \text{A})}$$

Where,

$\sigma^2 \text{sca}$ = Estimated variance due to sca.

$\sigma^2 \text{gca}$ = Estimated variance due to gca

(ii) Predictability ratio

It was suggested by Baker (1978) and was calculated as follows:

$$\text{Predictability ratio} = \frac{2\sigma^2 \text{g}}{2\sigma^2 \text{g} + \sigma^2 \text{s}}$$

3.8.2.2 Combining ability analysis

The combining ability analysis was carried out following line $\times$ tester mating design outlined by Kempthorne (1957) and further elaborated by Arunachalam (1974). Line $\times$ tester analysis was used to estimate general combining ability (gca) and specific combining ability (sca) variances and their effects using the observations taken on F₁ generation of the line $\times$ tester sets of crosses. In this mating system, a random sample of ‘l’ lines is taken and each line is mated to each of the ‘t’ testers (Singh and Chaudhary, 1977).

(i) The model underlying this analysis is as follows:

$$X_{ijk} = \mu + g_i + g_j + s_{ij} + e_{ijk}$$

Where,

μ = General mean

g_i = gca effect of the i^{th} male (tester), $i = 1, 2, \dots, m$.

g_j = gca effect of j^{th} female (line), $j = 1, 2, \dots, f$.

s_{ij} = sca effect of the i^{th} tester and j^{th} line cross combination.

e_{ijk} = Error associated with ijk^{th} observation, $k = 1, 2, \dots, r$.

(ii) The individual effects were estimated as follows:

$$(a) \quad \mu = \frac{X_{...}}{mfr}$$

Where,

$X_{...}$ = Total of all hybrid combinations.

$$(b) \quad g_i = \frac{X_{i..}}{fr} - \frac{X_{...}}{mfr}$$

Where,

$X_{i..}$ = Total of i^{th} male over all the females and replications.

$$(c) \quad g_j = \frac{X_{.j}}{mr} - \frac{X_{...}}{mfr}$$

Where,

$X_{.j}$ = total of j^{th} female over all males and replications.

$$(d) \quad s_{ij} = \frac{X_{ij..}}{r} - \frac{X_{i..}}{fr} - \frac{X_{.j}}{mr} + \frac{X_{...}}{mfr}$$

Where,

$X_{ij.}$ = Total of ij^{th} combination over all replications.

(iii) Standard errors for combining ability estimates were calculated as given below:

$$\begin{aligned} SE (gca \text{ for line}) &= (Me/rm)^{1/2} \\ SE (gca \text{ for tester}) &= (Me/rf)^{1/2} \\ SE (sca \text{ effect}) &= (Me/r)^{1/2} \\ SE (g_i - g_j) \text{ line} &= (2Me/rm)^{1/2} \\ SE (g_i - g_j) \text{ tester} &= (2Me/rf)^{1/2} \\ SE (S_{ij} - S_{kl}) &= (2Me/r)^{1/2} \end{aligned}$$

Where,

Me = Error MS

Critical differences (CD) were calculated as:

$CD = SEd \times t$ at 5% and 1% probability levels at error d.f.

(iv) The analysis of variance for combining ability is as follows:

Source of variation	d.f.	S.S.	M.S.	Expected MS
Replications	(r-1)	-	-	-
Lines (females)	(l-1)	SS (l)	MS (l)	$\sigma^2_e + r$ (Cov. F.S.-2 Cov. H.S.) + rt Cov. H.S.
Testers (males)	(t-1)	SS (t)	MS (t)	$\sigma^2_e + r$ (Cov. F.S.-2 Cov. H.S.) + rl Cov. H.S.
Lines $\times$ Testers	(l-1) (t-1)	SS (l $\times$ t)	MS (l $\times$ t)	$\sigma^2_e + r$ (Cov. F.S.-2 Cov. H.S.)
Error	(rlt-1)	SS (e)	MS (e)	σ^2_e

Where,

r = Number of replications

l = Number of lines

t = Number of testers

σ^2_e = Variance due to error

(v) Proportional contribution of lines, testers and their interactions:

$$\text{Contribution of lines (\%)} = \frac{\text{S.S. (lines)}}{\text{S.S. (crosses)}} \times 100$$

$$\text{Contribution of testers (\%)} = \frac{\text{S.S. (testers)}}{\text{S.S. (crosses)}} \times 100$$

$$\text{Contribution of lines} \times \text{testers} = \frac{\text{S.S. (lines} \times \text{testers)}}{\text{S.S. (crosses)}} \times 100$$

3.8.2.3 Nature and magnitude of heterosis for yield and its components

The nature and magnitude of heterosis was worked out using information on various quantitative characters studied. Heterosis expressed as per cent increase or decrease of hybrids (F₁'s) over better parent (heterobeltiosis) and standard mid parent (relative heterosis).

Heterobeltiosis

$$\text{Heterobeltiosis(\%)} = \frac{\bar{F}_1 - \overline{BP}}{\overline{BP}} \times 100$$

Where,

$\overline{BP}$ = Mean value of the better parent

$$\text{S.E (d) for } \overline{F_1} - \overline{BP} = \sqrt{\frac{2\text{MSE}}{r}}$$

$$\text{C.D.} = \text{S.E (d)} \times t \text{ (at error d.f.)}$$

Relative heterosis

$$\text{Relative heterosis (\%)} = \frac{\overline{F_1} - \overline{MP}}{\overline{MP}} \times 100$$

Where,

$\overline{MP}$ = Mean value of the standard variety.

$$\text{S.E (d) for } \overline{F_1} - \overline{MP} = \sqrt{\frac{2\text{MSE}}{r}}$$

$$\text{C.D.} = \text{S.E (d)} \times t \text{ (at error d.f.)}$$

Testing of significance of both types of heterosis was done on the basis of absolute difference between the value of F_1 and the value of better parent/mid parent.

RESULTS AND DISCUSSION

The results obtained in respect of the experiments conducted under present investigation have been described in this chapter under following heads:

- 4.1 Analysis of Variance
- 4.2 Components of Variance
- 4.3 Proportional Contribution of Lines, Testers and Lines $\times$ Testers
- 4.4 Combining Ability Variances and Their Effects
 - 4.4.1 Analysis of variance for combining ability
 - 4.4.2 Estimates of general combining ability and specific combining ability effects
- 4.5 Estimation of Heterosis Over Better Parent and Mid parent
- 4.6 Morphological Characterization of Long melon Parents and Their Hybrids

4.1 Analysis of variance

Analysis of variance for line x tester mating design for both the years and pooled had been presented in Table- 4.1. Analysis of variance revealed that the differences among treatments/genotypes were highly significant for all the characters in both the years and pooled. Further partitioning of treatment variances in to parents, crosses, lines and testers revealed that variances due to parents was highly significant for all the traits. Variances due to lines were highly significant for all the traits. Variances due to testers were highly significant for most of the traits except days to first male flowering in Y1, days to first female flowering Y1, days to first harvesting in Y1, days to 50% female flowering in Y1, number of primary branches in Y1, number seeds per fruit in Y1, Y2 and pooled, total carotenoid content in Y2. Variances due to lines vs. Testers were highly significant for most of the characters excluding days to first male flowering in Y1, days to first female flowering Y1, days to first fruit harvest in Y1, number of primary branches in Y1. Similar findings were also reported by El-Shoura *et al.*, 2023, Singh *et al.*, 2022, Saha *et al.*, 2022, Handayani *et al.*, 2022.

4.2: Estimation of Components of Variance

The estimates of *gca* and *sca* variances, predictability ratio and average degree of dominance had been given in Table- 4.2.

In the year Y1 estimates of *sca* variance (σ^2_s) were higher than *gca* variances (σ^2_g) for all the traits *viz.*, days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering, number of primary branches per plant, fruit length, fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, ascorbic acid, reducing sugars, nonreducing sugar, total sugars, total carotenoid content, dry matter, fruit yield per plant and fruit yield per hectare.

The value of *sca* variances were found significant and positive for days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first female flower appears, days to 50% female flowering, fruit length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, reducing sugars, non-reducing sugar, total sugars, total carotenoid content, dry matter, fruit yield per plant and fruit yield per hectare while, rest of the characters were non-significant. Positive and significant *gca* variances were also exhibited by all the traits except days to first female flowering, days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, number of primary branches per plant, fruit breadth, vine length, total soluble solids, ascorbic acid, fruit yield per plant.

The value of average degree of dominance were more than unity (1) for all the twentytwo traits *viz.*, days to first male flowering (1.25), days to first female flowering (1.58), days to first harvesting (1.5), number of nodes at which first male flower appears (1.12), number of nodes at which first female flower appears (1.87), days to 50% female flowering (1.2), number of primary branches per plant (1.55), fruit length (1.7), fruit breadth (1.62), vine length (1.55), average fruit weight (1.76), number of fruits per plant (1.72), number of seeds per fruits (1.26), total soluble solids (1.77), ascorbic acid (1.52), reducing sugars (1.37), non-reducing sugar (4.18), total sugars (1.83), total carotenoid content (1.48), dry matter (1.63), fruit yield per plant (1.68) and fruit yield per hectare (1.68). Predictability ratio was observed more than one for all the characters.

Table 4.1: Analysis of variance (Mean sum of square) for twenty- two characters of line × tester set of crosses and their parents in long melon over two years (Y1= 2024, Y2 = 2025) and pooled.

Source	df	Days to first male flowering			Days to first female flowering			Days to first harvesting			Number of nodes at which first male flower appears			Number of nodes at which first female flower appears			Days to 50% female flowering		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLICATION	2	0.04	1.04	0.22	1.45	0.51	0.92	0.58	1.31	0.61	0.031	0.054	0.039	0.018	0.09	0.04	0.91	0.76	0.82
GENOTYPE	38	6.18**	18.39**	10.94**	4.42**	19.14**	9.00**	5.76**	26.04**	13.09**	0.899**	1.001**	0.945**	4.267**	4.41**	4.34**	8.27**	24.38**	13.62**
CROSS	26	7.70**	21.52**	13.31**	5.45**	21.37**	10.58**	6.82**	27.73**	14.73**	1.058**	1.155**	1.102**	4.451**	4.60**	4.52**	9.43**	27.77**	15.64**
PARENT	11	1.52**	10.82**	4.63**	2.15**	15.23**	5.80**	3.38**	24.38**	10.27**	0.571**	0.699**	0.626**	3.528**	3.68**	3.60**	6.15**	17.89**	9.71**
LINE(p)	8	1.66**	12.07**	5.02**	2.55**	14.52**	5.93**	3.95**	22.19**	10.55**	0.641**	0.750**	0.691**	3.937**	4.10**	4.02**	7.36**	15.85**	9.49**
TEST(p)	2	0.56	5.05**	2.21**	0.49	22.07**	5.96**	2.02	21.21**	5.91**	0.230**	0.099**	0.156**	0.976**	1.06**	1.02**	0.57	18.46**	6.35**
L(P)vT(P)	1	2.36	12.36**	6.37**	2.27	7.23**	4.42**	1.56	48.32**	16.76**	0.690**	1.484**	1.048**	5.360**	5.52**	5.44**	7.60**	33.08**	18.12**
H vs P	1	17.73**	20.13**	18.87**	2.35	4.28	3.24*	4.06	0.22	1.55	0.382**	0.346**	0.366**	7.595**	7.48**	7.53**	1.46	7.70**	3.97**
ERROR	76	0.69	0.69	0.28	0.92	1.03	0.61	0.97	0.93	0.49	0.017	0.049	0.016	0.018	0.09	0.03	1.21	0.92	0.52
TOTAL	116	2.48	6.50	3.77	2.07	6.95	3.36	2.53	9.16	4.62	0.306	0.361	0.321	1.410	1.51	1.44	3.52	8.60	4.82

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Number of primary branches per plant			Fruit length(cm)			Fruit breadth (cm)			Vine length(m)			Number of fruits per plant			Average fruit weight (g)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLICATION	2	0.171	0.014	0.023	0.08	4.34	1.21	0.004	0.029	0.003	0.001	0.030	0.007	0.72	2.81	1.14	2.24	31.66	5.49
GENOTYPE	38	1.056**	3.772**	2.068	162.21**	204.89**	182.49**	0.333**	0.364**	0.347**	0.739**	0.816**	0.776**	68.84**	109.47**	87.49**	404.36**	436.24**	420.10**
CROSS	26	1.294**	3.931**	2.382**	199.37**	243.93**	220.88**	0.389**	0.426**	0.406**	0.857**	0.942**	0.897**	81.79**	126.34**	102.3**	494.15**	531.04**	512.41**
PARENT	11	0.417**	3.648**	1.388**	58.61**	102.58**	78.73**	0.207**	0.228**	0.216**	0.467**	0.535**	0.501**	36.78**	70.36**	51.92**	148.74**	171.66**	159.92**
LINE(p)	8	0.516**	3.194**	1.296**	66.64**	117.87**	90.04**	0.218**	0.233**	0.224**	0.473**	0.527**	0.500**	37.43**	66.59**	50.68**	164.50**	182.66**	173.44**
TEST(p)	2	0.060	4.137**	1.262**	24.54**	48.63**	35.54**	0.066**	0.103**	0.082**	0.332**	0.408**	0.369**	21.49**	56.69**	36.82**	67.77**	94.92**	80.76**
L(P)vT(P)	1	0.339	6.303**	2.376**	62.50**	88.18**	74.65**	0.406**	0.440**	0.421**	0.694**	0.848**	0.772**	62.14**	127.86**	92.04**	184.58**	237.10**	210.06**
H vs P	1	1.901**	1.006**	1.413**	335.69**	315.25**	325.53**	0.250**	0.263**	0.256**	0.650**	0.631**	0.635**	84.99**	101.23**	92.87**	881.93**	882.06**	882.06**
ERROR	76	0.116	0.020	0.035	0.52	2.49	0.65	0.004	0.021	0.006	0.002	0.015	0.004	0.33	1.52	0.52	6.97	24.14	7.42
TOTAL	116	0.425	1.249	0.701	53.48	68.83	60.23	0.112	0.133	0.118	0.243	0.278	0.257	22.78	36.91	29.02	137.07	159.27	142.58

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Number of seeds per fruit			Total soluble solids (%)			Dry matter (%)			Ascorbic acid (mg/100mg)			Reducing sugar (%)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLICATION	2	1233.7	1233.0	1225.9	0.005	0.101	0.019	0.022	0.090	0.006	0.001	0.000	0.001	0.000	0.001	0.001
GENOTYPE	38	59138.9**	56445.1**	57580.1**	0.771**	0.882**	0.807**	1.134**	1.207**	1.169**	0.151**	0.176**	0.162**	0.858**	0.939**	0.899**
CROSS	26	69904.1**	66418.3**	67867.4**	0.873**	1.025**	0.921**	1.411**	1.480**	1.445**	0.176**	0.202**	0.188**	0.989**	1.055**	1.026**
PARENT	11	37010.7**	36846.1**	36923.3**	0.505**	0.563**	0.535**	0.319**	0.408**	0.361**	0.091**	0.112**	0.100**	0.605**	0.740**	0.665**
LINE(p)	8	46874.8**	46788.6**	46825.2**	0.500**	0.543**	0.524**	0.333**	0.420**	0.374**	0.094**	0.113**	0.103**	0.709**	0.749**	0.728**
TEST(p)	2	859.0	847.0	852.8	0.450**	0.552**	0.501**	0.280**	0.360**	0.315**	0.062**	0.085**	0.071**	0.075**	0.335**	0.178**
L(P)vT(P)	1	30401.3**	29304.1**	29849.2**	0.655**	0.748**	0.698**	0.287**	0.403**	0.346**	0.122**	0.156**	0.137**	0.829**	1.477**	1.129**
H vs P	1	22652.9**	12731.8**	17337.4**	1.043**	0.669**	0.845**	2.888**	2.929**	2.912**	0.162**	0.202**	0.182**	0.240**	0.136**	0.177**
ERROR	76	633.6	588.5	601.9	0.013	0.055	0.014	0.015	0.071	0.020	0.001	0.001	0.001	0.001	0.004	0.001
TOTAL	116	19809.5	18897.5	19277.9	0.261	0.327	0.274	0.382	0.443	0.396	0.050	0.059	0.053	0.282	0.310	0.295

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Non -reducing sugar (%)			Total sugar (%)			Total carotenoid content (µg/100mg)			Fruit yield per plant(kg)			Fruit yield (q/ha)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLICATION	2	0.005	0.006	0.005	0.005	0.005	0.001	0.01	0.62	0.19	0.002	0.007	0.001	8.3	145.8	50.8
GENOTYPE	38	0.242**	0.215**	0.228**	1.726**	1.726**	1.728**	17.80**	24.47**	19.89**	1.486**	2.112**	1.778**	5328.6**	8017.5**	6573.4**
CROSS	26	0.287**	0.253**	0.271**	1.967**	1.967**	1.971**	22.27**	23.04**	22.65**	1.826**	2.607**	2.194**	6531.2**	9697.1**	8006.7**
PARENT	11	0.113**	0.099**	0.106**	1.188**	1.188**	1.188**	7.23**	30.03**	14.61**	0.578**	0.903**	0.719**	2142.5**	3647.3**	2810.5**
LINE(p)	8	0.126**	0.114**	0.119**	1.373**	1.373**	1.374**	7.95**	40.62**	18.87**	0.601**	0.841**	0.707**	2158.1**	3348.3**	2706.4**
TEST(p)	2	0.068**	0.052**	0.060**	0.280**	0.280**	0.280**	2.75**	1.62	2.14**	0.356**	0.873**	0.568**	1358.0**	3097.2**	2026.1**
L(P)vT(P)	1	0.106**	0.074**	0.089**	1.524**	1.524**	1.517**	10.42**	2.11**	5.48**	0.837**	1.456**	1.120**	3587.4**	7139.3**	5212.6**
H vs P	1	0.466**	0.486**	0.475**	1.371**	1.371**	1.370**	17.65**	0.55	6.13**	2.633**	2.537**	2.592**	9106.4**	12420.7**	10699.0**
ERROR	76	0.005	0.005	0.005	0.005	0.005	0.001	0.07	0.33	0.10	0.006	0.035	0.010	24.4	110.2	36.3
TOTAL	116	0.082	0.074	0.078	0.569	0.569	0.567	5.88	8.24	6.58	0.491	0.715	0.589	1761.7	2701.2	2178.0

*, ** significant at 5% and 1% level, respectively

Table 4.2: Components of genetic variance, average degree of dominance, predictability ratio for twenty characters in pumpkin over two years (Y1, Y2 and pooled)

S. No.	Parameters Characters	<i>gca</i> variance (σ^2g)			<i>sca</i> variance (σ^2s)		
		Y1	Y2	Pooled	Y1	Y2	Pooled
1.	Days to first male flowering	0.121**	0.344**	0.216**	0.379**	1.362**	0.879**
2.	Days to first female flowering	0.069	0.371**	0.185**	0.343**	0.816**	0.309**
3.	Days to first harvesting	0.097	0.52**	0.264**	0.435**	0.508**	0.507**
4.	Number of nodes at which first male flower appears	0.019	0.021	0.02	0.046	0.034	0.045
5.	Number of nodes at which first female flower appears	0.064	0.067	0.065	0.447**	0.429**	0.448**
6.	Days to 50 % female flowering	0.144**	0.519**	0.282**	0.413**	0.5	0.457**
7.	Number of primary branches per plant	0.019	0.059	0.036	0.09	0.354**	0.203**
8.	Fruit length (cm)	3.02**	3.82**	3.4**	17.51**	18.73**	18.38**
9.	Fruit breadth (cm)	0.006	0.007	0.006	0.032	0.026	0.031
10.	Vine length (cm)	0.014	0.015	0.014	0.065	0.061	0.065
11.	Number of fruits per plant	1.23**	2.06**	1.61**	7.26**	8.36**	7.87**
12.	Average fruit weight (g)	7.26**	7.93**	7.59**	45.03**	41.13**	45.77**
13.	Number of seeds per fruit	1193.8**	1119.9**	1157.2**	3794.9**	3847.7**	3721.6**
14.	Total soluble solids (%)	0.013	0.014	0.014	0.08**	0.09**	0.083**
15.	Dry matter (%)	0.022**	0.023**	0.022**	0.115**	0.096	0.113**
16.	Ascorbic acid (mg/100g)	0.003	0.003	0.003	0.013	0.013	0.013
17.	Reducing sugar (%)	0.017**	0.018**	0.017**	0.062**	0.066**	0.065**
18.	Non-reducing sugar (%)	0.002**	0.001	0.002**	0.065**	0.062**	0.063**
19.	Total sugar (%)	0.029**	0.029**	0.029**	0.192**	0.192**	0.193**
20.	Total carotenoid content ($\mu\text{g}/100\text{mg}$)	0.361**	0.372**	0.366**	1.575**	1.554**	1.593**
21.	Fruit yield per plant (kg)	0.028	0.041**	0.034**	0.156**	0.194**	0.176**
22.	Fruit yield (q/ha)	99.3**	149.4**	122.9**	563.4**	787.5**	673**

Contd...

S. No.	Parameters Characters	Average degree of dominance			Predictability ratio $2\sigma_2g/2\sigma_2g + \sigma_2s$		
		$\sqrt{\sigma_2s/2\sigma_2g}$					
		Y1	Y2	Pooled	Y1	Y2	Pooled
1.	Days to first male flowering	1.25	1.41	1.43	0.39	0.34	0.33
2.	Days to first female flowering	1.58	1.05	0.91	0.29	0.48	0.54
3.	Days to first harvesting	1.5	0.7	0.98	0.31	0.67	0.51
4.	Number of nodes at which first male flower appears	1.12	0.9	1.06	0.45	0.55	0.47
5.	Number of nodes at which first female flower appears	1.87	1.79	1.85	0.22	0.24	0.23
6.	Days to 50% female flowering	1.2	0.69	0.9	0.41	0.67	0.55
7.	Number of primary branches per plant	1.55	1.74	1.68	0.29	0.25	0.26
8.	Fruit length (cm)	1.7	1.57	1.64	0.26	0.29	0.27
9.	Fruit Fruit breadth (cm)	1.62	1.39	1.55	0.28	0.34	0.29
10.	Vine length (cm)	1.55	1.41	1.49	0.29	0.34	0.31
11.	Number of fruits per plant	1.72	1.43	1.56	0.25	0.33	0.29
12.	Average fruit weight (g)	1.76	1.61	1.74	0.24	0.28	0.25
13.	Number of seeds per fruits	1.26	1.31	1.27	0.39	0.37	0.38
14.	Total soluble solids (%)	1.77	1.76	1.74	0.24	0.24	0.25
15.	Dry matter (%)	1.63	1.44	1.59	0.27	0.32	0.28
16.	Ascorbic acid (mg/100g)	1.52	1.38	1.45	0.3	0.34	0.32
17.	Reducing sugar (%)	1.37	1.36	1.37	0.35	0.35	0.35
18.	Non reducing sugar (%)	4.18	4.89	4.52	0.05	0.04	0.05
19.	Total sugar (%)	1.83	1.83	1.83	0.23	0.23	0.23
20.	Total Carotenoid content ($\mu\text{g}/100\text{mg}$)	1.48	1.44	1.47	0.31	0.32	0.32
21.	Fruit yield per plant (kg)	1.68	1.53	1.6	0.26	0.3	0.28
22.	Fruit yield (q/ha)	1.68	1.62	1.65	0.26	0.28	0.27

Contd...

S. No.	Parameters Characters	Additive variance (σ^2A)			Dominant variance (σ^2D)		
		Y1	Y2	Pooled	Y1	Y2	Pooled
1.	Days to first male flowering	0.037	0.118	0.072	0.09	0.354	0.203
2.	Days to first female flowering	6.04	7.63	6.81	17.51	18.73	18.38
3.	Days to first harvesting	0.012	0.014	0.013	0.032	0.026	0.031
4.	Number of nodes at which first male flower appears	0.027	0.031	0.029	0.065	0.061	0.065
5.	Number of nodes at which first female flower appears	0.128	0.133	0.13	0.447	0.429	0.448
6.	Days to 50% female flowering	0.288	1.037	0.564	0.413	0.5	0.457
7.	Number of primary branches per plant	0.037	0.118	0.072	0.09	0.354	0.203
8.	Fruit length (cm)	6.04	7.63	6.81	17.51	18.73	18.38
9.	Fruit Fruit breadth (cm)	0.012	0.014	0.013	0.032	0.026	0.031
10.	Vine length (cm)	0.027	0.031	0.029	0.065	0.061	0.065
11.	Number of fruits per plant	2.46	4.12	3.23	7.26	8.36	7.87
12.	Average fruit weight (g)	14.52	15.86	15.18	45.03	41.13	45.77
13.	Number of seeds per fruits	2387.5	2239.9	2314.4	3794.9	3847.7	3721.6
14.	Total soluble solids (%)	0.026	0.029	0.027	0.08	0.09	0.083
15.	Dry matter (%)	0.043	0.046	0.045	0.115	0.096	0.113
16.	Ascorbic acid (mg/100g)	0.006	0.007	0.006	0.013	0.013	0.013
17.	Reducing sugar (%)	0.033	0.035	0.034	0.062	0.066	0.065
18.	Non reducing sugar (%)	0.004	0.003	0.003	0.065	0.062	0.063
19.	Total sugar (%)	0.057	0.057	0.057	0.192	0.192	0.193
20.	Total Carotenoid content ($\mu\text{g}/100\text{mg}$)	0.721	0.745	0.733	1.575	1.554	1.593
21.	Fruit yield per plant (kg)	0.056	0.083	0.068	0.156	0.194	0.176
22.	Fruit yield (q/ha)	198.5	298.7	245.8	563.4	787.5	673

The magnitude of over dominance was highest for non-reducing sugar (4.18), Number of nodes at which first female flower appears (1.87), total sugars (1.83), total soluble solids (1.77), average fruit weight (1.76), number of fruits per plant (1.72), fruit length (1.7), fruit yield per plant (1.68), fruit yield per hectare (1.68), dry matter (1.63), fruit Fruit breadth (1.62), Days to first female flowering (1.58), number of primary branches per plant (1.55), vine length (1.55), ascorbic acid (1.52), Days to first harvesting (1.5), total carotenoid content (1.48), reducing sugars (1.37), number of seeds per fruits (1.26), days to first male flowering (1.25), days to 50% female flowering (1.2) and number of nodes at which first male flower appears (1.12).

Additive genetic variance (σ^2_A) was lower than dominance genetic variance (σ^2_D) for all the characters *viz.*, days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering, number of primary branches per plant, fruit length, fruit Fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, ascorbic acid, reducing sugars, non-reducing sugar, total sugars, total soluble solids, dry matter, fruit yield per plant and fruit yield except total carotenoid content.

In the year Y2, estimates of *sca* variance (σ^2_s) were higher than *gca* variances (σ^2_g) for for all the trait's *viz.*, days to first male flowering, days to first female flowering, days to first harvesting, Number of nodes at which first female flower appears, Number of nodes at which first female flower appears, number of primary branches per plant, fruit length, fruit Fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, ascorbic acid, reducing sugars, non-reducing sugar, total sugars, total carotenoid content, dry matter, fruit yield per plant and fruit yield per hectare except days to 50% female flowering.

The value of *sca* variances were found significant and positive for days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first female flower appears, number of primary branches per plant, fruit length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, reducing sugars, non-reducing sugar, total sugars, total carotenoid content, fruit yield per plant and fruit yield per hectare while, rest of the characters were non-significant. Positive and significant *gca* variances were also exhibited by all the traits

except number of nodes at which first male flower appears, node number to first female flower appears, number of primary branches per plant, fruit breadth, vine length, total soluble solids, ascorbic acid and non-reducing sugar.

The value of average degree of dominance were more than unity (1) for all the twenty traits *viz.*, days to first male flowering (1.41), Days to first female flowering (1.05), Number of nodes at which first female flower appears (1.79), number of primary branches per plant (1.74), fruit length (1.57), fruit Fruit breadth (1.39), vine length (1.41), average fruit weight (1.61), number of fruits per plant (1.43), number of seeds per fruits (1.31), total soluble solids (1.76), ascorbic acid (1.38), reducing sugars (1.36), non-reducing sugar (4.89), total sugars (1.83), total carotenoid content (1.44), dry matter (1.44), fruit yield per plant (1.53) and fruit yield per hectare (1.62) except days to 50% female flowering (0.69), days to first harvesting (0.7) and number of nodes at which first female flower appears (0.90). Predictability ratio was observed more than one for all the characters.

The magnitude of over dominance was highest for non-reducing sugar (4.89), total sugars (1.83), Number of nodes at which first female flower appears (1.79), total soluble solids (1.76), number of primary branches per plant (1.74), fruit yield per hectare (1.62), average fruit weight (1.61), fruit length (1.57), fruit yield per plant (1.53), dry matter (1.44), total carotenoid content (1.44), number of fruits per plant (1.43), Number of nodes at which first male flower appears (1.41), vine length (1.41), fruit Fruit breadth (1.39), ascorbic acid (1.38), reducing sugars (1.36), number of seeds per fruits (1.31), days to first female flowering (1.05), number of nodes at which first male flower appears (0.90), days to first harvesting (0.7) and days to 50% female flowering (0.69).

Additive genetic variance (σ^2_A) was lower than dominance genetic variance (σ^2_D) for all the characters *viz.*, days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering, number of primary branches per plant, fruit length, fruit Fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, ascorbic acid, reducing sugars, nonreducing sugar, total sugars, dry matter, fruit yield per plant and fruit yield except total carotenoid content.

In the year pooled, estimates of *sca* variance (σ^2_s) were higher than *gca* variances (σ^2_g) for all the trait's *viz.*, days to first male flowering, days to first female flowering,

days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering, number of primary branches per plant, fruit length, fruit Fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, ascorbic acid, reducing sugars, nonreducing sugar, total sugars, total carotenoid content, dry matter, fruit yield per plant and fruit yield .

The value of *sca* variances were found significant and positive for days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first female flower appears, days to 50% female flowering, number of primary branches per plant, fruit length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, reducing sugars, non-reducing sugar, total sugars, total carotenoid content, dry matter, fruit yield per plant and fruit yield while, rest of the characters was non-significant Likewise, positive and significant *gca* variances were also exhibited by all the traits except number of nodes at which first female flower appears, node number to first female flower appears, number of primary branches per plant, fruit Fruit breadth, vine length, total soluble solids and ascorbic acid.

The value of average degree of dominance were more than unity (1) for all the twenty traits viz. days to first male flowering (1.43), number of nodes at which first male flower appears (1.06), number of nodes at which first female flower appears (1.85), number of primary branches per plant (1.68), fruit length (1.64), fruit Fruit breadth (1.55), vine length (1.49), average fruit weight (1.74), number of fruits per plant (1.56), number of seeds per fruits (1.27), total soluble solids (1.74), ascorbic acid (1.45), reducing sugars (1.37), non-reducing sugar (4.52), total sugars (1.83), total carotenoid content (1.47), dry matter (1.59), fruit yield per plant (1.6) and fruit yield per hectare (1.65) except days to first harvesting (0.98), days to first female flowering (0.91) and days to 50% female flowering (0.9). Predictability ratio was observed more than one for all the characters.

The magnitude of over dominance was highest for non-reducing sugar (4.52), Number of nodes at which first female flower appears (1.85), total sugars (1.83), average fruit weight (1.74), total soluble solids (1.74), number of primary branches per plant (1.68), fruit yield per heactare (1.65), fruit length (1.64), fruit yield per plant (1.6), dry matter (1.59), number of fruits per plant (1.56), fruit Fruit breadth (1.55), vine length (1.49), total carotenoid content (1.47), ascorbic acid (1.45), days to first male flowering (1.43),

reducing sugars (1.37), number of seeds per fruits (1.27), number of nodes at which first male flower appears (1.06), days to first harvesting (0.98), days to first female flowering (0.91) and days to 50% female flowering (0.9).

Additive genetic variance (σ^2_A) was lower than dominance genetic variance (σ^2_D) for all the characters *viz.*, days to first male flowering, days to first female flowering, days to first harvesting, number of nodes at which first male flower appears, number of nodes at which first female flower appears, number of primary branches per plant, fruit length, fruit breadth, vine length, average fruit weight per plant, number of fruits per plant, number of seeds per fruits, total soluble solids, ascorbic acid, reducing sugars, non-reducing sugar, total sugars, dry matter, fruit yield per plant and fruit yield per hectare except days to 50% female flowering and total carotenoid content.

4.3: Proportional Contribution of Lines, Testers and Lines $\times$ Testers towards Total Variance (%)

Proportional contribution of lines, testers and lines $\times$ testers for the twenty characters in Y1, Y2 and pooled had been presented in Table- 4.3.

4.3.1 Proportional Contribution of Lines

proportional contribution of lines in Y1 varied from 55.91 per cent (Non reducing sugar) to 89.32 per cent (Number of nodes at which first male flower appears). The maximum contribution of lines were observed for Number of nodes at which first male flower appears (89.32 %) followed by number of seeds per fruit (87.58 %), reducing sugars (80.66%), fruit yield (86.45%), days to first male flowering (83.86%), total carotenoid content (83.73%), vine length (82.9%), ascorbic acid (82.52%), dry matter (81.61%), days to first female flowering (81.27%), fruit breadth (81.02%), fruit length (80.91%), total sugars (80.66%), days to 50% female flowering (80.04%), fruit yield per plant (80.02%), average fruit weight (79.99%), total soluble solids (78.54%) while, minimum contribution of lines were number of primary branches (78.41%), number of fruits per plant (78.32%), Days to first harvesting (74.44%), Number of nodes at which first female flower appears (63.05%) and non-reducing sugar (55.91%).

The proportional contribution of lines in Y2 varied from 52.01 per cent (non-reducing sugars) to 93.26 per cent (days to first harvesting). The maximum contribution of lines were observed for Days to first harvesting (93.26 %) followed by days to 50% female flowering (92.38%), Number of nodes at which first male flower appears (90.61%), Days

Table 4.3: Proportional contribution of lines, testers and their interaction to total variance in a set of line × tester crosses in long melon over two years (Y1= 2024, Y2 = 2025) and pooled.

S. No.	Characters	Contribution (%)								
		Lines			Testers			Lines× Testers		
		Y1	Y2	Pooled	Y1	Y2	Pooled	Y1	Y2	Pooled
1.	Days to first male flowering	83.86	85.39	86.18	1.34	0.68	0.57	14.79	13.93	13.25
2.	Days to first female flowering	63.05	89.42	86.83	13.16	0.76	3.68	23.8	9.82	9.49
3.	Days to first harvesting	74.44	93.26	89.61	6.19	1.1	2.25	19.37	5.64	8.13
4.	Number of nodes at which first male flower appears	89.32	90.61	90.05	1.63	1.66	1.68	9.05	7.73	8.27
5.	Number of nodes at which first female flower appears	81.27	81.59	81.4	0.01	0.01	0.01	18.72	18.4	18.6
6.	Days to 50% female flowering	80.04	92.38	89.51	4.02	1.79	2.76	15.95	5.83	7.73
7.	Number of primary branches per plant	78.41	79.93	80.24	3.03	3.1	3.15	18.56	16.96	16.61
8.	Fruit length (cm)	80.91	82.43	81.73	2.69	2.7	2.7	16.4	14.87	15.58
9.	Fruit Fruit breadth (cm)	81.02	82.9	82.11	3.57	2.89	3.17	15.42	14.21	14.73
10.	Vine length (cm)	82.9	84.14	83.5	2.89	2.88	2.93	14.21	12.98	13.58
11.	Number of fruits per plant	78.32	82.7	80.85	5	4.34	4.64	16.68	12.96	14.5
12.	Average fruit weight (g)	79.99	80.75	80.37	2.3	2.25	2.27	17.72	17	17.35
13.	Number of seeds per fruits	87.58	86.59	87.35	1.81	2.16	1.97	10.61	11.25	10.69
14.	Total soluble solids (%)	78.54	79.22	80.31	3.49	1.24	2.22	17.97	19.55	17.47
15.	Dry matter (%)	81.61	82.62	82.12	2.61	2.37	2.49	15.79	15.01	15.39
16.	Ascorbic acid (mg/100g)	82.52	84.22	83.64	3.46	3.71	3.59	14.01	12.07	12.77
17.	Reducing sugar (%)	86.45	86.65	86.52	1.9	1.71	1.81	11.65	11.64	11.68
18.	Non reducing sugar (%)	55.91	52.01	54.15	1.63	1.62	1.58	42.46	46.38	44.27
19.	Total sugar (%)	80.66	80.66	80.7	1.17	1.17	1.17	18.17	18.17	18.14
20.	Total Carotenoid content (µg/100mg)	83.73	83.55	83.64	2.99	3.11	3.06	13.27	13.33	13.29
21.	Fruit yield per plant (kg)	80.02	82.62	81.5	3.93	3.08	3.48	16.05	14.3	15.03
22.	Fruit yield per hectacre (q)	86.45	86.65	86.52	1.9	1.71	1.81	11.65	11.64	11.68

to first female flowering (89.42%), reducing sugar (86.65%), fruit yield (86.65%), number of seeds per fruit (86.59%), days to first male flowering (85.39%), ascorbic acid (84.22%), vine length (84.17%), total carotenoid content (83.55%), fruit breadth (82.9%), number of fruits per plant (82.7%), dry matter (82.62%), fruit yield per plant (82.62%), fruit length (82.43%), number of nodes at which first female flower appears (81.59%), average fruit weight (80.75%), total sugar (80.66%), number of primary branches (79.93%), total soluble solids (79.22%) and non reducing sugar (52.01%).

The proportional contribution of lines in pooled varied from 54.15 per cent (non-reducing sugar) to 90.05 per cent (number of nodes at which first male flower appears). The maximum contribution of lines were observed for Number of nodes at which first male flower appears (90.05 %), followed by days to first harvesting (89.61%), days to 50% female flowering (89.50%), number of seeds per fruit (87.85%), days to first female flowering (86.83%), reducing sugar (86.52%), fruit yield (86.52%), days to first male flowering (86.18%), ascorbic acid (83.64%), total carotenoid content (83.64%), vine length (83.50%), dry matter (82.12%), fruit breadth (82.11%), fruit length (81.73%), fruit yield per plant (81.50%), number of nodes at which first female flower appears (81.40%), number of fruits per plant (80.85%), total sugar (80.70%), average fruit weight (80.37%), total soluble solids (80.31%), number of primary branches (80.24%) and non-reducing sugar (54.15%).

4.3.2 Proportional contribution of testers (%)

The proportional contribution of testers towards the variability for different characters in Y1 ranged from 0.01 percent (number of nodes at which first female flower appears) to 13.16 percent (days to first female flowering). The maximum contribution of testers were recorded for days to first female flowering (13.16%), days to first harvesting (6.19%), number of fruits per plant (5%), days to 50% female flowering (4.02%), fruit yield per plant (3.93%), fruit breadth (3.57%), total soluble solids (3.49%), ascorbic acid (3.46%), number of primary branches (3.03%), total carotenoid content (2.99%), vine length (2.89%), fruit length (2.69%), dry matter (2.61%), average fruit weight (2.3%), reducing sugar (1.9%), fruit yield (1.9%), number of seeds per fruit (1.81%) while, minimum contribution of testers was recorded for non-reducing sugar (1.63%), number of nodes at which first male flower appears (1.63%), days to first male flowering (1.34%), total sugar (1.17%) and Number of nodes at which first female flower appears (0.01%).

The proportional contribution of testers towards the variability for different characters in Y2 ranged from 0.00 per cent (number of nodes at which first female flower appears) to 4.34 per cent (number of fruits per plant). The maximum contribution of testers was recorded for Number of fruits per plant (4.34%), ascorbic acid (3.71%), total carotenoid content (3.11%), number of primary branches per plant (3.1%), fruit yield per plant (93.08%), fruit breadth (2.89%), vine length (2.88%), fruit length (2.7%), dry matter (2.37%), average fruit weight (2.25%), number of seeds per fruits (2.16%), days to 50% female flowering (1.79%), reducing sugar (1.71%), fruit yield (1.17%), number of nodes at which first male flower appears (1.66%), total sugar (1.62%), total soluble solids (1.24%), % while, minimum contribution of testers was recorded total sugar (1.17%), days to first harvesting (1.1%), days to first female flowering (0.76%), days to first male flowering (0.68%) and number of nodes at which first female flower appears (0.01%).

The proportional contribution of testers towards the variability for different characters in pooled ranged from 0.01 per cent (number of nodes at which first female flower appears) to 4.64 percent (number of fruits per plant). The maximum contribution of testers was recorded number of fruits per plant (4.64%), days to first female flowering (3.68%), ascorbic acid (3.59%), fruit yield per plant (3.48%), fruit breadth (3.17%), number of primary branches per plant (3.15%), total carotenoid content (3.06%), vine length (2.93%), days to 50% female flowering (2.76%), fruit length (2.70%), dry matter (2.49%), average fruit weight (2.27%), Days to first harvesting (2.25%), total soluble solids (2.22%), number of seeds per fruits (1.97%), reducing sugar (1.81%), fruit yield (1.81%), number of nodes at which first male flower appears (1.68%), non-reducing sugar (1.58%), total sugar (1.17%), days to first male flowering (0.57%) and number of nodes at which first female flower appears (0.01%).

4.3.3 Proportional contribution of line x testers (%)

In Y1 proportional contribution of line x testers for different traits varied from 9.05 per cent (Number of nodes at which first male flower appears) to 42.46 per cent (non-reducing sugar). Lines x testers component displayed greater contribution for non reducing sugar (42.46%) followed by days to first female flowering (23.8%), days to first harvesting (19.37%), number of nodes at which first female flower appears (18.72%), number of primary branches per plant (18.56%), total sugar (18.17%), total soluble solids (17.97%), average fruit weight (17.72%), number of fruits per plant (16.68%), fruit length (16.40%),

fruit yield per plant (16.05%), days to 50% female flowering (15.95%), dry matter (15.79%), fruit Fruit breadth (15.42%), days to first male flowering (14.79%), vine length (14.21%), ascorbic acid (14.02%) while, lines x testers component displayed lesser contribution total carotenoid content (13.27%), reducing sugar (11.65%), fruit yield (11.65%), number of seeds per fruits (10.61%) and Number of nodes at which first male flower appears (9.05%).

In Y2 Proportional contribution of line $\times$ testers for different traits varied from 5.64 per cent (days to first harvesting) to 46.68 per cent (non-reducing sugar). Lines x testers component displayed greater contribution for non-reducing sugar (46.68%) followed by total soluble solids (19.55%), Number of nodes at which first female flower appears (18.40%), total sugar (18.17%), average fruit weight (17.00%), number of primary branches per plant (16.96%), dry matter (15.01%), fruit length (14.87%), fruit yield per plant (14.30%), fruit Fruit breadth (14.21%), days to first male flowering (13.93%), total carotenoid content (13.33%), vine length (12.98%), number of fruits per plant (12.96%), ascorbic acid (12.07%), fruit yield (11.64%), reducing sugar (11.64%) while, lines x testers component displayed lesser contribution number of seeds per fruits (11.25%), days to first female flowering (9.82%), number of nodes at which first male flower appears (7.73%), days to 50% female flowering (5.83%) and days to first harvesting (5.64%).

In pooled proportional contribution of line x testers for different traits varied from 7.73 per cent (days to 50% female flowering) to 44.27 per cent (reducing sugar). Lines x testers component displayed greater contribution for reducing sugar (44.27 %), Number of nodes at which first female flower appears (18.60%), total sugar (18.14%), total soluble solids (17.47%), average fruit weight (17.35%), number of primary branches per plant (16.61%), fruit length (15.58%), dry matter (15.39%), fruit yield per plant (15.03%), fruit Fruit breadth (14.73%), number of fruits per plant (14.50%), vine length (13.58%), total carotenoid content (13.29%), days to first male flowering (13.25%), ascorbic acid (12.77%), reducing sugar (11.68%), fruit yield (11.68%), while, lines $\times$ testers component displayed lesser contribution for number of seeds per fruits (10.69%), days to first female flowering (9.49%), number of nodes at which first male flower appears (8.27%), days to first harvesting (8.13%) and days to 50% female flowering (7.73%).

Proportional contribution of lines, testers and lines $\times$ testers for the twenty characters in Y1, Y2 and pooled had been presented in Table 4.5. The knowledge

proportional contribution of lines, testers and their interplay components towards the expression of different characters gives an idea of relative importance of the nature and magnitude of genetic variability present in the material studied. Fixable component of genetic variation is reflected by the contribution of lines and testers while non-fixable effects are shown by the lines $\times$ testers component. The relative contribution of lines component was higher than the lines $\times$ testers and testers for all the characters in both the years which confirmed predominant role of additive gene effects in the inheritance of these characters. The predicated results, thus, revealed the greater importance of fixable components of genetic variation in the expression of all the characters under study.

4.4 Combining Ability Variances and Their Effect

4.4.1 Analysis of variance for combining ability

Analysis of variances for combining ability in both the years (Y1, Y2 and pooled) had presented in Table- 4.4.1 Analysis of variances for combining ability revealed that the partitioning of variances due to crosses how edhighly significant differences for all the twenties characters in both Y1, Y2 and pooled. Variances due to lines $\times$ testers were highly significant for all the characters in both years and pooled, except for days to first female flowering in Y1 and number of nodes at which first female flower appears in Y1, Y2 and pooled. Similar findings were also reported by Duradundi *et al.*, 2022, Esmaeili *et al.*, 2022, Handayani *et al.*, 2022.

4.4.2 Estimates of general combining ability effects

The estimates of general combining ability (*gca*) effects for all the twenty- two characters in respect to 12 parents (9 females and 3 males) in Y1, Y2 and pooled had presented in Table-4.4.2. The negative estimates of general combining ability were considered desirable for days to first male flowering, days to first female flowering, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering and days to first harvesting (earliness). However, for rest of the characters, positive estimates of general combining ability were considered desirable. The character wise results are presented below in sub-heads:

4.4.2.1 Days to first male flowering

Among parents NDLM-23-8 (-2.55), NDLM-23-6 (-1.75), NDLM-23-3 (-1.44) and Punjab Long melon (-0.21) exhibited significant and negative *gca* effects for days to

Table 4.4.1: Analysis of variance for combining ability following line $\times$ tester mating design for twenty-two characters in long melon over two years (Y1=2024, Y2=2025) and pooled.

Source	df	Days to first male flowering			Days to first female flowering			Days to first harvesting			Number of nodes at which first male flower appears			Number of nodes at which first female flower appears			Days to 50% female flowering		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLN	2	0.06	1.26	0.47	1.24	1.04	1.05	0.15	0.62	0.05	0.010	0.034	0.018	0.005	0.08	0.03	0.54	0.11	0.20
CROSS	26	7.70**	21.52**	13.31**	5.45**	21.37**	10.58**	6.82**	27.73**	14.73**	1.058**	1.155**	1.102**	4.45**	4.60**	4.52**	9.43**	27.77**	15.64**
LINE(c)	8	20.99**	59.73**	37.27**	11.17**	62.10**	29.85**	16.51**	84.05**	42.89**	3.072**	3.400**	3.226**	11.75**	12.21**	11.97**	24.53**	83.37**	45.50**
TEST(c)	2	1.34*	1.90*	0.99**	9.32**	2.10*	5.06**	5.49**	3.97**	4.31**	0.224**	0.250**	0.241**	0.005	0.001	0.002	4.93**	6.45**	5.61**
LXT (c)	16	1.85**	4.87**	2.86**	2.11	3.41**	1.63**	2.15**	2.54**	1.95**	0.156**	0.145**	0.148**	1.35**	1.38**	1.37**	2.44**	2.63**	1.96**
ERROR	52	0.71	0.79	0.23	1.08	0.96	0.71	0.84	1.02	0.43	0.017	0.043	0.014	0.015	0.09	0.02	1.20	1.13	0.59
TOTAL	80	2.97	7.54	4.48	2.50	7.60	3.92	2.77	9.69	5.06	0.355	0.404	0.368	1.456	1.56	1.49	3.86	9.76	5.47

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Number of primary branches per plant			Fruit length(cm)			Fruit breadth (cm)			Vine length(m)			Number of fruits per plant			Average fruit weight (g)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLN	2	0.196	0.002	0.049	0.03	6.37	1.54	0.001	0.033	0.009	0.002	0.039	0.007	0.88	3.40	1.71	4.30	31.08	3.80
CROSS	2 6	1.294* *	3.931**	2.382* *	199.37* *	243.93* *	220.88* *	0.389* *	0.426* *	0.406* *	0.857* *	0.942* *	0.897* *	81.79**	126.34* *	102.34* *	494.15**	531.04**	512.41**
LINE(c))	8	3.298* *	10.213* *	6.211* *	524.26* *	653.49* *	586.68* *	1.024* *	1.147* *	1.082* *	2.309* *	2.577* *	2.434* *	208.19* *	339.57* *	268.92* *	1284.54* *	1393.63* *	1338.49* *
TEST(c))	2	0.510* *	1.587**	0.977* *	69.71**	85.53**	77.44**	0.180* *	0.160* *	0.167* *	0.322* *	0.353* *	0.341* *	53.17**	71.21**	61.77**	147.73**	155.02**	151.37**
LXT (c)	1 6	0.390* *	1.084**	0.643* *	53.14**	58.95**	55.91**	0.097* *	0.098* *	0.097* *	0.198* *	0.199* *	0.198* *	22.16**	26.61**	24.12**	142.25**	146.74**	144.50**
ERRO R	5 2	0.120	0.021	0.035	0.61	2.75	0.79	0.003	0.021	0.005	0.002	0.016	0.004	0.39	1.51	0.50	7.16	23.34	7.19
TOTAL	8 0	0.503	1.291	0.798	65.19	81.22	72.34	0.128	0.153	0.136	0.280	0.318	0.295	26.86	42.13	33.63	165.36	188.54	171.30

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Number of seeds per fruit			Total soluble solids (%)			Dry matter (%)			Ascorbic acid (mg/100mg)			Reducing sugar (%)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLN	2	1646.8	1553.6	1589.4	0.010	0.117	0.020	0.008	0.106	0.015	0.001	0.001	0.001	0.001	0.001	0.001
CROSS	26	69904.1**	66418.3**	67867.4**	0.873**	1.025**	0.921**	1.411**	1.480**	1.445**	0.176**	0.202**	0.188**	0.989**	1.055**	1.026**
LINE(c)	8	198973.8**	186910.8**	192660.5**	2.227**	2.640**	2.404**	3.743**	3.973**	3.855**	0.471**	0.553**	0.510**	2.779**	2.971**	2.885**
TEST(c)	2	16433.4**	18635.4**	17341.3**	0.396**	0.165**	0.266**	0.478**	0.456**	0.467**	0.079**	0.098**	0.088**	0.244**	0.234**	0.241**
LXT (c)	16	12053.1**	12144.9**	11786.6**	0.255**	0.326**	0.262**	0.362**	0.361**	0.361**	0.040**	0.040**	0.039**	0.187**	0.200**	0.195**
ERROR	52	668.2	601.8	621.8	0.014	0.057	0.014	0.017	0.072	0.022	0.001	0.001	0.001	0.001	0.002	0.002
TOTAL	80	23194.3	22016.0	22500.8	0.293	0.373	0.309	0.470	0.531	0.484	0.058	0.066	0.061	0.322	0.344	0.334

*, ** significant at 5% and 1% level, respectively

Contd...

Source	df	Non -reducing sugar (%)			Total sugar (%)			Total carotenoid content (µg/100mg)			Fruit yield per plant(kg)			Fruit yield (q/ha)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
REPLN	2	0.003	0.005	0.004	0.001	0.001	0.000	0.01	0.84	0.20	0.004	0.024	0.008	8.4	264.9	88.4
CROSS	26	0.287**	0.253**	0.271**	1.967**	1.967**	1.971**	22.27**	23.04**	22.65**	1.826**	2.607**	2.194**	6531.2**	9697.1**	8006.7**
LINE(c)	8	0.522**	0.428**	0.476**	5.155**	5.155**	5.168**	60.62**	62.56**	61.57**	4.749**	7.001**	5.812**	16953.0**	25597.8**	21012.1**
TEST(c)	2	0.061**	0.053**	0.056**	0.299**	0.299**	0.299**	8.66**	9.33**	9.01**	0.934**	1.044**	0.991**	3324.6**	4005.8**	3628.2**
LXT (c)	16	0.198**	0.191**	0.195**	0.581**	0.581**	0.581**	4.80**	4.99**	4.89**	0.476**	0.606**	0.536**	1721.2**	2458.2**	2051.4**
ERROR	52	0.004	0.005	0.005	0.005	0.005	0.001	0.08	0.33	0.11	0.007	0.024	0.008	30.9	95.6	32.3
TOTAL	80	0.096	0.085	0.091	0.642	0.642	0.641	7.29	7.72	7.44	0.598	0.863	0.718	2142.9	3220.3	2625.4

*, ** significant at 5% and 1% level, respectively

first male flowering in Y1. In Y2, significant and negative *gca* effects were recorded for NDLM-23-8 (3.79), NDLM-23-6 (-3.44) and NDLM-23-3 (-2.84) and in case of pooled, significant and negative *gca* effects were observed for NDLM-23-8 (-3.17), NDLM-23-6 (-2.60) and NDLM-23-3 (-2.14). On the basis of *per se* performance and *gca* effect, parents NDLM-23-8 and NDLM-23-6 in both the years were considered best general combiner for days to first male flowering.

4.4.2.2 Days to first female flowering

Out of 12 parents, among line NDLM-23-8 (-1.85), NDLM-23-6 (-0.80), NDLM-23-3 (-0.70) and Kashi Vidhi (-0.63) were exhibited significant and negative *gca* effects for days to first female flowering in Y1 and in Y2, among parents significant and negative *gca* effects were recorded for NDLM-23-8 (-3.64), NDLM-23-6 (-3.50) and NDLM-23-3 (-2.90). In pooled significant and negative *gca* effects were observed for NDLM-23-8 (-2.75), NDLM-23-6 (2.15), NDLM-23-3 (-1.80) and Kashi Vidhi (-0.47). On the basis of *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 in Y1 and NDLM-23-8, NDLM-23-6 in Y2 were found good general combiner.

4.4.2.3 Days to 50% female flowering

For this trait negative and significant high value *gca* effects were exhibited by NDLM-23-8 (-1.62) followed by NDLM-23-6 (-1.53), NDLM-23-3 (-1.32) and tester Kashi Vidhi (0.48 in Y1. However, parents NDLM-23-8 (-4.93) followed by NDLM-23-6 (-4.13), NDLM-23-3 (-2.47) and tester Kashi Vidhi (-0.56) showed significant and negative *gca* effects for days to 50% female flowering in Y2. Over year pooled NDLM-23-8 (-3.27), NDLM-23-6 (-2.83), NDLM-23-3 (-1.90) and tester Kashi Vidhi (-0.52) exhibited significant and negative *gca* effects for days to 50% female flowering. Based on *per se* performance and *gca* effects parents NDLM-23-6 and NDLM-23-8 was recorded good general combiner.

4.4.2.4 Number of nodes at which first male flower appears

Negative and significantly high value *gca* effects were exhibited by parents NDLM-23-6 (-0.65) followed by NDLM-23-8 (-0.64), NDLM-23-3 (-0.53) and tester Kashi Vidhi (-0.09) exhibited significant and negative *gca* effects in Y1. On other hand in Y2, significant and negative *gca* effects were recorded NDLM-23-8 (-0.70) followed by NDLM-23-6 (-0.66), NDLM-23-3 (0.54) and Kashi Vidhi (-0.09) exhibited significant and

negative *gca* effects. The result over year pooled showed negative significant by NDLM-23-8 (-0.70) followed by NDLM-23-6 (-0.66) and NDLM-23-3 (-0.54) However, tester Kashi Vidhi (-0.09) exhibited significant and negative *gca* effects for number of nodes at which first male flower appears. On the basis of *per se* performance and *gca* effects NDLM-23-6 and NDLM-23-8 were recorded best general combiner.

4.4.2.5 Number of nodes at which first female flower appears

Parent NDLM-23-8 (-1.48) followed by NDLM-23-3 (-1.17), NDLM-23-6 (-0.15) and NDLM23-9 (-0.10) exhibited significant and negative *gca* effects for number of nodes at which first female flower appears in Y1 and whereas in Y2, NDLM-23-8 (-1.51) followed by NDLM-23-3 (-1.20) and NDLM-23-6 (-1.18) showed significant and negative *gca* effects, while over year pooled NDLM-23-8 (-1.49) followed by NDLM-23-3 (-1.18), NDLM-23-6 (-0.17) exhibited significant and negative *gca* effects for number of nodes at which first female flower appears. Based on *per se* performance and *gca* effects parents NDLM-23-6 and NDLM-23-8 were recorded best general combiner.

4.4.2.6 Days to first harvesting

In respect of days to first fruit harvest parents NDLM-23-8 (-2.17) followed by NDLM23-6 (-1.58) and tester Kashi Vidhi (-0.49) exhibited significant and negative *gca* effects for days to first harvesting. In Y2, NDLM-23-8 (-5.00) followed by NDLM-23-6 (-4.28), NDLM23-3 (-1.94), However one parent among testers Kashi Vidhi (-0.43) showed significant and negative *gca* effects. In pooled results NDLM-23-8 (-3.59), NDLM-23-6 (-2.93), NDLM-23-3 (-1.25) and Kashi Vidhi (-0.46) parents exhibited significant and negative *gca* effects for Days to first harvesting. Based on *per se* performance and *gca* effects parents NDLM-23-6 and NDLM-23-8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.7 Number of primary branches per plant

Out of 12 parents, NDLM-23-8 (0.95) followed by NDLM-23-6 (0.79), NDLM-23-3 (0.38) and Kashi Vidhi (0.15) exhibited significant and positive *gca* effects in Y1 and parents NDLM-23-8 (1.67) followed by NDLM-23-6 (1.34), NDLM-23-3 (0.83) and Kashi Vidhi (0.26) showed significant and positive *gca* effects for number of primary branches per plant. Pooled results showed NDLM-23-8 (1.31) followed by NDLM-23-6 (1.07), NDLM-23-3 (0.60) and Kashi Vidhi (0.21) were significant and positive *gca* effects for

number of primary branches per plant. Based on *per se* performance and *gca* effects parents NDLM-23-6 and NDLM-23-8 were recorded good general combiner in both years Y1 and Y2.

4.4.2.8 Fruit Length (cm)

Among parents NDLM-23-8 (11.05) followed by NDLM-23-6 (10.75), NDLM-23-3 (5.99) and tester Kashi Vidhi (1.70) exhibited significant and positive *gca* effects in Y1. In Y2, parents NDLM-23-8 (12.34) followed by NDLM-23-6 (11.97), NDLM-23-3 (7.24) and Kashi Vidhi (1.92) exhibited significant and positive *gca* effects for fruit length and NDLM-23-8 (11.69) followed by NDLM-23-6 (11.36), NDLM-23-3 (6.61) and Kashi Vidhi (1.81) in over year pooled had showed positive and significant *gca* effects. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23-8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.9 Fruit breadth (cm)

Positive *gca* is desirable for this trait, among parent NDLM-23-8 (0.45) followed by NDLM-23-6 (0.42), NDLM-23-3 (0.29) and Kashi Vidhi (0.09) exhibited significant and positive *gca* effects in Y1. On other hand NDLM-23-8 (0.47) followed by NDLM-23-6 (0.46), NDLM-23-3 (0.33) and Kashi Vidhi (0.09) exhibited significant and positive *gca* effects for fruit breadth in Y2 and NDLM-23-8 (0.46) followed by NDLM-23-6 (0.44), NDLM-23-3 (0.31) and Kashi Vidhi (0.09) over year pooled showed significant and positive *gca* effects for fruit breadth. On the basis of *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23-8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.10 Vine length (m)

Among 12 parent, 4 parents NDLM-23-8 (0.68) followed by NDLM-23-6 (0.61), NDLM-23-3 (0.46) and Kashi Vidhi (0.11) exhibited significant and positive *gca* effects in Y1, However in Y2, NDLM-23-8 (0.72) followed by NDLM-23-6 (0.65), NDLM-23-3 (0.51) and Kashi Vidhi (0.12) exhibited significant and positive *gca* effects Whereas NDLM-23-8 (0.70) followed by NDLM-23-6 (0.63), NDLM-23-3 (0.48) and among testers, Kashi Vidhi (0.12) observed significant and positive *gca* effects over pooled for vine length (m). Based on *per se* performance and *gca* effects parents NDLM-23-3,

NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.11 Number of fruits per plant

Among parents NDLM-23-6 (6.82) followed by NDLM-23-8 (6.76), NDLM-23-3 (3.48) and Kashi Vidhi (1.50) exhibited significant and positive *gca* effects in Y1. However, NDLM23-6 (7.73) followed by NDLM-23-8 (7.66), NDLM-23-3 (4.55) and Kashi Vidhi (1.78) exhibited significant and positive *gca* effects in Y2. Whereas NDLM-23-6 (6.82) followed by NDLM-23-8 (6.76), NDLM-23-3 (3.48) and Kashi Vidhi (1.64) exhibited significant and positive *gca* effects in pooled results. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded good general combiner in both years Y1 and Y2.

4.4.2.12 Average fruit weight (gm)

Out of 12 Parents NDLM-23-8 (18.29) followed by NDLM-23-6 (15.63), NDLM-23-3 (10.68) and Kashi Vidhi (2.54) exhibited significant and positive *gca* effects in Y1. However, parents NDLM-23-8 (18.96) followed by NDLM-23-6 (16.31), NDLM-23-3 (11.34) and Kashi Vidhi (2.61) showed significant and positive *gca* effects in Y2 whereas NDLM-23-8 (18.63) followed by NDLM-23-6 (15.97), NDLM-23-3 (11.01) and Kashi Vidhi (2.58) exhibited significant and positive *gca* effects over pooled for average fruit weight. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23-8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.13 Number of seeds per fruit

In respect of number of seeds per fruits, only 4 parents namely, NDLM-23-8 (198.85), NDLM-23-6 (179.19), NDLM-23-3 (125.52) and Kashi Vidhi (24.41) exhibited positive and significant *gca* effect in Y1 and in case of Y2, NDLM-23-8 (204.15), NDLM-23-6 (149.81), NDLM-23-3 (129.48) and Kashi Vidhi (28.59) While the result for NDLM-23-8 (201.50), NDLM-23-6 (164.50), NDLM-23-3 (127.50) and Kashi Vidhi (26.50) over year pooled showed positive significant for *gca* effect. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

Table 4.4.2: Estimates of general combiningability (*gca*) effects of parents (lines and testers) for twenty-two characters in long melon over two years (Y1=2024, Y2=2025) and pooled

S. No.	Parents	Days to first male flowering			Days to first female flowering			Days to first harvesting			Number of nodes at which first male flower appears			Number of nodes at which first female flower appears			Days to 50% female flowering		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1	NDLM-23-1	0.75**	2.06**	1.41**	0.12	2.01**	1.06**	0.46	1.14**	0.80**	0.09*	0.13	0.11**	0.34**	0.36**	0.35**	-0.07	1.76**	0.84**
2	NDLM-23-2	1.85**	2.27**	2.06**	1.73**	3.01**	2.37**	1.86**	3.82**	2.84**	1.04**	1.08**	1.05**	2.07**	2.09**	2.08**	3.57**	3.66**	3.62**
3	NDLM-23-3	-1.44**	-2.84**	-2.14**	-0.70*	-2.90**	-1.80**	-0.56	-1.94**	-1.25**	-0.53**	-0.56**	-0.54**	-1.17**	-1.20**	-1.18**	-1.32**	-2.47**	-1.90**
4	NDLM-23-4	0.60*	2.14**	1.37**	0.10	1.55**	0.82**	0.83**	1.46**	1.15**	0.07	0.09	0.08*	0.53**	0.55**	0.54**	-0.08	1.87**	0.90**
5	NDLM-23-5	1.42**	1.82**	1.62**	1.52**	2.23**	1.87**	1.62**	2.74**	2.18**	0.73**	0.76**	0.74**	0.94**	0.96**	0.95**	1.49**	2.07**	1.78**
6	NDLM-23-6	-1.75**	-3.44**	-2.60**	-0.80*	-3.50**	-2.15**	-1.58**	-4.28**	-2.93**	-0.65**	-0.67**	-0.66**	-1.15**	-1.18**	-1.17**	-1.53**	-4.13**	-2.83**
7	NDLM-23-7	0.61*	0.92**	0.77**	0.10	0.79*	0.45	0.00	1.14**	0.57*	-0.03	-0.08	-0.05	0.02	0.03	0.02	-0.12	1.15**	0.52*
8	NDLM-23-8	-2.55**	-3.79**	-3.17**	-1.85**	-3.64**	-2.75**	-2.17**	-5.00**	-3.59**	-0.64**	-0.70**	-0.67**	-1.48**	-1.51**	-1.49**	-1.62**	-4.93**	-3.27**
9	NDLM-23-9	0.50	0.86**	0.68**	-0.22	0.46	0.12	-0.46	0.91**	0.23	-0.07	-0.05	-0.06	-0.10*	-0.09	-0.10	-0.32	1.02**	0.35
10	Kashi Santusthi	0.26	0.07	0.16	0.53**	0.24	0.38*	0.40*	0.13	0.27*	0.09**	0.10*	0.10**	-0.01	-0.01	-0.01	0.35	0.35	0.35*
11	Punjab Long Melon	-0.13	-0.29	-0.21*	0.11	0.07	0.09	0.09	0.30	0.19	0.00	-0.01	-0.01	0.00	0.00	0.00	0.13	0.21	0.17
12	Kashi Vidhi	-0.13	0.22	0.05	-0.63**	-0.31	-0.47**	-0.49**	-0.43*	-0.46**	-0.09**	-0.09*	-0.09**	0.01	0.01	0.01	-0.48*	-0.56**	-0.52**
SE(<i>gca</i> L)		0.282	0.296	0.159	0.346	0.327	0.280	0.306	0.337	0.218	0.043	0.069	0.040	0.040	0.100	0.052	0.366	0.354	0.257
SE(<i>gca</i> T)		0.163	0.171	0.092	0.200	0.189	0.162	0.177	0.194	0.126	0.025	0.040	0.023	0.023	0.058	0.030	0.211	0.205	0.148
SE(bet <i>gca</i> L)		0.398	0.418	0.225	0.490	0.463	0.396	0.433	0.476	0.308	0.061	0.097	0.057	0.057	0.141	0.074	0.518	0.501	0.363
SE(bet <i>gca</i> T)		0.230	0.241	0.130	0.283	0.267	0.229	0.250	0.275	0.178	0.035	0.056	0.033	0.033	0.081	0.043	0.299	0.289	0.210

*,** significant at 5% and 1% level, respectively

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S. No.	Parents	Number of primary branches per plant			Fruit length(cm)			Fruit breadth (cm)			Vine length(m)			Number of fruits per plant			Average fruit weight (g)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1	NDLM-23-1	-0.22	-0.85**	-0.54**	-4.39**	-5.19**	-4.79*	-0.13**	-0.12*	-0.13**	-0.21**	-0.24**	-0.22**	-1.95**	-3.14**	-2.54**	-7.37**	-7.73**	-7.55**
2	NDLM-23-2	-0.96**	-1.60**	-1.28**	-9.23**	-10.01**	-9.62**	-0.49**	-0.49**	-0.49**	-0.74**	-0.76**	-0.75**	-6.33**	-7.20**	-6.76**	-13.21**	-13.63**	-13.42**
3	NDLM-23-3	0.38**	0.83**	0.60**	5.99**	7.24**	6.61**	0.29**	0.33**	0.31**	0.46**	0.51**	0.48**	3.48**	5.62**	4.55**	10.68**	11.34**	11.01**
4	NDLM-23-4	-0.21	-0.40**	-0.30**	-3.27**	-4.05**	-3.66**	-0.09**	-0.11*	-0.10**	-0.06**	-0.09*	-0.08**	-1.23**	-2.38**	-1.81**	-5.53**	-5.94**	-5.74**
5	NDLM-23-5	-0.46**	-0.39**	-0.42**	-8.59**	-9.06**	-8.82**	-0.43**	-0.45**	-0.44**	-0.64**	-0.66**	-0.65**	-5.80**	-6.97**	-6.39**	-12.99**	-13.40**	-13.20**
6	NDLM-23-6	0.79**	1.34**	1.07**	10.75**	11.97**	11.36**	0.42**	0.46**	0.44**	0.61**	0.65**	0.63**	6.82**	8.65**	7.73**	15.63**	16.31**	15.97**
7	NDLM-23-7	-0.15	-0.26**	-0.20**	-1.90**	-2.71**	-2.30**	-0.04*	-0.06	-0.05*	-0.06**	-0.09*	-0.07**	-1.18**	-2.35**	-1.77**	-4.42**	-4.80**	-4.61**
8	NDLM-23-8	0.95**	1.67**	1.31**	11.05**	12.34**	11.69**	0.45**	0.47**	0.46**	0.68**	0.72**	0.70**	6.76**	8.57**	7.66**	18.29**	18.96**	18.63**
9	NDLM-23-9	-0.11	-0.36**	-0.23**	-0.41	-0.54	-0.47	0.01	0.00	0.00	-0.04*	-0.04	-0.04	-0.57**	-0.78	-0.68**	-1.08	-1.11	-1.09
10	Kashi Santusthi	-0.12	-0.21**	-0.16**	-1.49**	-1.60**	-1.54**	-0.07**	-0.06*	-0.06**	-0.10**	-0.11**	-0.11**	-1.28**	-1.39**	-1.33**	-2.07**	-2.09*	-2.08**
11	Punjab Long Melon	-0.04	-0.05	-0.04	-0.21	-0.32	-0.27	-0.03*	-0.03	-0.02	-0.01	-0.01	-0.01	-0.23	-0.39	-0.31*	-0.46	-0.52	-0.49
12	Kashi Vidhi	0.15*	0.26**	0.21**	1.70**	1.92**	1.81**	0.09**	0.09**	0.09**	0.11**	0.12**	0.12**	1.50**	1.78**	1.64**	2.54**	2.61**	2.58**
	SE(<i>gca</i> L)	0.115	0.048	0.063	0.260	0.553	0.296	0.019	0.048	0.025	0.015	0.043	0.022	0.208	0.410	0.236	0.892	1.611	0.894
	SE(<i>gca</i> T)	0.067	0.028	0.036	0.150	0.319	0.171	0.011	0.028	0.014	0.009	0.025	0.013	0.120	0.237	0.137	0.515	0.930	0.516
	SE(bet <i>gca</i> L)	0.163	0.068	0.089	0.368	0.782	0.418	0.026	0.068	0.035	0.021	0.060	0.031	0.295	0.580	0.334	1.262	2.278	1.264
	SE(bet <i>gca</i> T)	0.094	0.039	0.051	0.212	0.451	0.241	0.015	0.039	0.020	0.012	0.035	0.018	0.170	0.335	0.193	0.728	1.315	0.730

*,** significant at 5% and 1% level, respectively

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S. No.	Parents	Number of seeds per fruit			Total soluble solids (%)			Dry matter (%)			Ascorbic acid (mg/100mg)			Reducing sugar (%)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1	NDLM-23-1	-4.48	1.81	-1.33	-0.11**	-0.38**	-0.25**	-0.45**	-0.46**	-0.46**	0.10**	0.12**	0.11**	0.00	-0.03	-0.02*
2	NDLM-23-2	-210.48**	-205.52**	-208.00**	-0.79**	-0.77**	-0.78**	-0.65**	-0.67**	-0.66**	0.35**	0.36**	0.36**	-0.95**	-0.96**	-0.96**
3	NDLM-23-3	125.52**	129.48**	127.50**	0.40**	0.48**	0.44**	0.59**	0.62**	0.60**	-0.22**	-0.24**	-0.23**	0.47**	0.50**	0.49**
4	NDLM-23-4	-50.81**	-47.19**	-49.00**	-0.05	-0.03	-0.04	-0.29**	-0.31**	-0.30**	0.04**	0.05**	0.05**	-0.07**	-0.09**	-0.08**
5	NDLM-23-5	-204.81**	-200.52**	-202.67**	-0.70**	-0.67**	-0.69**	-0.61**	-0.63**	-0.62**	0.26**	0.27**	0.26**	-0.78**	-0.80**	-0.80**
6	NDLM-23-6	179.19**	149.81**	164.50**	0.49**	0.61**	0.55**	0.87**	0.91**	0.89**	-0.28**	-0.31**	-0.29**	0.56**	0.60**	0.58**
7	NDLM-23-7	-10.81	-10.19	-10.50	0.09*	-0.01	0.04	-0.28**	-0.29**	-0.28**	0.03**	0.05**	0.04**	0.04**	0.02	0.03**
8	NDLM-23-8	198.85**	204.15**	201.50**	0.66**	0.74**	0.70**	1.01**	1.02**	1.02**	-0.30**	-0.34**	-0.32**	0.63**	0.66**	0.64**
9	NDLM-23-9	-22.15*	-21.85**	-22.00**	0.00	0.04	0.02	-0.19**	-0.19*	-0.20**	0.02	0.03*	0.02**	0.11**	0.10**	0.11**
10	Kashi Santusthi	-24.93**	-23.07**	-24.00**	-0.07**	-0.06	-0.07**	-0.15**	-0.14**	-0.14**	0.05**	0.05**	0.05**	-0.09**	-0.09**	-0.09**
11	Punjab Long Melon	0.52	-5.52	-2.50	-0.07**	-0.03	-0.05*	0.03	0.02	0.03	0.01	0.01*	0.01**	0.00	0.00	0.00
12	Kashi Vidhi	24.41**	28.59**	26.50**	0.14**	0.09	0.11**	0.11**	0.12*	0.12**	-0.06**	-0.07**	-0.06**	0.10**	0.09**	0.10**
SE(<i>gca</i> L)		8.617	8.177	8.312	0.040	0.079	0.040	0.044	0.090	0.049	0.011	0.011	0.008	0.008	0.016	0.007
SE(<i>gca</i> T)		4.975	4.721	4.799	0.023	0.046	0.023	0.025	0.052	0.028	0.006	0.007	0.004	0.005	0.010	0.004
SE(bet <i>gca</i> L)		12.186	11.565	11.755	0.056	0.112	0.056	0.062	0.127	0.069	0.015	0.016	0.011	0.011	0.023	0.010
SE(bet <i>gca</i> T)		7.036	6.677	6.787	0.033	0.065	0.032	0.036	0.073	0.040	0.009	0.009	0.006	0.007	0.013	0.006

*,** significant at 5% and 1% level, respectively

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S. No.	Parents	Non -reducing sugar (%)			Total sugar (%)			Total carotenoid content (µg/100mg)			Fruit yield per plant(kg)			Fruit yield (q/ha)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1	NDLM-23-1	-0.17**	-0.15**	-0.16**	-0.17**	-0.17**	-0.17**	-0.95**	-0.96**	-0.96**	-0.38**	-0.48**	-0.43**	-23.69**	-29.56**	-26.63**
2	NDLM-23-2	-0.04	-0.02	-0.03	-0.99**	-0.99**	-0.99**	-3.58**	-3.63**	-3.60**	-0.85**	-1.01**	-0.93**	-51.49**	-59.05**	-55.27**
3	NDLM-23-3	0.21**	0.18**	0.20**	0.68**	0.68**	0.68**	2.12**	2.16**	2.14**	0.54**	0.82**	0.68**	32.35**	49.37**	40.86**
4	NDLM-23-4	-0.15**	-0.13**	-0.14**	-0.22**	-0.22**	-0.23**	-0.99**	-1.03**	-1.01**	-0.28**	-0.38**	-0.33**	-17.42**	-23.81**	-20.61**
5	NDLM-23-5	-0.37**	-0.35**	-0.36**	-1.16**	-1.16**	-1.16**	-3.10**	-3.13**	-3.11**	-0.81**	-0.97**	-0.89**	-47.03**	-58.88**	-52.95**
6	NDLM-23-6	0.32**	0.28**	0.30**	0.88**	0.88**	0.88**	3.18**	3.22**	3.20**	1.03**	1.24**	1.13**	60.31**	76.03**	68.17**
7	NDLM-23-7	-0.09**	-0.07**	-0.08**	-0.05*	-0.05*	-0.05**	-0.47**	-0.50*	-0.48**	-0.24**	-0.31**	-0.28**	-13.81**	-20.20**	-17.00**
8	NDLM-23-8	0.34**	0.31**	0.32**	0.97**	0.97**	0.97**	3.84**	3.93**	3.89**	1.10**	1.25**	1.17**	66.58**	75.18**	70.88**
9	NDLM-23-9	-0.04*	-0.05*	-0.05*	0.06**	0.06**	0.06**	-0.06	-0.07	-0.07	-0.10**	-0.16**	-0.13**	-5.80**	-9.08**	-7.44**
10	Kashi Santusthi	0.03*	0.03*	0.03*	-0.06**	-0.06**	-0.06**	-0.60**	-0.63**	-0.62**	-0.18**	-0.17**	-0.17**	-10.66**	-10.12**	-10.39**
11	Punjab Long Melon	-0.05**	-0.05**	-0.05**	-0.06**	-0.06**	-0.06**	0.09	0.09	0.09	-0.02	-0.04	-0.03	-0.83	-3.40	-2.12
12	Kashi Vidhi	0.03*	0.02	0.02	0.12**	0.12**	0.12**	0.52**	0.54**	0.53**	0.20**	0.21**	0.20**	11.49**	13.52**	12.50**
SE(gca L)		0.022	0.023	0.023	0.023	0.023	0.012	0.093	0.192	0.112	0.028	0.051	0.030	1.852	3.259	1.895
SE(gca T)		0.013	0.013	0.013	0.013	0.013	0.007	0.054	0.111	0.065	0.016	0.030	0.017	1.069	1.882	1.094
SE(bet gca L)		0.031	0.032	0.032	0.032	0.032	0.016	0.132	0.271	0.158	0.040	0.073	0.042	2.619	4.609	2.680
SE(bet gca T)		0.018	0.019	0.018	0.019	0.019	0.010	0.076	0.156	0.091	0.023	0.042	0.024	1.512	2.661	1.548

*,** significant at 5% and 1% level, respectively

Table 4.4.2(a): List of the top three general combiners with desirable and significant for twenty-two characters in long melon over two years (Y1, Y2).

Characters	Seasons	Desirable parents according to <i>per se</i> performance	Good general combiners	Best parents based on <i>per se</i> performance and <i>gca</i> effects
Days to first male flowering	Y1	L-8, L-6, T-2,	L-8, L-6, L-3	L-8, L-6
	Y2	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
Days to first female flowering	Y1	L-3, L-6, T-3,	L-8, L-6, L-3	L-6, L-3
	Y2	L-6, T-8, T-2	L-8, L-6, L-3	L-8, L-6
Days to first harvesting	Y1	L-8, L-6, T-2	L-8, L-6, T-3	L-8, L-6
	Y2	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
Node number at first male flower appears	Y1	L-8, L-6, T-2	L-6, L-8, L-3	L-8, L-6
	Y2	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
Node number at first female flower appears	Y1	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
	Y2	L-8, L-6, T-2	L-8, L-3, L-6	L-8, L-6
Days to 50% female flowering	Y1	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
	Y2	L-8, L-6, T-2	L-8, L-6, L-3	L-8, L-6
Number of primary branches per plant	Y1	L-8, T-2, L-6	L-8, L-6, L-3	L-6, L-8
	Y2	L-8, T-2, L-6	L-8, L-6, L-3	L-6, L-8
Fruit length (cm)	Y1	L-8, T-2, L-6,	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Fruit breadth (cm)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Vine length (cm)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Number of fruits per plant	Y1	L-8, T-2, L-6, T-3, L-3	L-6, L-8, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-6, L-8, L-3	L-8, L-6, L-3

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Average fruit weight (g)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Number of seeds per fruit	Y1	L-8, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Total soluble solids (%)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Dry matter (%)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Ascorbic acid (mg/100g)	Y1	L-5, L-2, L-1	L-2, L-5, L-1	L-2, L-5, L-1
	Y2	L-5, L-2, L-1	L-2, L-5, L-1	L-2, L-5, L-1
Reducing sugar (%)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	T-2, L-8, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Non-reducing sugar (%)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Total sugar (%)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Total carotenoid (µg/100mg)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Fruit yield per plant (Kg)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
Fruit yield (q/ha)	Y1	L-8, T-2, L-6, T-3, L-3	L-8, L-6, L-3	L-8, L-6, L-3
	Y2	L-8, T-2, L-6, T-3, L-3	L-6, L-8, L-3	L-8, L-6, L-3

4.4.2.14 Fruit yield per plant (kg)

Positive values are desirable for total fruit yield per plant. Out of 12 parents, only 4 parents, namely NDLM-23-8 (1.10), NDLM-23-6 (1.03), NDLM-23-3 (0.54) and Kashi Vidhi (0.20) were showed significant positive *gca* effects in Y1, whereas parent NDLM-23-8 (1.25), NDLM-23-6 (1.24), NDLM-23-3 (0.82) and Kashi Vidhi (0.21) exhibited positive significant *gca* effects in Y2. The result over year pooled showed positive significant for NDLM-23-8 (1.17), NDLM-23-6 (1.13 kg), NDLM-23-3 (0.68 kg) and Kashi Vidhi (0.20 kg) *gca* effect. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM23- 8 were recorded best general combiner in both years Y1and Y2.

4.4.2.15 Fruit yield (q/ha)

Positive significant *gca* is desirable for total fruit yield. Out of 12 parents, only 4 parents, namely NDLM-23-8 (66.58), NDLM-23-6 (60.31), NDLM-23-3 (32.35) and Kashi Vidhi (11.49) were showed significant positive *gca* effects in Y1, whereas parents NDLM-23-6 (76.03), NDLM-23-8 (75.18), NDLM-23-3 (49.37) and Kashi Vidhi (13.52) exhibited positive significant *gca* effects in Y2 .The result NDLM-23-8 (70.88), NDLM-23-6 (68.17), NDLM-233 (40.86) and Kashi Vidhi (12.50) over year pooled showed positive significant for *gca* effect. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.16 Total soluble solids (%)

Out of 12 parents, 4 parents, NDLM-23-8 (0.66), NDLM-23-6 (0.49), NDLM-23-3 (0.40) and Kashi Vidhi (0.14) expressed highly significant *gca* effects for total soluble solid in Y1, while NDLM-23-8 (0.74), NDLM-23-6 (0.61) and NDLM-23-3 (0.48) in Y2 and NDLM23-8 (0.70), NDLM-23-6 (0.55), NDLM-23-3 (0.44) and Kashi Vidhi (0.11) in over year pooled showed positive and significant *gca* effect, respectively. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23-8 were recorded best general combiner in both years Y1and Y2.

4.4.2.17 Ascorbic acid (mg/100g fresh fruit)

Parents NDLM-23-2 (0.35), NDLM-23-5 (0.26), NDLM-23-1 (0.10), Kashi Santusthi (0.05), NDLM-23-4 (0.04) and NDLM-23-7 (0.03) expressed positive significant

gca effects for ascorbic acid content in Y1, while NDLM-23-2 (0.36), NDLM-23-5 (0.27), NDLM-23-1 (0.12), NDLM-23-7 (0.05) and Kashi Vidhi (0.05) were showed positive and significant *gca* effects in Y2 and parents NDLM-23-2 (0.36), NDLM-23-5 (0.26), NDLM-23-1 (0.12), NDLM23-4 (0.05), NDLM-23-7 (0.04), NDLM-23-9 (0.02) and Punjab Long Melon (0.01) over year pooled was recorded for ascorbic acid content. Based on *per se* performance and *gca* effects parents NDLM-23-1, NDLM-23-2 and NDLM-23- 5 were recorded best general combiner in both years Y1and Y2.

4.4.2.18 Dry matter content (%)

Out of 12 parents, 4 parents NDLM-23-8 (1.01), NDLM-23-6 (0.87), NDLM-23-3 (0.59) and Kashi Vidhi (0.11), expressed positive significant *gca* effects for dry matter content in Y1, while, NDLM-23-8 (1.02), NDLM-23-6 (0.91), NDLM-23-3 (0.62) and Kashi Vidhi (0.12) were showed positive and significant *gca* effects in Y2 and over year pooled. Parents NDLM23-8 (1.02), NDLM-23-6 (0.89) and NDLM-23-3 (0.60) and Kashi Vidhi (0.12) were good general combiner for this trait in both the year as well as over year pooled. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1and Y2.

4.4.2.19 Reducing sugars (%)

Positive and significant high value *gca* effects were exhibited by parents NDLM-23-8 (0.63), NDLM-23-6 (0.56), NDLM-23-3 (0.47), NDLM-23-9 (0.11), Kashi Vidhi (0.10) and NDLM-23-7 (0.04) showed negative significant *gca* effects for reducing sugar in Y1, while NDLM-23-8 (0.66), NDLM-23-6 (0.60), NDLM-23-3 (0.50), NDLM-23-9 (0.10) and Kashi Vidhi (0.09) exhibited positive significant *gca* effect in Y2 However parents NDLM-23-8 (0.64), NDLM-23-6 (0.58), NDLM-23-3 (0.49), NDLM-23-9 (0.11), Kashi Vidhi (0.10) and NDLM23-7 (0.03) exhibited positive significant *gca* effect over year pooled. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1and Y2.

4.4.2.20 Non-reducing sugars (%)

Among parents NDLM-23-8 (0.34), NDLM-23-6 (0.32), NDLM-23-3 (0.21), Kashi Santusthi (0.03) and Kashi Vidhi (0.03) showed Positive and significant high value *gca* effects in term of non-reducing sugar in Y1while in Y2 NDLM-23-8 (0.31), NDLM-23-6 (0.28), NDLM-23-3 (0.18), Kashi Santusthi (0.03) parents were observed positive

significant *gca* for non-reducing sugar, However NDLM-23-8 (0.32), NDLM-23-6 (0.30), NDLM-23-3 (0.20), Kashi Santusthi (0.03) exhibited positive significant *gca* effect over year pooled. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.21 Total sugars (%)

Positive and significant high value *gca* effects were exhibited by parents NDLM-23-8 (0.97), NDLM-23-6 (0.88), NDLM-23-3 (0.68), Kashi Vidhi (0.12) and NDLM-23-9 (0.06) in Y1 similar results were also observed in the year 2 and in pooled over years. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

4.4.2.22 Total carotenoid content (µg/100mg)

For this trait positive and significant high value *gca* effects were exhibited by parents NDLM-23-8 (0.34), NDLM-23-6 (3.18), NDLM-23-3 (2.12) and Kashi Vidhi (0.52) in Y1 and Y2 parents NDLM-23-8 (3.93), NDLM-23-6 (3.22), NDLM-23-3 (2.16) and Kashi Vidhi (0.54), However NDLM-23-8 (3.89), NDLM-23-6 (3.20), NDLM-23-3 (2.14) and Kashi Vidhi (0.53) exhibited positive significant *gca* effect over year pooled for carotenoid content. Based on *per se* performance and *gca* effects parents NDLM-23-3, NDLM-23-6 and NDLM-23- 8 were recorded best general combiner in both years Y1 and Y2.

4.4.3 Estimates of specific combining ability effects

The estimates of specific combining ability (*sca*) effects for all the twenty- two characters in respect to 27 F1's in Y1, Y2 and pooled had presented in Table-4.3. The negative estimates of specific combining ability were considered desirable for days to first male flowering, days to first female flowering, number of nodes at which first male flower appears, number of nodes at which first female flower appears, days to 50% female flowering and days to first harvesting (earliness). However, for rest of the characters, positive estimates of specific combining ability were considered desirable. The character wise results are presented below in sub-heads:

4.4.3.1 Days to first male flowering

Out of 27 crosses, significant negative *sca* effects were observed in 1 cross combination NDLM-23-3 x Kashi Santusthi (-1.05) in Y1 and in Y₂ , 4 crosses NDLM-

23-9 x Kashi Vidhi (-1.43), NDLM-23-3 x Kashi Santusthi (-2.10), NDLM-23-1 x Kashi Santusthi (-1.34) and NDLM-23-6 x Punjab Long Melon (-1.17) whereas 5 crosses NDLM-23-3 x Kashi Santusthi (-1.57), NDLM-23-9 x Kashi Vidhi (-1.43), NDLM-23-6 x Punjab Long Melon (-1.03), NDLM-23-1 x Kashi Santusthi (-0.99) and NDLM-23-7 x Kashi Vidhi (-0.63) in over year pooled showed significant negative *sca* effects. Based on *per se* performance cross NDLM-23-8 x Kashi Vidhi, NDLM-23-8 x Punjab Long Melon and NDLM-23-6 x Punjab Long Melon were considered the best specific combiner for days to first male flowering.

4.4.3.2 Days to first female flowering

Negative high significant *sca* effects were observed in the 1 cross NDLM-23-8 x Kashi Kashi Vidhi (-1.72) in Y1 and 4 crosses NDLM-23-3 x Kashi Santusthi (-2.03), NDLM-23-9 x Kashi Vidhi (-1.40), NDLM-23-8 x Kashi Vidhi (-1.31) and NDLM-23-5 x Kashi Santusthi (-1.17) in Y2, whereas 1 cross NDLM-23-8 x Kashi Vidhi (-1.31) in over year pooled. Based on *per se* performance cross combinations NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon and NDLM-23-6 x Kashi Vidhi Melon were considered the best specific combiner for this character.

4.4.3.3 Days to 50% female flowering

Among the crosses, 1 cross NDLM-23-2 x Kashi Vidhi (-1.54) exhibited negatively significant *sca* value in Y1, whereas 1 cross NDLM-23-3 x Kashi Santusthi (-1.56) expressed negative significant *sca* effects in Y2 and 2 crosses NDLM-23-2 x Kashi Vidhi (-1.20) followed by NDLM-23-3 x Kashi Santusthi (-1.07) showed negative significant *sca* effect in over year pooled respectively for days to 50% female flowering. Based on *per se* performance parents NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi and *sca* effects NDLM-23-9 x Kashi Vidhi, NDLM-23-7 x Kashi Vidhi, NDLM-23-1 x Kashi Santusthi in were found best specific combiner in both the years. Based on *per se* performance hybrids NDLM-23-8 x Kashi Vidhi followed by NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Santushti were found best specific combiner for this character.

4.4.3.4 Number of nodes at which first male flower appears

Among 27 cross combinations only 3 crosses NDLM-23-9 x Kashi Vidhi (-0.31), NDLM-23-7 x Kashi Vidhi (-0.30), NDLM-23-1 x Kashi Santusthi (-0.25), NDLM-23-4 x

Table 4.4.3: Estimates of specific combining ability (*sca*) effects of crosses for twenty-two characters in long melon over twoyears (Y1= 2024, Y2 = 2025) and pooled

S. No.	Crosses	Days to first male flowering			Days to first female flowering			Days to first harvesting			Number of nodes at which first male flower appears			Number of nodes at which first female flower appears			Days to 50% female flowering		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1.	NDLM-23-1 x Kashi Santusthi	-0.63	-1.34*	-0.99**	-0.88	0.02	-0.43	-1.01	-0.77	-0.89*	-0.25**	-0.25*	-0.25**	-0.32**	-0.32	-0.32**	-1.00	-0.02	-0.51
2.	NDLM-23-1 x Punjab Long Melon	0.43	0.94	0.69*	0.39	0.17	0.28	0.24	0.57	0.40	0.14	0.14	0.14*	0.39**	0.38*	0.39**	0.73	-0.23	0.25
3.	NDLM-23-1 x Kashi Vidhi	0.20	0.40	0.30	0.48	-0.19	0.15	0.78	0.20	0.49	0.11	0.11	0.11	-0.08	-0.07	-0.07	0.27	0.24	0.25
4.	NDLM-23-2 x Kashi Santusthi	-0.17	0.01	-0.08	-0.39	0.69	0.15	-0.27	0.59	0.16	-0.03	-0.04	-0.03	0.14*	0.14	0.14	1.42*	0.60	1.01*
5.	NDLM-23-2 x Punjab Long Melon	0.17	0.33	0.25	-0.14	-0.76	-0.45	-0.10	-0.01	-0.06	0.04	0.05	0.04	-0.02	-0.01	-0.02	0.13	0.25	0.19
6.	NDLM-23-2 x Kashi Vidhi	0.01	-0.34	-0.17	0.54	0.08	0.31	0.38	-0.58	-0.10	-0.01	-0.01	-0.01	-0.12	-0.12	-0.12	-1.54*	-0.85	-1.20**
7.	NDLM-23-3 x Kashi Santusthi	-1.05*	-2.10**	-1.57**	0.32	-2.03**	-0.86	-0.70	-1.59**	-1.14**	-0.20**	-0.22	-0.21**	-0.25**	-0.25	-0.25**	-0.57	-1.56*	-1.07*
8.	NDLM-23-3 x Punjab Long Melon	-0.56	-0.28	-0.42	0.15	0.69	0.42	-0.08	0.61	0.27	-0.08	-0.08	-0.08	-0.25**	-0.25	-0.25**	-0.35	0.95	0.30
9.	NDLM-23-3 x Kashi Vidhi	1.61**	2.38**	1.99**	-0.48	1.34*	0.44	0.78	0.98	0.88*	0.29**	0.30*	0.29**	0.50**	0.51**	0.50**	0.93	0.61	0.77
10.	NDLM-23-4 x Kashi Santusthi	0.29	0.02	0.15	0.59	0.04	0.31	0.11	0.86	0.48	0.28**	0.26*	0.27**	0.36**	0.35*	0.36**	0.97	0.47	0.72
11.	NDLM-23-4 x Punjab Long Melon	-0.20	-0.12	-0.16	-0.82	-0.33	-0.57	0.01	-1.24*	-0.61	-0.22**	-0.20	-0.21**	-0.76**	-0.76**	-0.76**	-0.81	-0.86	-0.84
12.	NDLM-23-4 x Kashi Vidhi	-0.09	0.10	0.01	0.23	0.29	0.26	-0.12	0.38	0.13	-0.06	-0.06	-0.06	0.40**	0.40*	0.40**	-0.17	0.39	0.12
13.	NDLM-23-5 x Kashi Santusthi	-0.31	-0.10	-0.21	-0.45	-1.17*	-0.81	-0.29	-0.11	-0.20	-0.12	-0.13	-0.13	-1.02**	-1.02**	-1.02**	-0.30	-0.43	-0.37
14.	NDLM-23-5 x Punjab Long Melon	-0.14	0.03	-0.05	-0.36	0.80	0.22	-0.40	-0.51	-0.46	-0.18*	-0.16	-0.17*	-0.04	-0.04	-0.04	-0.33	-0.11	-0.22
15.	NDLM-23-5 x Kashi Vidhi	0.45	0.07	0.26	0.81	0.37	0.59	0.69	0.62	0.65	0.30**	0.29*	0.30**	1.05**	1.06**	1.06**	0.63	0.54	0.58
16.	NDLM-23-6 x Kashi Santusthi	1.40**	0.64	1.02**	0.33	0.25	0.29	0.34	0.03	0.18	0.09	0.07	0.08	0.08	0.07	0.07	-0.16	-0.49	-0.32

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17.	NDLM-23-6 x Punjab Long Melon	-0.89	-1.17*	-1.03**	-0.27	-0.38	-0.33	-0.62	-0.41	-0.52	-0.07	-0.04	-0.06	-0.36**	-0.36*	-0.36**	-0.23	-0.74	-0.49
18.	NDLM-23-6 x Kashi Vidhi	-0.51	0.53	0.01	-0.05	0.13	0.04	0.28	0.39	0.33	-0.01	-0.03	-0.02	0.28**	0.28	0.29**	0.40	1.22*	0.81
19.	NDLM-23-7 x Kashi Santusthi	-0.13	0.17	0.02	-0.71	-0.50	-0.60	-0.39	-0.67	-0.53	0.01	0.08	0.05	0.09	0.09	0.09	-0.87	-0.55	-0.71
20.	NDLM-23-7 x Punjab Long Melon	0.63	0.59	0.61*	1.03	-0.18	0.42	0.68	0.97	0.83*	0.28**	0.16	0.22**	0.71**	0.71**	0.71**	1.17	0.87	1.02*
21.	NDLM-23-7 x Kashi Vidhi	-0.50	-0.76	-0.63*	-0.32	0.67	0.18	-0.30	-0.30	-0.30	-0.30**	-0.24*	-0.27**	-0.79**	-0.80**	-0.80**	-0.30	-0.32	-0.31
22.	NDLM-23-8 x Kashi Santusthi	0.33	1.16*	0.75**	0.95	1.43*	1.19*	1.64**	0.68	1.16**	0.07	0.04	0.06	0.09	0.09	0.09	-0.19	1.33*	0.57
23.	NDLM-23-8 x Punjab Long Melon	0.15	-0.94	-0.40	0.77	-0.13	0.32	-0.12	0.38	0.13	-0.07	-0.04	-0.06	-0.02	-0.02	-0.02	-0.14	-0.22	-0.19
24.	NDLM-23-8 x Kashi Vidhi	-0.48	-0.22	-0.35	-1.72**	-1.31*	-1.51**	-1.51**	-1.06	-1.28**	-0.01	0.00	0.00	-0.07	-0.07	-0.07	0.33	-1.11	-0.38
25.	NDLM-23-9 x Kashi Santusthi	0.28	1.54**	0.91**	0.24	1.27*	0.76	0.58	0.97	0.77*	0.14	0.19	0.17*	0.82**	0.84**	0.84**	0.72	0.65	0.68
26.	NDLM-23-9 x Punjab Long Melon	0.41	0.63	0.52	-0.75	0.13	-0.31	0.40	-0.35	0.02	0.16*	0.16	0.16*	0.35**	0.35*	0.35**	-0.17	0.09	-0.04
27.	NDLM-23-9 x Kashi Vidhi	-0.69	-2.16**	-1.43**	0.52	-1.40*	-0.44	-0.98	-0.62	-0.80*	-0.31**	-0.35**	-0.33**	-1.17**	-1.20**	-1.18**	-0.55	-0.74	-0.64
SE(gca L)		0.488	0.512	0.276	0.600	0.567	0.485	0.530	0.583	0.377	0.075	0.119	0.069	0.070	0.173	0.090	0.634	0.614	0.445
SE(gca T)		0.690	0.724	0.390	0.849	0.802	0.686	0.749	0.825	0.533	0.105	0.169	0.098	0.099	0.244	0.128	0.896	0.868	0.630

*,** significant at 5% and 1% level, respectively

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S. No.	Crosses	Number of primary branches per plant			Fruit length(cm)			Fruit breadth (cm)			Vine length(m)			Number of fruits per plant			Average fruit weight (g)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1.	NDLM-23-1 x Kashi Santusthi	0.19	0.26**	0.23*	3.52**	3.61**	3.56**	0.20**	0.17*	0.19**	0.31**	0.29**	0.30**	3.97**	4.08**	4.02**	6.29**	6.34*	6.32**
2.	NDLM-23-1 x Punjab Long Melon	-0.07	-0.04	-0.05	-2.75**	-2.67**	-2.71**	-0.19**	-0.15	-0.17**	-0.18**	-0.18*	-0.18**	-2.87**	-2.75**	-2.81**	-4.47**	-4.41	-4.44**
3.	NDLM-23-1 x Kashi Vidhi	-0.13	-0.22**	-0.17	-0.77	-0.94	-0.86	-0.01	-0.02	-0.02	-0.13**	-0.11	-0.12**	-1.09**	-1.33	-1.21**	-1.82	-1.93	-1.87
4.	NDLM-23-2 x Kashi Santusthi	0.25	0.42**	0.33**	1.26**	1.40	1.33*	0.02	0.04	0.03	0.03	0.03	0.03	0.57	0.94	0.75	2.06	2.06	2.06
5.	NDLM-23-2 x Punjab Long Melon	-0.53**	-0.66**	-0.59**	0.08	0.17	0.12	0.03	0.01	0.02	0.02	0.02	0.02	0.52	0.70	0.61	0.45	0.51	0.48
6.	NDLM-23-2 x Kashi Vidhi	0.28	0.23**	0.26*	-1.33**	-1.57	-1.45**	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-1.08**	-1.64*	-1.36**	-2.51	-2.57	-2.54
7.	NDLM-23-3 x Kashi Santusthi	0.31	0.37**	0.35**	4.09**	4.22**	4.15**	0.14**	0.15	0.14**	0.19**	0.21**	0.20**	1.89**	1.67*	1.78**	9.13**	9.16**	9.15**
8.	NDLM-23-3 x Punjab Long Melon	0.17	0.11	0.14	2.77**	2.88**	2.83**	0.09**	0.06	0.07	0.08**	0.06	0.07	0.81*	0.63	0.72	3.28*	3.33	3.31*
9.	NDLM-23-3 x Kashi Vidhi	-0.49*	-0.49**	-0.49**	-6.86**	-7.10**	-6.98**	-0.22**	-0.21*	-0.22**	-0.26**	-0.27**	-0.27**	-2.70**	-2.30**	-2.50**	-12.41**	-12.49**	-12.45**
10.	NDLM-23-4 x Kashi Santusthi	-0.02	0.52**	0.25*	-2.80**	-2.67**	-2.74**	-0.25**	-0.25**	-0.25**	-0.36**	-0.35**	-0.36**	-3.10**	-2.99**	-3.05**	-5.05**	-5.02	-5.04**
11.	NDLM-23-4 x Punjab Long Melon	0.12	-0.16	-0.02	3.32**	3.45**	3.39**	0.19**	0.20*	0.19**	0.32**	0.32**	0.31**	2.53**	2.67**	2.60**	4.32**	4.37	4.35**
12.	NDLM-23-4 x Kashi Vidhi	-0.09	-0.37**	-0.23*	-0.53	-0.78	-0.65	0.05	0.05	0.05	0.04	0.03	0.04	0.58	0.32	0.45	0.73	0.65	0.69
13.	NDLM-23-5 x Kashi Santusthi	0.14	0.41**	0.27*	1.62**	1.44	1.53**	0.08*	0.07	0.08	0.12**	0.11	0.12**	1.34**	1.47*	1.40**	2.18	2.20	2.19
14.	NDLM-23-5 x Punjab Long Melon	0.12	0.29**	0.21	0.89	0.64	0.77	0.05	0.06	0.05	0.05	0.06	0.06	0.35	0.53	0.44	0.58	0.61	0.59
15.	NDLM-23-5 x Kashi Vidhi	-0.25	-0.70**	-0.48**	-2.51**	-2.08*	-2.29**	-0.14**	-0.13	-0.13**	-0.17**	-0.17*	-0.17**	-1.69**	-2.00**	-1.85**	-2.76	-2.81	-2.79
16.	NDLM-23-6 x Kashi Santusthi	-0.43*	-0.51**	-0.48**	-1.40**	-1.30	-1.35**	-0.05	-0.04	-0.04	-0.04	-0.05	-0.04	-1.41**	-1.27	-1.34**	-5.32**	-5.30	-5.31**
17.	NDLM-23-6 x Punjab	0.57**	0.83**	0.70**	1.90**	2.00*	1.95**	0.09**	0.10	0.10*	0.16**	0.17*	0.17**	1.67**	1.82*	1.74**	5.02**	5.07	5.05**

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	Long Melon																		
18.	NDLM-23-6 x Kashi Vidhi	-0.13	-0.32**	-0.22*	-0.51	-0.70	-0.60	-0.05	-0.06	-0.05	-0.12**	-0.12	-0.12**	-0.26	-0.55	-0.40	0.30	0.23	0.27
19.	NDLM-23-7 x Kashi Santusthi	0.09	-0.40**	-0.16	0.47	0.58	0.53	0.10**	0.11	0.11*	0.06*	0.07	0.07	1.51**	1.64*	1.57**	2.68	2.72	2.70
20.	NDLM-23-7 x Punjab Long Melon	-0.14	0.11	-0.01	-5.24**	-5.12**	-5.18**	-0.30**	-0.30**	-0.30**	-0.36**	-0.35**	-0.36**	-4.01**	-3.89**	-3.95**	-7.55**	-7.52**	-7.54**
21.	NDLM-23-7 x Kashi Vidhi	0.04	0.29**	0.17	4.76**	4.54**	4.65**	0.19**	0.19*	0.19**	0.30**	0.28**	0.29**	2.51**	2.25**	2.38**	4.87**	4.80	4.84**
22.	NDLM-23-8 x Kashi Santusthi	-0.44*	-0.65**	-0.55**	-1.32**	-1.26	-1.29*	-0.04	-0.05	-0.05	-0.07*	-0.08	-0.07	-1.76**	-1.67*	-1.71**	-2.81	-2.77	-2.79
23.	NDLM-23-8 x Punjab Long Melon	-0.09	-0.02	-0.06	1.53**	1.71	1.62**	0.04	0.04	0.04	0.07**	0.08	0.08*	1.71**	1.82*	1.77**	0.85	0.88	0.87
24.	NDLM-23-8 x Kashi Vidhi	0.53**	0.67**	0.60**	-0.21	-0.45	-0.33	0.01	0.00	0.01	-0.01	0.00	-0.01	0.04	-0.15	-0.06	1.96	1.89	1.92
25.	NDLM-23-9 x Kashi Santusthi	-0.08	-0.42**	-0.25*	-5.45**	-6.01**	-5.73**	-0.20**	-0.22**	-0.21**	-0.24**	-0.25**	-0.24**	-3.00**	-3.88**	-3.43**	-9.16**	-9.39**	-9.27**
26.	NDLM-23-9 x Punjab Long Melon	-0.14	-0.49**	-0.31**	-2.50**	-3.07**	-2.78**	-0.01	-0.01	-0.01	-0.16**	-0.17*	-0.17**	-0.70	-1.53*	-1.11**	-2.48	-2.86	-2.66
27.	NDLM-23-9 x Kashi Vidhi	0.23	0.90**	0.57**	7.94**	9.08**	8.51**	0.21**	0.24**	0.22**	0.39**	0.42**	0.41**	3.69**	5.41**	4.55**	11.63**	12.25**	11.94**
SE(gca L)		0.200	0.083	0.108	0.450	0.958	0.512	0.032	0.083	0.043	0.026	0.074	0.038	0.361	0.710	0.409	1.545	2.789	1.548
SE(gca T)		0.283	0.118	0.153	0.637	1.354	0.724	0.046	0.117	0.060	0.037	0.104	0.054	0.510	1.005	0.579	2.185	3.945	2.189

*,** significant at 5% and 1% level, respectively

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S. No.	Crosses	No. of seeds per fruit			Total soluble solids			Dry matter (%)			Ascorbic acid (mg/100mg)			Reducing sugar (%)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1.	NDLM-23-1 x Kashi Santusthi	76.26**	76.41**	76.33**	0.30**	0.60**	0.45**	0.30**	0.31*	0.30**	-0.13**	-0.13**	-0.13**	0.26**	0.26**	0.26**
2.	NDLM-23-1 x Punjab Long Melon	-73.19**	-66.15**	-69.67**	-0.30**	-0.03	-0.16*	-0.14	-0.13	-0.14	0.08**	0.08**	0.08**	-0.24**	-0.24**	-0.24**
3.	NDLM-23-1 x Kashi Vidhi	-3.07	-10.26	-6.66	0.00	-0.57**	-0.29**	-0.15*	-0.18	-0.17	0.05**	0.05*	0.05**	-0.01	-0.02	-0.02
4.	NDLM-23-2 x Kashi Santusthi	19.26	14.74	17.00	-0.01	-0.03	-0.02	0.12	0.12	0.12	0.02	0.02	0.02	0.03	0.03	0.03*
5.	NDLM-23-2 x Punjab Long Melon	0.81	8.19	4.50	0.08	0.04	0.06	-0.04	-0.02	-0.03	0.01	0.00	0.01	0.00	-0.02	-0.01
6.	NDLM-23-2 x Kashi Vidhi	-20.07	-22.93	-21.50	-0.07	-0.01	-0.04	-0.08	-0.09	-0.09	-0.03	-0.02	-0.03*	-0.02	-0.01	-0.02
7.	NDLM-23-3 x Kashi Santusthi	40.26**	33.74*	37.00*	0.14*	0.12	0.13	0.46**	0.46**	0.46**	-0.12**	-0.11**	-0.11**	0.20**	0.22**	0.21**
8.	NDLM-23-3 x Punjab Long Melon	-5.19	4.19	-0.50	0.13	0.10	0.12	0.18*	0.18	0.18*	-0.03	-0.03	-0.03*	0.09**	0.08**	0.08**
9.	NDLM-23-3 x Kashi Vidhi	-35.07*	-37.93**	-36.50*	-0.28**	-0.22	-0.25**	-0.64**	-0.65**	-0.64**	0.15**	0.15**	0.15**	-0.28**	-0.29**	-0.29**
10.	NDLM-23-4 x Kashi Santusthi	-126.41**	-125.59**	-126.00**	-0.37**	-0.37**	-0.37**	-0.14	-0.15	-0.15	0.13**	0.13**	0.13**	-0.46**	-0.45**	-0.46**
11.	NDLM-23-4 x Punjab Long Melon	118.15**	122.85**	120.50**	0.32**	0.28*	0.30**	0.15*	0.16	0.15	-0.11**	-0.11**	-0.11**	0.31**	0.32**	0.31**
12.	NDLM-23-4 x Kashi Vidhi	8.26	2.74	5.50	0.05	0.09	0.07	-0.01	0.00	-0.01	-0.02	-0.02	-0.02	0.15**	0.13**	0.14**
13.	NDLM-23-5 x Kashi Santusthi	26.59	27.74	27.17	0.08	0.07	0.08	0.15*	0.14	0.15	-0.08**	-0.08**	-0.08**	0.15**	0.15**	0.15**
14.	NDLM-23-5 x Punjab Long Melon	2.15	10.19	6.16	0.09	0.06	0.07	-0.02	0.00	-0.01	-0.05*	-0.04*	-0.04**	0.08**	0.08**	0.08**
15.	NDLM-23-5 x Kashi Vidhi	-28.74	-37.93**	-33.33*	-0.18*	-0.13	-0.15*	-0.14	-0.15	-0.14	0.12**	0.13**	0.12**	-0.23**	-0.23**	-0.23**
16.	NDLM-23-6 x Kashi Santusthi	12.59	42.41**	27.50	-0.01	0.02	0.00	-0.30**	-0.30	-0.30**	0.03	0.03	0.03**	-0.08**	-0.08**	-0.08**
17.	NDLM-23-6 x Punjab Long Melon	35.15*	-26.15	4.50	0.12	0.08	0.10	0.34**	0.34*	0.34**	-0.07**	-0.06**	-0.06**	0.13**	0.14**	0.13**
18.	NDLM-23-6 x Kashi Vidhi	-47.74**	-16.26	-32.00*	-0.11	-0.10	-0.10	-0.05	-0.04	-0.04	0.03	0.02	0.03*	-0.05**	-0.05	-0.05**

19.	NDLM-23-7 x Kashi Santusthi	-33.41*	-46.59**	-40.00**	0.41**	0.15	0.28**	-0.04	-0.06	-0.05	-0.02	-0.02	-0.02	0.18**	0.20**	0.19**
20.	NDLM-23-7 x Punjab Long Melon	-23.85	-12.15	-18.00	-0.51**	-0.42**	-0.46**	-0.32**	-0.30	-0.31**	0.16**	0.14**	0.15**	-0.37**	-0.37**	-0.37**
21.	NDLM-23-7 x Kashi Vidhi	57.26**	58.74**	58.00**	0.10	0.27	0.18**	0.36**	0.36*	0.36**	-0.14**	-0.12**	-0.13**	0.18**	0.17**	0.18**
22.	NDLM-23-8 x Kashi Santusthi	11.93	12.07	12.00	-0.15*	-0.17	-0.16*	-0.35**	-0.27	-0.31**	0.04*	0.04*	0.04**	-0.04**	-0.05	-0.04**
23.	NDLM-23-8 x Punjab Long Melon	-4.52	1.52	-1.50	-0.05	-0.09	-0.07	0.16*	0.07	0.12	-0.04*	-0.05*	-0.04**	0.02	0.02	0.02
24.	NDLM-23-8 x Kashi Vidhi	-7.41	-13.59	-10.50	0.20**	0.26	0.23**	0.18*	0.20	0.19*	0.00	0.00	0.00	0.03	0.03	0.02
25.	NDLM-23-9 x Kashi Santusthi	-27.07	-34.93*	-31.00*	-0.39**	-0.40**	-0.39**	-0.21**	-0.24	-0.22**	0.12**	0.12**	0.12**	-0.23**	-0.27**	-0.26**
26.	NDLM-23-9 x Punjab Long Melon	-49.52**	-42.48**	-46.00**	0.11	-0.02	0.04	-0.32**	-0.31*	-0.31**	0.05**	0.07**	0.06**	0.00	-0.01	-0.01
27.	NDLM-23-9 x Kashi Vidhi	76.59**	77.41**	77.00**	0.28**	0.42**	0.35**	0.52**	0.55**	0.54**	-0.17**	-0.19**	-0.17**	0.24**	0.29**	0.26**
SE(<i>gca</i> L)		14.925	14.164	14.397	0.069	0.137	0.068	0.076	0.155	0.085	0.019	0.020	0.013	0.014	0.028	0.013
SE(<i>gca</i> T)		21.107	20.030	20.360	0.098	0.194	0.097	0.107	0.220	0.120	0.026	0.028	0.019	0.020	0.040	0.018

*,** significant at 5% and 1% level, respectively

Contd...

S. No.	Crosses	Non reducing sugar (%)			Total sugar (%)			Total carotenoid content (µg/100mg)			Fruit yield per plant(kg)			Fruit yield (q/ha)		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
1.	NDLM-23-1 x Kashi Santusthi	0.05	0.04	0.04	0.30**	0.30**	0.30**	1.16**	1.17**	1.16**	0.49**	0.59**	0.54**	27.75**	35.83**	31.79**
2.	NDLM-23-1 x Punjab Long Melon	-0.05	-0.05	-0.05	-0.29**	-0.29**	-0.29**	-0.88**	-0.87*	-0.87**	-0.33**	-0.37**	-0.36**	-19.07**	-21.61**	-20.35**
3.	NDLM-23-1 x Kashi Vidhi	0.00	0.01	0.01	-0.01	-0.01	-0.01	-0.28	-0.30	-0.29	-0.16**	-0.22*	-0.19**	-8.68**	-14.22*	-11.44**
4.	NDLM-23-2 x Kashi Santusthi	0.67**	0.68**	0.68**	0.70**	0.70**	0.70**	0.32*	0.33	0.33	0.12*	0.15	0.13*	7.17*	7.17	7.17*
5.	NDLM-23-2 x Punjab Long Melon	-0.31**	-0.32**	-0.31**	-0.32**	-0.32**	-0.32**	-0.05	-0.05	-0.05	0.04	0.04	0.04	2.43	6.19	4.31
6.	NDLM-23-2 x Kashi Vidhi	-0.36**	-0.36**	-0.36**	-0.39**	-0.39**	-0.38**	-0.28	-0.28	-0.28	-0.16**	-0.19*	-0.17**	-9.60**	-13.36*	-11.48**
7.	NDLM-23-3 x Kashi Santusthi	0.05	0.05	0.05	0.25**	0.25**	0.25**	1.36**	1.36**	1.36**	0.42**	0.46**	0.44**	21.49**	27.28**	24.38**
8.	NDLM-23-3 x Punjab Long Melon	0.11**	0.11**	0.11**	0.20**	0.20**	0.20**	0.47**	0.49	0.48*	0.15**	0.19*	0.17**	12.89**	13.33*	13.11**
9.	NDLM-23-3 x Kashi Vidhi	-0.17**	-0.16**	-0.16**	-0.45**	-0.45**	-0.45**	-1.84**	-1.85**	-1.84**	-0.57**	-0.65**	-0.61**	-34.37**	-40.61**	-37.49**
10.	NDLM-23-4 x Kashi Santusthi	-0.22**	-0.21**	-0.22**	-0.68**	-0.68**	-0.68**	-1.09**	-1.07**	-1.08**	-0.34**	-0.40**	-0.37**	-19.53**	-24.73**	-22.13**
11.	NDLM-23-4 x Punjab Long Melon	0.16**	0.14**	0.15**	0.47**	0.47**	0.47**	1.19**	1.19**	1.19**	0.29**	0.31**	0.30**	18.47**	19.32**	18.89**
12.	NDLM-23-4 x Kashi Vidhi	0.06	0.07	0.07	0.21**	0.21**	0.21**	-0.10	-0.12	-0.11	0.04	0.09	0.07	1.06	5.41	3.24
13.	NDLM-23-5 x Kashi Santusthi	-0.02	-0.02	-0.02	0.13**	0.13**	0.13**	0.63**	0.67*	0.65**	0.18**	0.18*	0.18**	11.36**	10.94	11.15**
14.	NDLM-23-5 x Punjab Long Melon	0.07	0.07	0.07	0.15**	0.15**	0.15**	0.28	0.29	0.29	0.03	0.06	0.04	3.09	4.81	3.95
15.	NDLM-23-5 x Kashi Vidhi	-0.05	-0.05	-0.05	-0.28**	-0.28**	-0.28**	-0.92**	-0.96**	-0.94**	-0.21**	-0.24**	-0.22**	-14.44**	-15.75**	-15.10**
16.	NDLM-23-6 x Kashi Santusthi	-0.12**	-0.13**	-0.13**	-0.20**	-0.20**	-0.20**	-0.91**	-0.91**	-0.91**	-0.32**	-0.21*	-0.26**	-16.94**	-9.39	-13.17**
17.	NDLM-23-6 x Punjab Long Melon	0.12**	0.12**	0.12**	0.25**	0.25**	0.25**	1.38**	1.41**	1.39**	0.30**	0.27**	0.29**	18.67**	15.45**	17.06**
18.	NDLM-23-6 x Kashi Vidhi	0.00	0.01	0.01	-0.05	-0.05	-0.05*	-0.47**	-0.50	-0.48*	0.01	-0.06	-0.02	-1.72	-6.06	-3.89
19.	NDLM-23-7 x Kashi Santusthi	-0.06	-0.07	-0.06	0.13**	0.13**	0.13**	0.64**	0.67*	0.66**	0.19**	0.08	0.13*	13.48**	6.45	9.97**
20.	NDLM-23-7 x Punjab Long Melon	-0.14**	-0.14**	-0.14**	-0.51**	-0.51**	-0.51**	-1.62**	-1.63**	-1.63**	-0.51**	-0.44**	-0.47**	-31.92**	-32.90**	-32.41**

Results and Discussion

21.	NDLM-23-7 x Kashi Vidhi	0.20**	0.21**	0.20**	0.38**	0.38**	0.38**	0.97**	0.96**	0.97**	0.32**	0.36**	0.34**	18.44**	26.45**	22.45**
22.	NDLM-23-8 x Kashi Santusthi	-0.12**	-0.14**	-0.13**	-0.17**	-0.17**	-0.17**	-1.11**	-1.14**	-1.13**	-0.29**	-0.31**	-0.30**	-17.50**	-19.22**	-18.36**
23.	NDLM-23-8 x Punjab Long Melon	0.07	0.08*	0.08*	0.09*	0.09*	0.09**	-0.18	-0.22	-0.20	0.19**	0.20*	0.19**	6.02	12.79*	9.40**
24.	NDLM-23-8 x Kashi Vidhi	0.05	0.06	0.05	0.08*	0.08*	0.08**	1.29**	1.36**	1.33**	0.10*	0.10	0.11*	11.48**	6.44	8.96**
25.	NDLM-23-9 x Kashi Santusthi	-0.23**	-0.20**	-0.22**	-0.46**	-0.46**	-0.47**	-1.01**	-1.08**	-1.04**	-0.45**	-0.55**	-0.50**	-27.28**	-34.31**	-30.80**
26.	NDLM-23-9 x Punjab Long Melon	-0.04	-0.01	-0.03	-0.04	-0.04	-0.04*	-0.60**	-0.61	-0.60**	-0.17**	-0.26**	-0.21**	-10.56**	-17.38**	-13.97**
27.	NDLM-23-9 x Kashi Vidhi	0.27**	0.21**	0.24**	0.50**	0.50**	0.51**	1.61**	1.69**	1.65**	0.62**	0.80**	0.71**	37.84**	51.69**	44.76**
SE(<i>gca</i> L)		0.038	0.039	0.039	0.039	0.039	0.020	0.162	0.332	0.194	0.049	0.089	0.051	3.207	5.645	3.283
SE(<i>gca</i> T)		0.054	0.056	0.055	0.056	0.056	0.028	0.229	0.469	0.274	0.069	0.126	0.073	4.536	7.983	4.643

*,** significant at 5% and 1% level, respectively

Punjab Long Melon (-0.22), NDLM-23-3 x Kashi Santusthi (-0.20) and NDLM-23-5 x Punjab Long Melon (-0.18) showed high negative and significant *sca* in Y1 and in Y2 among crosses, 3 cross combinations NDLM-23-9 x Kashi Vidhi (-0.35), NDLM-23-1 x Kashi Santusthi (-0.25) and NDLM-23-7 x Kashi Vidhi (-0.24) however 6 crosses NDLM-23-9 x Kashi Vidhi (-0.33), NDLM-23-7 x Kashi Vidhi (0.27), NDLM-23-1 x Kashi Santusthi (-0.25), NDLM-23-4 x Punjab Long Melon (-0.21), NDLM-23-3 x Kashi Santusthi (-0.21) and NDLM-23-5 x Punjab Long Melon (-0.17) exhibited negative significant *sca* over pooled for number of nodes at which first male flower appears. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were found best specific combiner in both years.

4.4.3.5 Number of nodes at which first female flower appears

Out of 27 crosses, significant *sca* effects were observed in 8 cross combinations NDLM-23-9 x Kashi Vidhi (-1.17), NDLM-23-5 x Kashi Santusthi (-1.02), NDLM-23-7 x Kashi Vidhi (-0.79), NDLM-23-4 x Punjab Long Melon (-0.76), NDLM-23-6 x Punjab Long Melon (-0.36), NDLM-23-1 x Kashi Santusthi (-0.32), NDLM-23-3 x Kashi Santusthi (-0.25) and NDLM-23-3 x Punjab Long Melon (-0.25) in Y1 and in Y2, 5 crosses NDLM-23-9 x Kashi Vidhi (-1.20), NDLM-23-5 x Kashi Santusthi (-1.02), NDLM-23-7 x Kashi Vidhi (-0.80), NDLM-23-4 x Punjab Long Melon (-0.76), NDLM-23-6 x Punjab Long Melon (-0.36), whereas 8 crosses NDLM-23-9 x Kashi Vidhi (-1.17), NDLM-23-5 x Kashi Santusthi (-1.02), NDLM-23-7 x Kashi Vidhi (-0.79), NDLM-23-4 x Punjab Long Melon (-0.76), NDLM-23-6 x Punjab Long Melon (-0.36), NDLM-23-1 x Kashi Santusthi (-0.32), NDLM-23-3 x Kashi Santusthi (-0.25) and NDLM-23-3 x Punjab Long Melon (-0.25) exhibited significant and negative *sca* effects for number of nodes at which first female flower appears in over year pooled. Based on *per se* performance hybrids, NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were found best specific combiner in both years.

4.4.3.6 Days to first harvesting

For this trait negative and significant high value *sca* effects were exhibited by NDLM-23-8 x Kashi Vidhi (-1.51) in Y1 and in case of Y2 among crosses 2 cross combinations NDLM-23-3 x Kashi Santusthi (-1.59) and NDLM-23-4 x Punjab Long Melon (-1.24) showed significant and negative *sca* effects for Days to first harvesting. In Pooled values 4 crosses NDLM-23-8 x Kashi Vidhi (-1.28), NDLM-23-3 x Kashi Santusthi

(-1.14), NDLM-23-1 x Kashi Santusthi (-0.89) and NDLM-23-9 x Kashi Vidhi (-0.80) showed significant and negative *sca* effects. Based on *per se* performance NDLM-23-8 x Kashi Vidhi followed by NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Punjab Long Melon were found best specific combiner for days to first harvesting.

4.4.3.7 Number of primary branches per plant

Among the crosses , 2 cross combinations NDLM-23-6 x Punjab Long Melon (0.57) and NDLM-23-8 x Kashi Vidhi (0.53) exhibited positively significant *sca* value in Y1, whereas, 11 cross NDLM-23-9 x Kashi Vidhi (0.90), NDLM-23-6 x Punjab Long Melon (0.83), NDLM-23-8 x Kashi Vidhi (0.67), NDLM-23-4 x Kashi Santusthi (0.52), NDLM-23-2 x Kashi Santusthi (0.33), NDLM-23-5 x Kashi Santusthi (0.41), NDLM-23-3 x Kashi Santusthi (0.37), NDLM-23-7 x Kashi Vidhi (0.29), NDLM-23-1 x Kashi Santusthi (0.26) and NDLM-23-2 x Kashi Vidhi (0.23) expressed positive significant *sca* effects in Y2 and 9 crosses NDLM-23-6 x Punjab Long Melon (0.70), NDLM-23-8 x Kashi Vidhi (0.60), NDLM-23-9 x Kashi Vidhi (0.57), NDLM-23-3 x Kashi Santusthi (0.35), NDLM-23-2 x Kashi Santusthi (0.33) NDLM-23-5 x Kashi Santusthi (0.27), NDLM-23-2 x Kashi Vidhi (0.26), NDLM-23-4 x Kashi Santusthi (0.25) and NDLM-23-1 x Kashi Santusthi (0.23) showed positive significant *sca* effect in over year pooled respectively. Based on *per se* performance, crosses NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi and NDLM-23-3 x Kashi Santusthi were recorded best specific combiner in both the years pooled.

4.4.3.8 Fruit Length (cm)

For this trait positive and significant high value *sca* effects were exhibited by 9 crosses NDLM-23-9 x Kashi Vidhi (7.94), NDLM-23-7 x Kashi Vidhi (4.76), NDLM-23-3 x Kashi Santusthi (4.09), NDLM-23-1 x Kashi Santusthi (3.52), NDLM-23-4 x Punjab Long Melon (3.32), NDLM-23-3 x Punjab Long Melon (2.77), NDLM-23-6 x Punjab Long Melon (1.90), NDLM-23-5 x Kashi Santusthi (1.62) and NDLM-23-8 x Punjab Long Melon (1.53) in Y1 while 7 crosses NDLM-23-9 x Kashi Vidhi (9.08), NDLM-23-7 x Kashi Vidhi (4.54), NDLM-23-3 x Kashi Santusthi (4.22), NDLM-23-1 x Kashi Santusthi (3.61), NDLM-23-4 x Punjab Long Melon (3.45), NDLM-23-3 x Punjab Long Melon (2.88) and NDLM-23-6 x Punjab Long Melon (2.00) showed in Y2, however in pooled results, 7 crosses NDLM-23-9 x Kashi Vidhi (8.51), NDLM-23-7 x Kashi Vidhi (4.65), NDLM-23-3 x Kashi Santusthi (4.15), NDLM-23-1 x Kashi Santusthi (3.56), NDLM-23-4

x Punjab Long Melon (3.39), NDLM-23-3 x Punjab Long Melon (2.83) and NDLM-23-6 x Punjab Long Melon (1.95) exhibited positive significant *gca* effects for fruit length. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi followed by NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were observed good specific combiner for fruit length.

4.4.3.9 Fruit breadth (cm)

In respect of fruit breadth, only 9 parents namely NDLM-23-9 x Kashi Vidhi (0.21), NDLM-23-1 x Kashi Santusthi (0.20), NDLM-23-7 x Kashi Vidhi (0.19), NDLM-23-4 x Punjab Long Melon (0.19), NDLM-23-3 x Kashi Santusthi (0.14), NDLM-23-7 x Kashi Santusthi (0.10), NDLM-23-6 x Punjab Long Melon (0.09), NDLM-23-3 x Punjab Long Melon (0.09) and NDLM-23-5 x Kashi Santusthi (0.08) in Y1 while Y2 results showed 4 crosses NDLM-23-9 x Kashi Vidhi (0.24), NDLM-23-4 x Punjab Long Melon (0.20), NDLM-23-7 x Kashi Vidhi (0.19) and NDLM-23-1 x Kashi Santusthi (0.17). However, 7 crosses NDLM-23-9 x Kashi Vidhi (0.22), NDLM-23-4 x Punjab Long Melon (0.19), NDLM-23-7 x Kashi Vidhi (0.19), NDLM-23-1 x Kashi Santusthi (0.19), NDLM-23-3 x Kashi Santusthi (0.14), NDLM-23-7 x Kashi Santusthi (0.11) and NDLM-23-6 x Punjab Long Melon (0.10) showed significant positive *sca* effect in over year pooled. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi followed by NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were observed good specific combiner for fruit breadth.

4.4.3.10 Vine length (m)

In respect of vine length, 10 crosses NDLM-23-9 x Kashi Vidhi (0.39), NDLM-23-4 x Punjab Long Melon ((0.32), NDLM-23-1 x Kashi Santusthi (0.31), NDLM-23-7 x Kashi Vidhi (0.30), NDLM-23-3 x Kashi Santusthi (0.19), NDLM-23-6 x Punjab Long Melon (0.16), NDLM-23-5 x Kashi Santusthi (0.12), NDLM-23-3 x Punjab Long Melon (0.08), NDLM-23-8 x Punjab Long Melon (0.07) and NDLM-23-7 x Kashi Santusthi showed positive significant *sca* Y1 and 6 cross NDLM-23-9 x Kashi Vidhi (0.42), NDLM-23-4 x Punjab Long Melon ((0.32), NDLM-23-1 x Kashi Santusthi (0.29), NDLM-23-7 x Kashi Vidhi (0.28), NDLM-23-3 x Kashi Santusthi (0.21) and NDLM-23-6 x Punjab Long Melon (0.17) in Y2, whereas 7 cross NDLM-23-9 x Kashi Vidhi (0.41), NDLM-23-4 x Punjab Long Melon ((0.31), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-7 x Kashi Vidhi (0.29), NDLM-23-3 x Kashi Santusthi (0.20), NDLM-23-6 x Punjab Long Melon

(0.17) and NDLM-23-5 x Kashi Santusthi (0.12) exhibited positive significant *sca* over pooled. Based on *per se* performance cross combinations NDLM-23-8 x Kashi Vidhi followed by NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon were found good specific combiner in pooled data.

4.4.3.11 Number of fruits per plant

Positive significant *sca* is desirable for number of fruits per plant, out of 27 crosses, 10 cross combinations NDLM-23-1 x Kashi Santusthi (3.97), NDLM-23-9 x Kashi Vidhi (3.69), NDLM-23-4 x Punjab Long Melon (2.53), NDLM-23-7 x Kashi Vidhi (2.51), NDLM-23-3 x Kashi Santusthi (1.89), NDLM-23-8 x Punjab Long Melon (1.71), NDLM-23-6 x Punjab Long Melon (1.67), NDLM-23-7 x Kashi Santusthi (1.51), NDLM-23-5 x Kashi Santusthi (1.34) and NDLM-23-3 x Punjab Long Melon (0.81) showed positive significant *sca* effects in Y1 While 9 cross combination NDLM-23-9 x Kashi Vidhi (5.41), NDLM-23-1 x Kashi Santusthi (4.08), NDLM-23-4 x Punjab Long Melon (2.67), NDLM-23-7 x Kashi Vidhi (2.25), NDLM-23-6 x Punjab Long Melon (1.82), NDLM-23-8 x Punjab Long Melon (1.82), NDLM-23-3 x Kashi Santusthi (1.67) and NDLM-23-7 x Kashi Santusthi (1.64) in Y2, however 9 crosses NDLM-23-9 x Kashi Vidhi (4.55), NDLM-23-1 x Kashi Santusthi (4.02), NDLM-23-4 x Punjab Long Melon (2.60), NDLM-23-7 x Kashi Vidhi (2.38), NDLM-23-3 x Kashi Santusthi (1.78), NDLM-23-8 x Punjab Long Melon (1.77), NDLM-23-6 x Punjab Long Melon (1.74), NDLM-23-7 x Kashi Santusthi (1.57) and NDLM-23-5 x Kashi Santusthi (1.40) exhibited Positive significant *sca* over pooled. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-9 x Kashi Vidhi and NDLM-23-6 x Kashi Santusthi were observed good specific combiner for number of fruits per plant.

4.4.3.12 Average fruit weight (gm)

Out of 27 crosses, significant *sca* effects were observed in 7 cross combinations NDLM-23-9 x Kashi Vidhi (11.63), NDLM-23-3 x Kashi Santusthi (9.13), NDLM-23-1 x Kashi Santusthi (6.29), NDLM-23-6 x Punjab Long Melon (5.02), NDLM-23-7 x Kashi Vidhi (4.87), NDLM-23-4 x Punjab Long Melon (4.32) and NDLM-23-3 x Punjab Long Melon (3.28) in Y1. On the other hand 3 crosses NDLM-23-9 x Kashi Vidhi (12.25), NDLM-23-3 x Kashi Santusthi (9.16) and NDLM-23-1 x Kashi Santusthi (6.34) and 7 cross combinations NDLM-23-9 x Kashi Vidhi (11.94), NDLM-23-3 x Kashi Santusthi

(9.15), NDLM-23-1 x Kashi Santusthi (6.32), NDLM-23-6 x Punjab Long Melon (5.05), NDLM-23-7 x Kashi Vidhi (4.84), NDLM-23-4 x Punjab Long Melon (4.35) and NDLM-23-3 x Punjab Long Melon (3.31) showed significant and positive *sca* effects over pooled. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi followed by NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi and NDLM-23-3 x Kashi Santusthi were observed good specific combiner for average fruit weight.

4.4.3.13 Number of seeds per fruit

Out of 27 crosses, significant *sca* effects were observed in 5 cross combinations NDLM-23-4 x Punjab Long Melon (118.15), NDLM-23-9 x Kashi Vidhi (76.59), NDLM-23-1 x Kashi Santusthi (76.26), NDLM-23-7 x Kashi Vidhi (57.26) and NDLM-23-3 x Kashi Santusthi (40.26) in Y1 and in Y2, 5 crosses NDLM-23-4 x Punjab Long Melon (122.85), NDLM-23-9 x Kashi Vidhi (77.41), NDLM-23-1 x Kashi Santusthi (76.41), NDLM-23-7 x Kashi Vidhi (58.74) and NDLM-23-6 x Kashi Santusthi (42.41) whereas 4 crosses NDLM-23-4 x Punjab Long Melon (120.50), NDLM-23-9 x Kashi Vidhi (77.00), NDLM-23-1 x Kashi Santusthi (76.33) and NDLM-23-7 x Kashi Vidhi (58.00) exhibited significant and *sca* effects for number of seeds per fruits in over year pooled. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were observed good specific combiner for number of seeds per fruit.

4.4.3.14 Fruit yield per plant (kg)

In respect of total fruit yield per plant, only 12 cross namely NDLM-23-9 x Kashi Vidhi (0.62), NDLM-23-1 x Kashi Santusthi (0.49), NDLM-23-3 x Kashi Santusthi (0.42), NDLM-23-7 x Kashi Vidhi (0.32), NDLM-23-6 x Punjab Long Melon (0.30), NDLM-23-4 x Punjab Long Melon (0.29), NDLM-23-7 x Kashi Santusthi (0.19), NDLM-23-8 x Punjab Long Melon (0.19), NDLM-23-5 x Kashi Santusthi (0.18), NDLM-23-3 x Punjab Long Melon (0.15), NDLM-23-2 x Kashi Santusthi (0.12) and NDLM-23-8 x Kashi Vidhi (0.10) in Y1 Whereas 9 crosses NDLM-23-9 x Kashi Vidhi (0.80), NDLM-23-1 x Kashi Santusthi (0.59), NDLM-23-3 x Kashi Santusthi (0.46), NDLM-23-7 x Kashi Vidhi (0.36), NDLM-23-4 x Punjab Long Melon (0.31), NDLM-23-6 x Punjab Long Melon (0.27), NDLM-23-8 x Punjab Long Melon (0.20), NDLM-23-3 x Punjab Long Melon (0.19) and NDLM-23-5 x Kashi Santusthi (0.18) in Y2 showed significant positive *sca* effect for fruit breadth. In case of pooled of year 12 cross combinations NDLM-23-9 x Kashi Vidhi (0.71), NDLM-23-1 x Kashi Santusthi (0.54), NDLM-23-3 x Kashi Santusthi (0.44),

NDLM-23-7 x Kashi Vidhi (0.34), NDLM-23-4 x Punjab Long Melon(0.30), NDLM-23-6 x Punjab Long Melon (0.29), NDLM-23-8 x Punjab Long Melon (0.19), NDLM-23-5 x Kashi Santusthi (0.18), NDLM-23-3 x Punjab Long Melon (0.17), NDLM-23-2 x Kashi Santusthi (0.13), NDLM-23-7 x Kashi Santusthi (0.13) and NDLM-23-8 x Kashi Vidhi (0.11) exhibited significant positive *sca* effects. Based on *per se* performance crosses NDLM-23-8 × Kashi Vidhi followed by NDLM-23-6 × Punjab Long Melon, NDLM-23-8 × Punjab Long Melon and NDLM-23-6 × Kashi Vidhi were observed good specific combiner for fruit yield per plant.

4.4.3.15 Fruit yield (q/ha)

Among the crosses , 10 crosses NDLM-23-9 x Kashi Vidhi (37.84), NDLM-23-1 x Kashi Santusthi (27.75), NDLM-23-3 x Kashi Santusthi (21.49), NDLM-23-6 x Punjab Long Melon (18.67), NDLM-23-4 x Punjab Long Melon (18.47), NDLM-23-7 x Kashi Vidhi (18.44), NDLM-23-7 x Kashi Santusthi (13.48), NDLM-23-3 x Punjab Long Melon (12.89), NDLM-23-5 x Kashi Santusthi (11.36) and NDLM-23-2 x Kashi Santusthi (7.17) exhibited positively significant *sca* value in Y1, whereas, 8 cross combinations NDLM-23-9 x Kashi Vidhi (51.69), NDLM-23-1 x Kashi Santusthi (35.83), NDLM-23-3 x Kashi Santusthi (27.28), NDLM-23-7x Kashi Vidhi (26.45), NDLM-23-4 x Punjab Long Melon (19.32), NDLM-23-6 x Punjab Long Melon (15.45), NDLM-23-3 x Punjab Long Melon (13.33) and NDLM-23-8 x Punjab Long Melon (12.79) expressed positive significant *sca* effects in Y2 and 12 cross combinations NDLM-23-9 x Kashi Vidhi (51.69), NDLM-23-1 x Kashi Santusthi (35.83), NDLM-23-3 x Kashi Santusthi (27.28), NDLM-23-7x Kashi Vidhi (26.45), NDLM-23-4 x Punjab Long Melon (19.32), NDLM-23-6 x Punjab Long Melon (15.45), NDLM-23-3 x Punjab Long Melon (13.33) , NDLM-23-5 x Kashi Santusthi (11.15), NDLM-23-7 x Kashi Santusthi (9.97), NDLM-23-8 x Punjab Long Melon (9.40), NDLM-23-8 x Kashi Vidhi (8.96) and NDLM-23-2 x Kashi Santusthi (7.17) showed positive significant *sca* effect in over year pooled respectively. Based on *per se* performance crosses NDLM-23-8 × Kashi Vidhi, NDLM-23-6 × Punjab Long Melon, NDLM-23-8 × Punjab Long Melon, NDLM-23-6 × Kashi Vidhi were observed good specific combiner for fruit yield per hectare.

4.4.3.16 Total soluble solids (%)

Among 27 cross combinations only 6 crosses NDLM-23-7 x Kashi Santusthi (0.41), NDLM-23-4 x Punjab Long Melon (0.32), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-9 x Kashi Vidhi (0.28), NDLM-23-8 x Kashi Vidhi (0.20) and NDLM-23-3 x

Kashi Santusthi (0.14) showed high negative and significant *sca* in Y1 and in Y2 among crosses 3 cross combinations namely NDLM-23-1 x Kashi Santusthi (0.60), NDLM-23-9 x Kashi Vidhi (0.42) and NDLM-23-2 x Punjab Long Melon (0.28) however 6 cross NDLM-23-1 x Kashi Santusthi (0.45), NDLM-23-9 x Kashi Vidhi (0.35), NDLM-23-4 x Punjab Long Melon (0.30), NDLM-23-7 x Kashi Santusthi (0.28), NDLM-23-8 x Kashi Vidhi (0.23) and NDLM-23-7 x Kashi Vidhi (0.18) exhibited positive significant *sca* over pooled. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi were observed good specific combiner for total soluble solids.

4.2.3.17 Ascorbic acid (mg/100g fresh fruit)

Related to ascorbic acid content, among 27 crosses only 10 cross combinations NDLM-23-7 x Punjab Long Melon (0.16), NDLM-23-3 x Kashi Vidhi (0.15), NDLM-23-4 x Kashi Santusthi (0.13), NDLM-23-9 x Kashi Santusthi (0.12), NDLM-23-5 x Kashi Vidhi (0.12), NDLM-23-1 x Punjab Long Melon (0.08), NDLM-23-1 x Kashi Vidhi (0.05), NDLM-23-9 x Punjab Long Melon (0.05), NDLM-23-8 x Kashi Santusthi (0.04) and NDLM-23-6 x Kashi Vidhi (0.03) in Y1 on the other hand 9 cross combinations NDLM-23-3 x Kashi Vidhi (0.15), NDLM-23-7 x Punjab Long Melon (0.14), NDLM-23-4 x Kashi Santusthi (0.13), NDLM-23-5 x Kashi Vidhi (0.13), NDLM-23-9 x Kashi Santusthi (0.12), NDLM-23-1 x Punjab Long Melon (0.08), NDLM-23-9 x Punjab Long Melon (0.07), NDLM-23-1 x Kashi Vidhi (0.05) and NDLM-23-8 x Kashi Santusthi (0.04) in Y2 and 10 cross combinations NDLM-23-7 x Punjab Long Melon (0.15), NDLM-23-3 x Kashi Vidhi (0.15), NDLM-23-4 x Kashi Santusthi (0.13), NDLM-23-5 x Kashi Vidhi (0.12), NDLM-23-9 x Kashi Santusthi (0.12), NDLM-23-1 x Punjab Long Melon (0.08), NDLM-23-9 x Punjab Long Melon (0.06), NDLM-23-1 x Kashi Vidhi (0.05), NDLM-23-8 x Kashi Santusthi (0.04) and NDLM-23-6 x Kashi Vidhi (0.03) in pooled results exhibited positive significant *sca* effects. Based on *per se* performance crosses NDLM-23-6 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi good specific combiner for ascorbic acid content.

4.3.3.18 Dry matter content (%)

In respect of dry matter content, 10 cross combinations NDLM-23-9 x Kashi Vidhi (0.52), NDLM-23-3 x Kashi Santusthi (0.46), NDLM-23-7 x Kashi Vidhi (0.36), NDLM-23-6 x Punjab Long Melon (0.34), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-

23-8 x Kashi Vidhi (0.18), NDLM-23-3 x Punjab Long Melon (0.18), NDLM-23-8 x Punjab Long Melon (0.16), NDLM-23-4 x Punjab Long Melon (0.15) and NDLM-23-5 x Kashi Santusthi (0.15) were found positive significant *sca* effects and in case of Y2, 5 cross combinations NDLM-23-9 x Kashi Vidhi (0.55), NDLM-23-3 x Kashi Santusthi (0.46), NDLM-23-7 x Kashi Vidhi (0.36), NDLM-23-6 x Punjab Long Melon (0.34) and NDLM-23-1 x Kashi Santusthi (0.31) and 7 cross combinations NDLM-23-9 x Kashi Vidhi (0.54), NDLM-23-7 x Kashi Santusthi (0.46), NDLM-23-7 x Kashi Vidhi (0.36), NDLM-23-6 x Punjab Long Melon (0.34), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-8 x Kashi Vidhi (0.19) and NDLM-23-3 x Punjab Long Melon (0.18) in pooled results showed positive significant *sca* effects. Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon good specific combiner for dry matter.

4.4.3.19 Reducing sugars (%)

Positive and significant high value *sca* effects were showed by 10 cross combination NDLM-23-4 x Punjab Long Melon (0.31), NDLM-23-1 x Kashi Santusthi (0.26), NDLM-23-9 x Kashi Vidhi (0.24), NDLM-23-3 x Kashi Santusthi (0.20), NDLM-23-7 x Kashi Santusthi (0.18), NDLM-23-7 x Kashi Vidhi (0.18), NDLM-23-4 x Kashi Vidhi (0.15), NDLM-23-5 x Kashi Santusthi (0.15), NDLM-23-3 x Punjab Long Melon (0.09) and NDLM-23-5 x Punjab Long Melon (0.08) in Y1 while 10 cross combinations NDLM-23-4 x Punjab Long Melon (0.32), NDLM-23-9 x Kashi Vidhi (0.29), NDLM-23-1 x Kashi Santusthi (0.26), NDLM-23-3 x Kashi Santusthi (0.22), NDLM-23-7 x Kashi Santusthi (0.20), NDLM-23-7 x Kashi Vidhi (0.17), NDLM-23-5 x Kashi Santusthi (0.15), NDLM-23-6 x Punjab Long Melon (0.14), NDLM-23-4 x Kashi Vidhi (0.13) and NDLM-23-5 x Punjab Long Melon (0.08) in Y2 and on the other hand in pooled results 11 cross combinations NDLM-23-4 x Punjab Long Melon (0.31), NDLM-23-9 x Kashi Vidhi (0.26), NDLM-23-1 x Kashi Santusthi (0.26), NDLM-23-3 x Kashi Santusthi (0.21), NDLM-23-7 x Kashi Santusthi (0.19), NDLM-23-7 x Kashi Vidhi (0.18), NDLM-23-5 x Kashi Santusthi (0.15), NDLM-23-4 x Kashi Vidhi (0.14), NDLM-23-6 x Punjab Long Melon (0.13), NDLM-23-5 x Punjab Long Melon (0.08) and NDLM-23-3 x Punjab Long Melon (0.08). Based on *per se* performance crosses NDLM-23-8 x Kashi Vidhi, NDLM-23-6 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi was observed best combiner for reducing sugar content.

4.4.3.20 Non-reducing sugars (%)

In 27 crosses, 6 cross combinations NDLM-23-2 x Kashi Santusthi (0.67), NDLM-23-9 x Kashi Vidhi (0.27), NDLM-23-7 x Kashi Vidhi (0.20), NDLM-23-4 x Punjab Long Melon (0.16), NDLM-23-6 x Punjab Long Melon (0.12) and NDLM-23-3 x Punjab Long Melon (0.11) in Y1 and 3 cross combinations NDLM-23-2 x Kashi Santusthi (0.68), NDLM-23-9 x Kashi Vidhi (1.21) and NDLM-23-7 x Kashi Vidhi (0.21) were observed positive significant *sca* effects and 7 cross combinations NDLM-23-2 x Kashi Santusthi (0.68), NDLM-23-9 x Kashi Vidhi (0.24), NDLM-23-7 x Kashi Vidhi (0.20), NDLM-23-4 x Punjab Long Melon (0.15), NDLM-23-6 x Punjab Long Melon (0.12), NDLM-23-3 x Punjab Long Melon (0.11) and NDLM-23-8 x Punjab Long Melon (0.08) over year pooled exhibited positive *sca* effects. Based on *per se* performance crosses NDLM-23-2 x Kashi Santusthi (2.12%), NDLM-23-8 x Kashi Vidhi (1.85%), NDLM-23-6 x Punjab Long Melon were found best specific combiner for non-reducing sugar.

4.4.3.21 Total sugars (%)

Among 27 crosses, only 13 cross combinations NDLM-23-2 x Kashi Santusthi (0.70), NDLM-23-9 x Kashi Vidhi (0.50), NDLM-23-4 x Punjab Long Melon (0.47), NDLM-23-7 x Kashi Vidhi (0.38), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-3 x Kashi Santusthi (0.25), NDLM-23-4 x Kashi Vidhi (0.21), NDLM-23-3 x Punjab Long Melon (0.20), NDLM-23-5 x Punjab Long Melon (0.15), NDLM-23-7 x Kashi Santusthi (0.13), NDLM-23-5 x Kashi Santusthi (0.13), NDLM-23-8 x Punjab Long Melon (0.09) and NDLM-23-8 x Kashi Vidhi (0.08) observed significant *sca* in Y1. On other hand in Y2, 13 cross combinations NDLM-23-2 x Kashi Santusthi (0.70), NDLM-23-9 x Punjab Long Melon (0.50), NDLM-23-4 x Punjab Long Melon (0.47), NDLM-23-7 x Kashi Vidhi (0.38), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-3 x Kashi Santusthi (0.25), NDLM-23-4 x Kashi Vidhi (0.21), NDLM-23-3 x Punjab Long Melon (0.20), NDLM-23-5 x Punjab Long Melon (0.15), NDLM-23-7 x Kashi Santusthi (0.13), NDLM-23-5 x Kashi Santusthi (0.13), NDLM-23-8 x Punjab Long Melon (0.09) and NDLM-23-8 x Kashi Vidhi (0.08) and 13 cross combinations NDLM-23-2 x Kashi Santusthi (0.70), NDLM-23-9 x Kashi Vidhi (0.51), NDLM-23-4 x Punjab Long Melon (0.47), NDLM-23-7 x Kashi Vidhi (0.38), NDLM-23-1 x Kashi Santusthi (0.30), NDLM-23-3 x Kashi Santusthi (0.25), NDLM-23-4 x Kashi Vidhi (0.21), NDLM-23-3 x Punjab Long Melon (0.20), NDLM-23-5 x Punjab Long Melon (0.15), NDLM-23-7 x Kashi Santusthi (0.13), NDLM-23-5 x Kashi Santusthi (0.13), NDLM-23-8 x Punjab Long Melon (0.09) and NDLM-23-8 x Kashi Vidhi

(0.08) exhibited positive significant *sca* in over year pooled results. Based on *per se* performance crosses NDLM-23-2 × Kashi Santushti (2.12%), NDLM-23-8 × Kashi Vidhi (1.85%), NDLM-23-6 × Punjab Long Melon were found best specific combiner for non-reducing sugar.

4.4.3.22 Total carotenoid content (µg/100mg)

Our 27 crosses, 11 cross combinations NDLM-23-9 x Kashi Vidhi (1.61), NDLM-23-6 x Punjab Long Melon (1.38), NDLM-23-3 x Kashi Santusthi (1.36), NDLM-23-8 x Kashi Vidhi (1.29), NDLM-23-4 x Punjab Long Melon (1.19), NDLM-23-1 x Kashi Santusthi (1.16), NDLM-23-7 x Kashi Vidhi (0.97), NDLM-23-7 x Kashi Santusthi (0.64), NDLM-23-5 x Kashi Santusthi (0.63), NDLM-23-3 x Punjab Long Melon (0.47) and NDLM-23-2 x Kashi Santusthi (0.32) exhibited significant positive *sca* effects in Y1 whenever 8 cross combinations NDLM-23-9 x Kashi Vidhi (1.69), NDLM-23-6 x Punjab Long Melon (1.41), NDLM-23-3 x Kashi Santusthi (1.36), NDLM-23-4 x Punjab Long Melon (1.19), NDLM-23-1 x Kashi Santusthi (0.17), NDLM-23-7 x Kashi Vidhi (0.96), NDLM-23-5 x Kashi Santusthi (0.67) and NDLM-23-7 x Kashi Santusthi (0.67) in Y2, however 10 cross combinations NDLM-23-9 x Kashi Vidhi (1.65), NDLM-23-6 x Punjab Long Melon (1.39), NDLM-23-3 x Kashi Santusthi (1.36), NDLM-23-8 x Kashi Vidhi (1.33), NDLM-23-4 x Punjab Long Melon (1.19), NDLM-23-1 x Kashi Santusthi (1.16), NDLM-23-7 x Kashi Vidhi (0.97), NDLM-23-7 x Kashi Santusthi (0.66), NDLM-23-5 x Kashi Santusthi (0.65) and NDLM-23-3 x Punjab Long Melon (0.48) showed positive significant *sca* effects over year pooled. Based on *per se* performance crosses NDLM-23-8 × Kashi Vidhi, NDLM-23-6 × Punjab Long Melon, NDLM-23-8 × Punjab Long Melon were found best specific combiner for carotenoid content.

4.5 Estimates of Heterosis over Better Parent and Mid Parent

Heterosis calculated as percent increase or decrease over better parent and mid parent for twenty-two characters in Y1, Y2 and pooled had given in Table 4.5 and described as negative heterosis desirable for earliness characters and positive heterosis desirable for growth, yield and quality follow:

4.5.1 Days to first male flowering

Among the 27 crosses, the magnitude of heterosis for days to first male flowering ranged from -9.57 (NDLM-23-8 x Kashi Vidhi) to -5.09 % (NDLM-23-7 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from 5.09 (NDLM-23-9 x Kashi

Vidhi) to 11.73 % (NDLM-23-2 x Kashi Santusthi). Out of crosses, 8 crosses showed significant negative heterosis over better parent whereas, 20 crosses showed significant positive heterosis over midparent. Best five crosses based on high negative value over better parent were NDLM-23-8 x Kashi Vidhi (-9.57), NDLM-23-3 x Kashi Santusthi (-8.43), NDLM-23-6 x Punjab Long Melon (-7.84), NDLM-23-8 x Kashi Santusthi (-7.67) and NDLM-23-6 x Kashi Vidhi (-7.44) in Y1 whereas in case of Y2 the magnitude of heterosis ranged from -17.97 (NDLM-23-3 x Kashi Santusthi) to -3.35 % (NDLM-23-4 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from 7.83 (NDLM-23-9 x Kashi Vidhi) to 19.33 % (NDLM-23-1 x Punjab Long Melon).

Among the 27 crosses, 14 crosses showed significant negative heterosis over better parent whereas, 19 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative heterosis over better parent were NDLM-23-3 x Kashi Santusthi (-17.97), NDLM-23-3 x Punjab Long Melon (-14.24), NDLM- 23-8 x Punjab Long Melon (-11.23), NDLM-23-6 x Punjab Long Melon (-10.90) and NDLM23-6 x Kashi Santusthi (-10.80) and pooled year data showed the magnitude of heterosis ranged from -12.88 (NDLM-23-3 x Kashi Santusthi) to -2.54 % (NDLM-23-4 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from 4.50 (NDLM-23-6 x Kashi Santusthi) to 14.94 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 14 crosses showed significant negative heterosis over better parent whereas, 20 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-3 x Kashi Santusthi (-12.88), NDLM-23-2 x Punjab Long Melon (-10.80), NDLM-23-6 x Punjab Long Melon (-9.34), NDLM-23-8 x Punjab Long Melon (9.14) and NDLM-23-8 x Kashi Vidhi (-9.11).

4.5.2 Days to first female flowering

Out of 27 evaluated crosses results showed the magnitude of heterosis for Days to first female flowering ranged from -10.58 (NDLM-23-8 x Kashi Vidhi) to -4.64 % (NDLM-23-7 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -5.54 (NDLM-238 x Kashi Vidhi) to 10.34 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 2 crosses showed significant negative heterosis over better parent whereas, 18 crosses showed significant positive and 1 significant negative heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better

parent were NDLM-23-8 x Kashi Vidhi (-10.58) and NDLM-23-7 x Kashi Vidhi (-4.64), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-5.54) in Y1.

In case of Y2, the magnitude of heterosis for Days to first female flowering ranged from -17.12 (NDLM-23-3 x Kashi Santusthi) to -5.10 % (NDLM-23-7 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -4.72 (NDLM-23-8 x Kashi Vidhi) to 19.98 % (NDLM-23-2 x Kashi Santusthi). Among the 27 crosses, 9 crosses showed significant negative heterosis over better parent whereas, 20 crosses showed significant positive heterosis and 1 cross showed negative heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-3 x Kashi Santusthi (-17.12), NDLM-23-6 x Kashi Santusthi (-13.27), NDLM-23-8 x Kashi Santusthi (-10.86), NDLM-23-8 x Kashi Vidhi (-9.36) and NDLM-23-3 x Punjab Long Melon (-9.08), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-4.72) observed for Y2.

On other hand pooled year data showed the magnitude of heterosis for Days to first female flowering ranged from -9.23 (NDLM-23-8 x Kashi Vidhi) to -3.31 % (NDLM-23-8 x Punjab Long Melon) over better parent while, for mid-parent heterosis it varied from -5.14 (NDLM-23-8 x Kashi Vidhi) to 15.09 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 9 crosses showed significant negative heterosis over better parent whereas, 19 crosses showed significant positive heterosis and 1 cross showed negative heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-8 x Kashi Vidhi (-9.23), NDLM-23-3 x Kashi Santusthi (-8.72), NDLM-23-6 x Kashi Santusthi (-6.84), NDLM-23-8 x Kashi Santusthi (-6.10) and NDLM-23-3 x Kashi Vidhi (-5.70), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-5.14).

4.5.3 Days to 50% female flowering

Regarding the magnitude of heterosis for days to 50 % flowering ranged from -5.56 (NDLM-23-5 x Punjab Long Melon) to 8.40 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from 5.26 (NDLM-23-9 x Kashi Santusthi) to 16.14 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 4 crosses showed significant negative heterosis and 2 significant positive heterosis over better parent whereas, 10 crosses showed significant positive heterosis over mid-parent. Among 27

Table 4.5: Estimates of heterosis (%) over better parent (BP) and mid parent (MP) over two years (Y1= 2024, Y2 = 2025) and pooled.

S. No.	Crosses	Days to first male flowering					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-2.04	7.13**	-1.99	13.52**	-2.02	10.27**
2	NDLM-23-1 x Punjab Long Melon	-0.21	9.14**	3.02	19.33**	1.44	14.16**
3	NDLM-23-1 x Kashi Vidhi	-0.84	8.45**	2.95	19.24**	1.09	13.77**
4	NDLM-23-2 x Kashi Santusthi	0.69	11.73**	0.7	18.26**	0.69	14.94**
5	NDLM-23-2 x Punjab Long Melon	0.58	11.6**	0.57	18.11**	0.58	14.81**
6	NDLM-23-2 x Kashi Vidhi	0.13	11.11**	0.18	17.65**	0.16	14.33**
7	NDLM-23-3 x Kashi Santusthi	-8.43**	-0.57	-	-3.65	-	-2.09
				17.97**		12.88**	
8	NDLM-23-3 x Punjab Long Melon	-7.19**	-0.24	-	0.74	-	0.25
				14.24**		10.80**	
9	NDLM-23-3 x Kashi Vidhi	-1.26	6.13*	-6.01**	10.40**	-3.69**	8.24**
10	NDLM-23-4 x Kashi Santusthi	0.41	9.40**	-3.94*	17.89**	-1.86	13.57**
11	NDLM-23-4 x Punjab Long Melon	-1.98	6.81*	-5.18**	16.36**	-3.65**	11.51**
12	NDLM-23-4 x Kashi Vidhi	-1.68	7.13**	-3.35*	18.61**	-2.54*	12.79**
13	NDLM-23-5 x Kashi Santusthi	-1.37	10.05**	-1.31	16.56**	-1.35	13.26**
14	NDLM-23-5 x Punjab Long Melon	-1.93	9.43**	-1.9	15.86**	-1.92	12.60**
15	NDLM-23-5 x Kashi Vidhi	-0.4	11.14**	-0.49	17.53**	-0.45	14.28**
16	NDLM-23-6 x Kashi Santusthi	-2.62	5.73*	-	2.83	-6.77**	4.30*
				10.80**			
17	NDLM-23-6 x Punjab Long Melon	-7.84**	-2.13	-	-3.8	-9.34**	-2.95
				10.90**			
18	NDLM-23-6 x Kashi Vidhi	-7.44**	-1.03	-5.58**	2.96	-6.51**	0.94
19	NDLM-23-7 x Kashi Santusthi	-3.09	8.20**	-2.12	14.65**	-2.60*	11.37**
20	NDLM-23-7 x Punjab Long Melon	-2.11	9.29**	-1.97	14.82**	-2.03	12.02**
21	NDLM-23-7 x Kashi Vidhi	-5.09**	5.96*	-4.14*	12.28**	-4.61**	9.08**
22	NDLM-23-8 x Kashi Santusthi	-7.67**	0.24	-	3.36	-9.01**	1.78
				10.33**			
23	NDLM-23-8 x Punjab Long Melon	-7.10**	-1.44	-11.23**	-4.15	-9.16**	-2.78
24	NDLM-23-8 x Kashi Vidhi	-9.57**	-3.3	-8.66**	-0.4	-9.11**	-1.87
25	NDLM-23-9 x Kashi Santusthi	0.46	9.08**	2.91	18.63**	1.71	13.78**
26	NDLM-23-9 x Punjab Long Melon	-0.14	8.34**	-0.19	14.74**	-0.16	11.49**
27	NDLM-23-9 x Kashi Vidhi	-3.13	5.09**	-6.19**	7.83**	-4.69**	6.43*
No. of crosses with significant (+) heterosis		0	4	0	19	0	20
No. of crosses with significant (-) heterosis		8	0	14	0	14	0
Range of heterosis		- 9.57 to +5.09	5.09 to +11.73	-17.97 to +3.35	7.83 to +19.33	-12.88 to -2.54	4.30 to +14.94

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S. No.	Crosses	Days to first female flowering					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-2.51	4.85*	-1.12	15.48**	-0.88	10.08**
2	NDLM-23-1 x Punjab Long Melon	-0.45	7.07*	1.99	15.44**	0.79	11.20**
3	NDLM-23-1 x Kashi Vidhi	-2.03	5.37	0.25	13.47**	-0.87	9.36**
4	NDLM-23-2 x Kashi Santusthi	0.55	10.34**	2.73	19.98**	2.26	15.09**
5	NDLM-23-2 x Punjab Long Melon	0.14	9.90**	0.16	15.64**	0.16	12.73**
6	NDLM-23-2 x Kashi Vidhi	0	9.74**	1.23	16.88**	0.63	13.26**
7	NDLM-23-3 x Kashi Santusthi	0.33	5.85*	-17.12**	-3.21	-8.72**	1.38
8	NDLM-23-3 x Punjab Long Melon	-1.54	4.32*	-9.08**	3.66	-4.36**	3.99
9	NDLM-23-3 x Kashi Vidhi	-3.08	0.73	-8.42**	4.41*	-5.70**	2.55
10	NDLM-23-4 x Kashi Santusthi	2.72	8.64**	-2.13	14.30**	0.33	11.43**
11	NDLM-23-4 x Punjab Long Melon	-1.98	3.85	-2.85	12.85**	-2.34	8.30**
12	NDLM-23-4 x Kashi Vidhi	-1.04	4.67*	-2.28	13.52**	-1.69	9.02**
13	NDLM-23-5 x Kashi Santusthi	-0.48	9.64**	-4.31*	12.87**	-2.43	11.22**
14	NDLM-23-5 x Punjab Long Melon	-1.26	8.77**	-0.19	17.73**	-0.71	13.19**
15	NDLM-23-5 x Kashi Vidhi	-0.24	9.90**	-2.03	15.56**	-1.15	12.69**
16	NDLM-23-6 x Kashi Santusthi	0.1	5.61*	-13.27**	1.29	-6.84**	3.47
17	NDLM-23-6 x Punjab Long Melon	-2.84	2.94	-4.07	-0.83	-3.44*	1.08
18	NDLM-23-6 x Kashi Vidhi	-2.27	1.58	-5.33*	-0.49	-3.78*	0.56
19	NDLM-23-7 x Kashi Santusthi	-2.76	5.27*	-5.10**	10.83**	-2.75	8.01*
20	NDLM-23-7 x Punjab Long Melon	0.42	8.70**	0.87	11.25**	0.63	9.95**
21	NDLM-23-7 x Kashi Vidhi	-4.64*	3.23	2.01	12.50**	-1.33	7.80*
22	NDLM-23-8 x Kashi Santusthi	-1.07	4.50*	-10.86**	4.10*	-6.10**	4.30*
23	NDLM-23-8 x Punjab Long Melon	-2.86	2.92	-3.8	-0.54	-3.31*	1.21
24	NDLM-23-8 x Kashi Vidhi	-10.58**	-5.54*	-9.36**	-4.72*	-9.23**	-5.14*
25	NDLM-23-9 x Kashi Santusthi	1.31	6.89*	-1.8	14.68**	-0.3	10.73**
26	NDLM-23-9 x Punjab Long Melon	-2.6	3.19	0.8	11.16**	-0.65	7.12*
27	NDLM-23-9 x Kashi Vidhi	-0.8	4.58*	-3.84	6.05*	-2.34	5.29*
No. of crosses with significant (+) heterosis		0	18	0	20	0	19
No. of crosses with significant (-) heterosis		2	1	9	1	9	1
Range of heterosis		-10.58 to -4.64	-5.54 to +10.34	-17.12 to -5.10	-4.72 to +19.98	-9.23 to -3.31	-5.14 to +15.09

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S. No.	Crosses	Days to first harvesting					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-2.08	2.03	-4.25*	11.89**	-3.17*	6.67**
2	NDLM-23-1 x Punjab Long Melon	-0.11	4.09*	-1.06	15.61**	-0.58	9.52**
3	NDLM-23-1 x Kashi Vidhi	-0.22	4.02*	-3.40*	12.89**	-1.78	8.19**
4	NDLM-23-2 x Kashi Santusthi	0.56	6.74**	3.77*	21.92**	2.15	13.89**
5	NDLM-23-2 x Punjab Long Melon	0.26	6.42**	2.84	20.84**	1.53	13.20**
6	NDLM-23-2 x Kashi Vidhi	0.07	6.22**	0.08	17.60**	0.08	11.58**
7	NDLM-23-3 x Kashi Santusthi	-1.97	0.47	-9.97**	2.19	-5.95**	1.28
8	NDLM-23-3 x Punjab Long Melon	-0.92	1.13	-3.58*	8.07**	-2.24	4.40*
9	NDLM-23-3 x Kashi Vidhi	-2.38	1.77	-4.39*	7.16**	-2.32	4.31*
10	NDLM-23-4 x Kashi Santusthi	2.41	5.31*	1.15	16.73**	1.78	10.68**
11	NDLM-23-4 x Punjab Long Melon	1.53	4.40*	-3.04	11.90**	-0.74	7.94**
12	NDLM-23-4 x Kashi Vidhi	-1.35	2.84	-1.11	14.12**	-0.54	8.16**
13	NDLM-23-5 x Kashi Santusthi	-2.2	6.19**	-2.88	17.50**	-2.54*	11.52**
14	NDLM-23-5 x Punjab Long Melon	-3.08	5.24*	-3.38*	16.90**	-3.22**	10.74**
15	NDLM-23-5 x Kashi Vidhi	-2.01	6.40**	-2.56	17.89**	-2.28	11.81**
16	NDLM-23-6 x Kashi Santusthi	-1.93	0.51	-11.54**	0.4	-6.72**	0.45
17	NDLM-23-6 x Punjab Long Melon	-3.26	-2.3	-2.24	-0.3	-2.68*	-1.36
18	NDLM-23-6 x Kashi Vidhi	-5.60**	-1.59	-2.19	-0.12	-4.01**	-0.9
19	NDLM-23-7 x Kashi Santusthi	-1.22	2.39	-1.31	12.13**	-1.27	6.98**
20	NDLM-23-7 x Punjab Long Melon	0.38	4.05*	2.63	16.61**	1.49	9.96**
21	NDLM-23-7 x Kashi Vidhi	-3.48*	0.62	-1.74	11.64**	-2.35	5.80*
22	NDLM-23-8 x Kashi Santusthi	-0.41	2.07	-11.71**	0.21	-6.04**	1.19
23	NDLM-23-8 x Punjab Long Melon	-3.12	-2.52	-2.08	-0.13	-2.64*	-1.4
24	NDLM-23-8 x Kashi Vidhi	-10.65**	-6.86**	-7.48**	-5.52**	-9.17**	-6.23*
25	NDLM-23-9 x Kashi Santusthi	0.86	3.49	1.88	15.64**	1.42	9.22**
26	NDLM-23-9 x Punjab Long Melon	-0.19	2.41	-0.32	12.75**	-0.26	7.28**
27	NDLM-23-9 x Kashi Vidhi	-5.90**	-1.91	-2.52	10.27**	-3.47**	3.83
No. of crosses with significant (+) heterosis		0	11	1	20	0	19
No. of crosses with significant (-) heterosis		4	1	9	1	11	1
Range of heterosis		-10.65 to -3.48	-6.86 to +6.47	-11.71 to +3.77	-5.52 to +21.92	-9.17 to -2.54	-6.23 to +13.89

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S. No.	Crosses	Node number at first male flower appearance					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-9.08**	14.57**	-6.3	16.84**	-7.66**	15.60**
2	NDLM-23-1 x Punjab Long Melon	-1.32	24.33**	1.35	26.36**	-0.09	25.11**
3	NDLM-23-1 x Kashi Vidhi	-4.5	20.33**	-1.71	22.56**	-3.12	21.29**
4	NDLM-23-2 x Kashi Santusthi	7.90**	53.33**	8.43*	55.89**	8.12**	54.57**
5	NDLM-23-2 x Punjab Long Melon	7.27**	52.43**	7.96	55.22**	7.49**	53.67**
6	NDLM-23-2 x Kashi Vidhi	3.91	47.67**	4.76	50.61**	4.22	48.98**
7	NDLM-23-3 x Kashi Santusthi	-21.86**	-4.67	-20.56**	-5.05*	-20.08**	-4.92*
8	NDLM-23-3 x Punjab Long Melon	-18.13**	-3.67	-19.72**	-4.04	-19.00**	-3.92
9	NDLM-23-3 x Kashi Vidhi	-10.20**	5.67*	-11.27*	6.06*	-10.82**	5.79
10	NDLM-23-4 x Kashi Santusthi	7.36*	31.33**	0.85	33.00**	4.04	32.14**
11	NDLM-23-4 x Punjab Long Melon	-8.81**	11.57**	-13.70**	13.80**	-11.25**	12.72**
12	NDLM-23-4 x Kashi Vidhi	-7.08*	13.67**	-12.17**	15.82**	-9.75**	14.60**
13	NDLM-23-5 x Kashi Santusthi	-7.22**	40.00**	-8.44*	42.42**	-7.87**	41.04**
14	NDLM-23-5 x Punjab Long Melon	-10.68**	34.77**	-11.69**	37.37**	-11.15**	36.02**
15	NDLM-23-5 x Kashi Vidhi	-1.91	48.00**	-3.46	50.17**	-2.77	48.88**
16	NDLM-23-6 x Kashi Santusthi	-17.21**	1	-12.88*	1.01	-15.10**	1
17	NDLM-23-6 x Punjab Long Melon	-13.23**	-7.43*	-12.34*	-6.73*	-12.79**	-7.16*
18	NDLM-23-6 x Kashi Vidhi	-18.72**	-8.33*	-17.26**	-9.09**	-17.87**	-8.70**
19	NDLM-23-7 x Kashi Santusthi	-2.46	19.00**	-1.91	21.21**	-2.18	20.09**
20	NDLM-23-7 x Punjab Long Melon	2.46	25.00**	-2.72	20.20**	-0.18	22.53**
21	NDLM-23-7 x Kashi Vidhi	-15.85**	2.67	-15.89**	3.94	-15.91**	3.21
22	NDLM-23-8 x Kashi Santusthi	-17.49**	0.67	-14.62**	-1.01	-16.04**	-0.13
23	NDLM-23-8 x Punjab Long Melon	-10.19**	-7.00*	-11.04	-7.74*	-10.76**	-7.5
24	NDLM-23-8 x Kashi Vidhi	-18.42**	-8.00*	-17.26**	-9.09**	-17.77**	-8.60**
25	NDLM-23-9 x Kashi Santusthi	0	22.00**	1.63	25.93**	1.18	23.97**
26	NDLM-23-9 x Punjab Long Melon	-1.56	19.57**	-2.17	21.21**	-1.82	20.29**
27	NDLM-23-9 x Kashi Vidhi	-16.93**	0.9	-18.21**	1.35	-17.49**	1.1
No. of crosses with significant (+) heterosis		3	17	1	16	2	16
No. of crosses with significant (-) heterosis		16	4	13	5	16	4
Range of heterosis		-21.86 to +7.90	-8.33 to +53.33	-20.56 to +8.43	-9.09 to +55.89	-20.08 to +8.12	-8.70 to +54.57

Contd...

S. No.	Crosses	Node number at first female flower appears					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-26.67**	42.00**	-26.65**	43.84**	-26.66**	42.90**
2	NDLM-23-1 x Punjab Long Melon	-15.64**	63.33**	-15.77**	65.17**	-15.71**	64.22**
3	NDLM-23-1 x Kashi Vidhi	-22.56**	49.93**	-22.51**	51.95**	-22.57**	50.85**
4	NDLM-23-2 x Kashi Santusthi	21.56**	107.12**	21.60**	109.61**	21.58**	108.41**
5	NDLM-23-2 x Punjab Long Melon	18.88**	102.56**	19.16**	105.41**	19.02**	104.01**
6	NDLM-23-2 x Kashi Vidhi	17.48**	100.18**	17.42**	102.40**	17.45**	101.32**
7	NDLM-23-3 x Kashi Santusthi	-35.90**	-0.71	-36.78**	-0.9	-36.40**	-0.9
8	NDLM-23-3 x Punjab Long Melon	-30.05**	-0.6	-30.90**	-0.6	-30.45**	-0.48
9	NDLM-23-3 x Kashi Vidhi	-14.05**	22.13**	-14.82**	22.52**	-14.56**	22.26*
10	NDLM-23-4 x Kashi Santusthi	-12.80**	67.80**	-12.67**	69.67**	-12.74**	68.71**
11	NDLM-23-4 x Punjab Long Melon	-30.03**	34.64**	-29.68**	36.64**	-29.86**	35.60**
12	NDLM-23-4 x Kashi Vidhi	-11.71**	69.88**	-11.59**	71.77**	-11.66**	70.80**
13	NDLM-23-5 x Kashi Santusthi	-32.56**	39.20**	-32.52**	40.84**	-32.56**	39.99**
14	NDLM-23-5 x Punjab Long Melon	-18.33**	68.60**	-18.27**	70.57**	-18.30**	69.61**
15	NDLM-23-5 x Kashi Vidhi	-2.31	101.67**	-2.3	103.90**	-2.31	102.81**
16	NDLM-23-6 x Kashi Santusthi	-29.42**	9.32**	-30.27**	9.31**	-29.88**	9.27**
17	NDLM-23-6 x Punjab Long Melon	-21.86**	-3.49	-21.46**	-3.3	-21.67**	-3.38
18	NDLM-23-6 x Kashi Vidhi	-16.31**	16.18**	-16.59**	16.22**	-16.42**	16.27**
19	NDLM-23-7 x Kashi Santusthi	-24.74**	44.38**	-24.50**	46.25**	-24.57**	45.38**
20	NDLM-23-7 x Punjab Long Melon	-14.96**	63.15**	-14.73**	65.17**	-14.80**	64.22**
21	NDLM-23-7 x Kashi Vidhi	-37.99**	18.95**	-37.98**	20.12**	-38.02**	19.44**
22	NDLM-23-8 x Kashi Santusthi	-35.45**	0	-36.21**	0	-35.76**	0.12
23	NDLM-23-8 x Punjab Long Melon	-19.79**	-2.98	-19.85**	-3	-19.70**	-2.87
24	NDLM-23-8 x Kashi Vidhi	-30.90**	-4.08	-31.25**	-4.2	-31.04**	-4.07
25	NDLM-23-9 x Kashi Santusthi	5.19*	62.94**	5.36	65.17**	5.31*	64.13**
26	NDLM-23-9 x Punjab Long Melon	-1.12	49.03**	-1.18	50.75**	-1.18	49.87**
27	NDLM-23-9 x Kashi Vidhi	-30.83**	4.26	-31.50**	4.50*	-31.16**	4.4
No. of crosses with significant (+) heterosis		4	20	3	20	4	20
No. of crosses with significant (-) heterosis		21	0	22	0	21	0
Range of heterosis		-37.99 to +21.56	9.32 to +107.12	-37.98 to +21.60	9.31 to +109.61	-38.02 to +21.58	9.27 to +108.41

Contd...

S. No.	Crosses	Days to 50% female flowering					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-4.33*	1.8	0.31	12.98**	-1.91	7.48**
2	NDLM-23-1 x Punjab Long Melon	-0.98	5.37*	-0.39	12.20**	-0.66	8.84**
3	NDLM-23-1 x Kashi Vidhi	-3.33	2.86	-1.01	11.51**	-2.12	7.24**
4	NDLM-23-2 x Kashi Santusthi	8.40**	16.14**	4.01*	18.79**	6.09**	17.48**
5	NDLM-23-2 x Punjab Long Melon	5.06*	12.56**	3.02	17.66**	3.99**	15.15**
6	NDLM-23-2 x Kashi Vidhi	0.04	7.18*	-0.74	13.37**	-0.36	10.33**
7	NDLM-23-3 x Kashi Santusthi	-3.39	-0.14	-11.13**	-0.28	-7.47**	-0.21
8	NDLM-23-3 x Punjab Long Melon	-2.03	-0.14	-5.40**	5.19*	-3.83**	2.56*
9	NDLM-23-3 x Kashi Vidhi	-0.46	1.46	-7.69**	2.64	-4.29**	2.06*
10	NDLM-23-4 x Kashi Santusthi	1.36	6.43*	1.58	14.37**	1.46	10.46**
11	NDLM-23-4 x Punjab Long Melon	-3.15	1.7	-1.4	11.01**	-2.24	6.43**
12	NDLM-23-4 x Kashi Vidhi	-3.06	1.79	-0.42	12.12**	-1.68	7.04**
13	NDLM-23-5 x Kashi Santusthi	-5.03**	7.14*	-2.78	12.75**	-3.88**	9.98**
14	NDLM-23-5 x Punjab Long Melon	-5.56**	6.54*	-2.39	13.21**	-3.93**	9.93**
15	NDLM-23-5 x Kashi Vidhi	-4.82*	7.38*	-2.64	12.91**	-3.71**	10.19**
16	NDLM-23-6 x Kashi Santusthi	-2.93	0.33	-12.34**	-1.63	-7.89**	-0.66
17	NDLM-23-6 x Punjab Long Melon	-1.79	-0.35	-4.34*	-2.5	-3.09*	-1.45
18	NDLM-23-6 x Kashi Vidhi	-2.08	-0.29	-2.56	0.22	-2.32	-0.02
19	NDLM-23-7 x Kashi Santusthi	-1.36	1.99	-3.61*	10.36**	-2.57*	6.23**
20	NDLM-23-7 x Punjab Long Melon	2.81	6.31*	-1.01	13.33**	0.78	9.88**
21	NDLM-23-7 x Kashi Vidhi	-1.94	1.4	-4.94**	8.82**	-3.54**	5.17**
22	NDLM-23-8 x Kashi Santusthi	-3.21	0.04	-10.24**	0.73	-6.91**	0.4
23	NDLM-23-8 x Punjab Long Melon	-1.74	-0.35	-4.95**	-3.15	-3.38*	-1.77
24	NDLM-23-8 x Kashi Vidhi	-2.44	-0.66	-9.53**	-6.95**	-6.04**	-3.84**
25	NDLM-23-9 x Kashi Santusthi	1.84	5.26*	0.55	12.83**	1.15	9.09**
26	NDLM-23-9 x Punjab Long Melon	-0.3	2.65	-0.73	11.24**	-0.53	7.00**
27	NDLM-23-9 x Kashi Vidhi	-2.57	0.31	-4.01*	7.56**	-3.33*	3.99**
No. of crosses with significant (+) heterosis		2	10	1	18	2	22
No. of crosses with significant (-) heterosis		4	0	11	1	14	1
Range of heterosis		-5.56 to +8.40	5.26 to +16.14	-12.34 to +4.01	-6.95 to +18.79	-7.89 to +6.09	-3.84 to +17.48

Contd...

S. No.	Crosses	Number of primary branches per plant					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	1.64	-9.85*	0.58	-33.38**	1.26	-22.22**
2	NDLM-23-1 x Punjab Long Melon	-6.41	-12.76*	-32.93**	-35.27**	-20.67**	-24.66**
3	NDLM-23-1 x Kashi Vidhi	-1.25	-10.66*	-29.82**	-33.38**	-16.64**	-22.63**
4	NDLM-23-2 x Kashi Santusthi	-10.75*	-20.84**	-12.27**	-41.90**	-11.41**	-31.96**
5	NDLM-23-2 x Punjab Long Melon	-27.21**	-32.15**	-53.53**	-55.15**	-41.33**	-44.30**
6	NDLM-23-2 x Kashi Vidhi	-7.14	-15.99**	-34.40**	-37.74**	-21.80**	-27.42**
7	NDLM-23-3 x Kashi Santusthi	13.11*	1.78	39.55**	-7.30**	25.02**	-2.95
8	NDLM-23-3 x Punjab Long Melon	8.15	0.81	-5.36**	-8.66**	0.91	-4.17
9	NDLM-23-3 x Kashi Vidhi	3.04	-6.79	-8.21**	-12.87**	-3.08	-10.05**
10	NDLM-23-4 x Kashi Santusthi	-2	-13.09*	16.22**	-23.03**	6.30*	-18.35**
11	NDLM-23-4 x Punjab Long Melon	-2.95	-9.53*	-27.97**	-30.48**	-16.32**	-20.54**
12	NDLM-23-4 x Kashi Vidhi	-0.36	-9.85*	-25.23**	-29.03**	-13.78**	-19.98**
13	NDLM-23-5 x Kashi Santusthi	-3.64	-14.54**	13.95**	-24.53**	4.45	-19.77**
14	NDLM-23-5 x Punjab Long Melon	-7.28	-13.57*	-21.05**	-23.80**	-14.65**	-18.96**
15	NDLM-23-5 x Kashi Vidhi	-7.68	-16.48**	-30.22**	-33.77**	-19.88**	-25.64**
16	NDLM-23-6 x Kashi Santusthi	5.48	-3.55	-9.21**	-12.77**	-2.5	-8.46**
17	NDLM-23-6 x Punjab Long Melon	22.18**	13.89*	13.08**	9.14**	17.28**	11.36**
18	NDLM-23-6 x Kashi Vidhi	15.55**	5.65	0.86	-3.09	7.71**	1.12
19	NDLM-23-7 x Kashi Santusthi	1.09	-10.34*	-0.95	-34.40**	0.27	-22.98**
20	NDLM-23-7 x Punjab Long Melon	-6.41	-12.76*	-21.80**	-24.53**	-14.65**	-18.96**
21	NDLM-23-7 x Kashi Vidhi	3.04	-6.79	-12.90**	-17.31**	-5.49*	-12.28**
22	NDLM-23-8 x Kashi Santusthi	3.38	-1.13	-10.14**	-10.01*	-3.9	-5.81*
23	NDLM-23-8 x Punjab Long Melon	10.64*	5.82	1.5	1.64	5.67*	3.56
24	NDLM-23-8 x Kashi Vidhi	24.32**	18.90**	15.94**	16.11**	19.86**	17.48**
25	NDLM-23-9 x Kashi Santusthi	-1.51	-12.44*	-3.51	-36.10**	-2.26	-24.92**
26	NDLM-23-9 x Punjab Long Melon	-5.72	-12.12*	-32.33**	-34.69**	-19.97**	-24.01**
27	NDLM-23-9 x Kashi Vidhi	7.14	-3.07	-5.15**	-9.97**	0.49	-6.73**
No. of crosses with significant (+) heterosis		5	2	5	2	6	2
No. of crosses with significant (-) heterosis		2	16	17	23	12	21
Range of heterosis		-27.21 to+24.32	-32.15 to+18.90	-53.53 to+39.55	-55.15 to+16.11	-41.33 to+25.02	-44.30 to+17.48

Contd...

S. No.	Crosses	Fruit length (cm)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	10.72**	-31.59**	11.35	-36.62**	11.05**	-34.15**
2	NDLM-23-1 x Punjab Long Melon	-31.29**	-46.38**	-37.60**	-50.95**	-34.49**	-48.70**
3	NDLM-23-1 x Kashi Vidhi	-11.99**	-34.84**	-19.14**	-39.57**	-15.64**	-37.25**
4	NDLM-23-2 x Kashi Santusthi	-23.31**	-52.62**	-24.12**	-56.81**	-23.67**	-54.74**
5	NDLM-23-2 x Punjab Long Melon	-38.93**	-52.34**	-44.83**	-56.63**	-41.94**	-54.54**
6	NDLM-23-2 x Kashi Vidhi	-33.60**	-50.84**	-40.08**	-55.23**	-36.90**	-53.07**
7	NDLM-23-3 x Kashi Santusthi	47.91**	0.84	59.55**	0.8	53.59**	0.8
8	NDLM-23-3 x Punjab Long Melon	29.02**	0.69	28.06**	0.66	28.56**	0.67
9	NDLM-23-3 x Kashi Vidhi	5.17*	-22.13**	4.93	-21.59**	5.04	-21.87**
10	NDLM-23-4 x Kashi Santusthi	-14.20**	-46.99**	-14.58*	-51.38**	-14.37**	-49.23**
11	NDLM-23-4 x Punjab Long Melon	-4	-25.07**	-11.07*	-30.10**	-7.60**	-27.64**
12	NDLM-23-4 x Kashi Vidhi	-6.53**	-30.80**	-14.14**	-35.84**	-10.41**	-33.37**
13	NDLM-23-5 x Kashi Santusthi	-18.52**	-49.65**	-19.12**	-53.96**	-18.78**	-51.84**
14	NDLM-23-5 x Punjab Long Melon	-33.42**	-48.04**	-39.64**	-52.56**	-36.56**	-50.33**
15	NDLM-23-5 x Kashi Vidhi	-35.72**	-52.41**	-38.39**	-53.96**	-37.07**	-53.19**
16	NDLM-23-6 x Kashi Santusthi	27.97**	-1.32	26.97**	-1.44	27.45**	-1.39
17	NDLM-23-6 x Punjab Long Melon	43.79**	12.22**	42.13**	11.72**	42.96**	11.94**
18	NDLM-23-6 x Kashi Vidhi	43.66**	10.77**	42.21**	10.40**	42.91**	10.57**
19	NDLM-23-7 x Kashi Santusthi	8.07**	-33.23**	8.58	-38.20**	8.34*	-35.76**
20	NDLM-23-7 x Punjab Long Melon	-31.27**	-46.36**	-37.52**	-50.89**	-34.44**	-48.66**
21	NDLM-23-7 x Kashi Vidhi	20.12**	-11.07**	11.45*	-16.71**	15.71**	-13.94**
22	NDLM-23-8 x Kashi Santusthi	11.22**	-0.2	1.28	-0.26	5.95**	-0.24
23	NDLM-23-8 x Punjab Long Melon	24.82**	12.00**	13.68**	11.95**	18.90**	11.95**
24	NDLM-23-8 x Kashi Vidhi	25.41**	12.54**	13.88**	12.15**	19.30**	12.33**
25	NDLM-23-9 x Kashi Santusthi	-13.32**	-46.34**	-13.94*	-50.89**	-13.61**	-48.65**
26	NDLM-23-9 x Punjab Long Melon	-15.22**	-33.83**	-22.10**	-38.77**	-18.72**	-36.35**
27	NDLM-23-9 x Kashi Vidhi	38.80**	2.76	37.20**	2.53	37.99**	2.63
No. of crosses with significant (+) heterosis		13	4	6	4	9	4
No. of crosses with significant (-) heterosis		13	18	14	18	14	18
Range of heterosis		-38.93 to+47.91	-52.62 to+12.54	-44.83 to+59.55	-56.81 to+12.15	-41.94 to+53.59	-54.74 to+12.33

Contd...

S. No.	Crosses	Fruit breadth (cm)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	2.41	-11.46**	3.27	-13.06**	2.83	-12.20**
2	NDLM-23-1 x Punjab Long Melon	-20.96**	-23.61**	-20.57**	-23.02**	-20.71**	-23.26**
3	NDLM-23-1 x Kashi Vidhi	-3.97*	-13.30**	-5.34	-14.78**	-4.73	-14.03**
4	NDLM-23-2 x Kashi Santusthi	-19.68**	-30.56**	-17.14**	-30.24**	-18.35**	-30.28**
5	NDLM-23-2 x Punjab Long Melon	-26.35**	-28.82**	-28.01**	-30.24**	-27.02**	-29.38**
6	NDLM-23-2 x Kashi Vidhi	-19.36**	-27.19**	-20.61**	-28.52**	-19.92**	-27.76**
7	NDLM-23-3 x Kashi Santusthi	13.87**	0.69	17.00**	1.72	15.35**	1.28
8	NDLM-23-3 x Punjab Long Melon	3.83*	0.35	2.84	-0.34	3.45	0.14
9	NDLM-23-3 x Kashi Vidhi	3.85*	-6.25**	4.58	-5.84*	4.21	-5.98**
10	NDLM-23-4 x Kashi Santusthi	-14.06**	-25.69**	-13.47**	-27.15**	-13.63**	-26.27**
11	NDLM-23-4 x Punjab Long Melon	-5.75**	-8.92**	-7.8	-10.65**	-6.79**	-9.78**
12	NDLM-23-4 x Kashi Vidhi	0	-9.72**	-1.91	-11.68**	-1.02	-10.72**
13	NDLM-23-5 x Kashi Santusthi	-14.46**	-26.04**	-14.29**	-27.84**	-14.30**	-26.82**
14	NDLM-23-5 x Punjab Long Melon	-22.99**	-25.59**	-24.82**	-27.15**	-23.93**	-26.37**
15	NDLM-23-5 x Kashi Vidhi	-20.38**	-28.13**	-22.14**	-29.90**	-21.33**	-29.04**
16	NDLM-23-6 x Kashi Santusthi	6.74**	-1.04	7.41	-0.34	6.95**	-0.69
17	NDLM-23-6 x Punjab Long Melon	8.86**	5.21*	8.98*	5.60*	9.05**	5.53*
18	NDLM-23-6 x Kashi Vidhi	12.48**	4.27*	12.22**	4.12*	12.16**	4.15*
19	NDLM-23-7 x Kashi Santusthi	2.01	-11.81**	3.27	-13.06**	2.56	-12.44**
20	NDLM-23-7 x Punjab Long Melon	-21.68**	-24.31**	-23.76**	-26.12**	-22.62**	-25.10**
21	NDLM-23-7 x Kashi Vidhi	7.05**	-3.37	4.96	-5.50*	5.87*	-4.49*
22	NDLM-23-8 x Kashi Santusthi	2.86	0	2.47	-0.34	2.61	-0.21
23	NDLM-23-8 x Punjab Long Melon	7.14**	4.17*	6.95	4.02	7.23**	4.29
24	NDLM-23-8 x Kashi Vidhi	10.36**	7.29**	9.54*	6.53**	10.07**	7.05**
25	NDLM-23-9 x Kashi Santusthi	-8.67**	-20.73**	-8.77	-22.58**	-8.72**	-21.64**
26	NDLM-23-9 x Punjab Long Melon	-9.46**	-12.50**	-11.35**	-14.09**	-10.36**	-13.24**
27	NDLM-23-9 x Kashi Vidhi	9.62**	-1.04	9.16*	-1.72	9.32**	-1.38
No. of crosses with significant (+) heterosis		10	4	5	3	8	4
No. of crosses with significant (-) heterosis		13	17	10	20	12	21
Range of heterosis		-26.35 to +13.87	-30.56 to +7.29	-28.01 to +17.00	-30.24 to +6.53	-27.02 to +15.35	-30.28 to +7.05

Contd...

S. No.	Crosses	Vine length (m)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	17.65**	-20.63**	15.48*	-23.62**	16.57**	-22.13**
2	NDLM-23-1 x Punjab Long Melon	-31.33**	-36.51**	-34.18**	-38.58**	-32.77**	-37.55**
3	NDLM-23-1 x Kashi Vidhi	-19.24**	-29.48**	-21.78**	-30.71**	-20.51**	-30.04**
4	NDLM-23-2 x Kashi Santusthi	-30.59**	-53.17**	-31.55**	-54.72**	-30.97**	-53.87**
5	NDLM-23-2 x Punjab Long Melon	-45.49**	-49.60**	-47.68**	-51.18**	-46.67**	-50.47**
6	NDLM-23-2 x Kashi Vidhi	-40.00**	-47.62**	-42.22**	-48.82**	-41.02**	-48.10**
7	NDLM-23-3 x Kashi Santusthi	33.86**	0.91	38.30**	2.36	35.98**	1.58
8	NDLM-23-3 x Punjab Long Melon	8.58**	0.4	7.59	0.39	7.94**	0.28
9	NDLM-23-3 x Kashi Vidhi	5.00**	-8.33**	4.44	-7.48**	4.49	-8.02**
10	NDLM-23-4 x Kashi Santusthi	-13.53**	-41.67**	-13.69*	-42.91**	-13.81**	-42.41**
11	NDLM-23-4 x Punjab Long Melon	-3.86**	-11.11**	-6.75	-12.99**	-5.39*	-12.13**
12	NDLM-23-4 x Kashi Vidhi	-5.00**	-17.06**	-8.44	-18.90**	-6.74**	-17.91**
13	NDLM-23-5 x Kashi Santusthi	-19.22**	-45.52**	-20.24**	-47.24**	-19.92**	-46.52**
14	NDLM-23-5 x Punjab Long Melon	-39.91**	-44.44**	-41.77**	-45.67**	-40.85**	-45.06*
15	NDLM-23-5 x Kashi Vidhi	-40.76**	-48.29**	-43.11**	-49.61**	-42.07**	-49.01**
16	NDLM-23-6 x Kashi Santusthi	6.80**	-2.38	6.87	-1.97	6.76**	-2.25
17	NDLM-23-6 x Punjab Long Melon	18.45**	9.52**	18.14**	10.24**	18.30**	9.88**
18	NDLM-23-6 x Kashi Vidhi	12.88**	3.17	13.30**	3.94*	13.09**	3.56*
19	NDLM-23-7 x Kashi Santusthi	11.18**	-25.00**	11.31	-26.38**	11.24**	-25.69**
20	NDLM-23-7 x Punjab Long Melon	-33.05**	-38.10**	-35.02**	-39.37**	-33.90**	-38.62**
21	NDLM-23-7 x Kashi Vidhi	6.82**	-6.75**	2.22	-9.45**	4.49	-8.02**
22	NDLM-23-8 x Kashi Santusthi	3.44*	-0.67	2.85	-0.39	3.01	-0.67
23	NDLM-23-8 x Punjab Long Melon	13.22**	8.73**	13.01**	9.45**	13.11**	9.09**
24	NDLM-23-8 x Kashi Vidhi	14.88**	10.32**	15.04**	11.42**	14.89**	10.79**
25	NDLM-23-9 x Kashi Santusthi	-7.95**	-35.71**	-8.05	-37.01**	-8.17**	-36.36**
26	NDLM-23-9 x Punjab Long Melon	-22.89**	-28.69**	-25.32**	-30.31**	-24.11**	-29.53**
27	NDLM-23-9 x Kashi Vidhi	12.27**	-1.98	11.11*	-1.57	11.53**	-1.86
No. of crosses with significant (+) heterosis		13	3	7	4	8	4
No. of crosses with significant (-) heterosis		14	18	11	12	14	18
Range of heterosis		-45.49 to+33.86	-53.17 to+10.32	-47.68 to+38.30	-54.72 to+11.42	-46.67 to+35.98	-53.87 to+10.79

Contd...

S. No.	Crosses	Number of fruits per plant					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	16.42**	-12.42**	17.31**	-22.32**	16.86**	-17.54**
2	NDLM-23-1 x Punjab Long Melon	-31.60**	-34.68**	-40.56**	-43.11**	-36.25**	-39.04**
3	NDLM-23-1 x Kashi Vidhi	-10.87**	-21.18**	-21.98**	-30.29**	-16.66**	-25.90**
4	NDLM-23-2 x Kashi Santusthi	-23.32**	-42.32**	-21.52**	-48.04**	-22.45**	-45.28**
5	NDLM-23-2 x Punjab Long Melon	-35.59**	-38.49**	-42.84**	-45.29**	-39.34**	-42.00**
6	NDLM-23-2 x Kashi Vidhi	-29.87**	-37.99**	-39.45**	-45.89**	-34.86**	-42.08**
7	NDLM-23-3 x Kashi Santusthi	23.16**	0.46	39.04**	0.36	30.90**	0.41
8	NDLM-23-3 x Punjab Long Melon	5.07**	0.35	4.7	0.21	4.88*	0.29
9	NDLM-23-3 x Kashi Vidhi	5.75**	-6.49**	9.13*	-2.49	7.51**	-4.41*
10	NDLM-23-4 x Kashi Santusthi	-16.03**	-36.83**	-16.72**	-44.86**	-16.38**	-41.00**
11	NDLM-23-4 x Punjab Long Melon	-6.96**	-11.15**	-17.54**	-21.07**	-12.45**	-16.28**
12	NDLM-23-4 x Kashi Vidhi	-0.48	-12.00**	-12.35**	-21.68**	-6.66**	-17.01**
13	NDLM-23-5 x Kashi Santusthi	-16.68**	-37.32**	-17.42**	-45.32**	-17.06**	-41.48**
14	NDLM-23-5 x Punjab Long Melon	-34.14**	-37.10**	-42.65**	-45.11**	-38.55**	-41.24**
15	NDLM-23-5 x Kashi Vidhi	-30.20**	-38.28**	-40.01**	-46.39**	-35.32**	-42.49**
16	NDLM-23-6 x Kashi Santusthi	7.71**	0.62	7.23	0.68	7.46**	0.66
17	NDLM-23-6 x Punjab Long Melon	21.98**	16.49**	20.45**	15.29**	21.19**	15.88**
18	NDLM-23-6 x Kashi Vidhi	23.90**	15.74**	22.06**	14.61**	22.93**	15.15**
19	NDLM-23-7 x Kashi Santusthi	7.79**	-18.92**	8.41	-28.21**	8.08*	-23.74**
20	NDLM-23-7 x Punjab Long Melon	-33.11**	-36.11**	-41.90**	-44.39**	-37.67**	-40.40**
21	NDLM-23-7 x Kashi Vidhi	8.12**	-4.39*	-4.56	-14.71**	1.53	-9.72**
22	NDLM-23-8 x Kashi Santusthi	3.08	-0.92	2.36	-1.04	2.7	-0.97
23	NDLM-23-8 x Punjab Long Melon	21.16**	16.46**	18.95**	15.00**	20.00**	15.70**
24	NDLM-23-8 x Kashi Vidhi	21.40**	16.69**	19.69**	15.71**	20.50**	16.18**
25	NDLM-23-9 x Kashi Santusthi	-14.04**	-33.87**	-15.00**	-42.32**	-14.51**	-38.24**
26	NDLM-23-9 x Punjab Long Melon	-17.27**	-20.99**	-27.24**	-30.36**	-22.45**	-25.85**
27	NDLM-23-9 x Kashi Vidhi	15.96**	2.54	14.35**	2.18	15.10**	2.35
No. of crosses with significant (+) heterosis		13	4	6	4	10	4
No. of crosses with significant (-) heterosis		13	18	14	17	14	18
Range of heterosis		-35.59 to +23.90	-42.32 to +16.69	-42.84 to +39.04	-48.04 to +15.71	-39.34 to +30.90	-45.28 to +16.18

Contd...

S. No.	Crosses	Average fruit weight (g)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	4.16	-15.68**	4.32	-16.63**	4.24	-16.16**
2	NDLM-23-1 x Punjab Long Melon	-15.88**	-24.34**	-17.52**	-25.30**	-16.70**	-24.83**
3	NDLM-23-1 x Kashi Vidhi	-4.99*	-18.99**	-6.16	-19.99**	-5.58*	-19.50**
4	NDLM-23-2 x Kashi Santusthi	-7.61**	-25.20**	-7.71	-26.24**	-7.66**	-25.72**
5	NDLM-23-2 x Punjab Long Melon	-16.84**	-25.20**	-18.54**	-26.23**	-17.69**	-25.72**
6	NDLM-23-2 x Kashi Vidhi	-12.23**	-25.16**	-13.41**	-26.17**	-12.82**	-25.67**
7	NDLM-23-3 x Kashi Santusthi	23.51**	4.08	25.04**	4.07	24.27**	4.07
8	NDLM-23-3 x Punjab Long Melon	11.25**	0.06	10.48*	0.05	10.86**	0.05
9	NDLM-23-3 x Kashi Vidhi	3.28	-11.94*	3.27	-11.95**	3.28	-11.95**
10	NDLM-23-4 x Kashi Santusthi	-6.94**	-24.67**	-6.99	-25.66**	-6.97**	-25.17**
11	NDLM-23-4 x Punjab Long Melon	-4.70*	-14.28**	-6.47	-15.30**	-5.59*	-14.80**
12	NDLM-23-4 x Kashi Vidhi	-0.11	-14.84**	-1.32	-15.86**	-0.72	-15.35**
13	NDLM-23-5 x Kashi Santusthi	-7.20**	-24.88**	-7.27	-25.89**	-7.24**	-25.39**
14	NDLM-23-5 x Punjab Long Melon	-16.47**	-24.88**	-18.18**	-25.91**	-17.34**	-25.40**
15	NDLM-23-5 x Kashi Vidhi	-12.26**	-25.19**	-13.43**	-26.18**	-12.85**	-25.69**
16	NDLM-23-6 x Kashi Santusthi	8.00**	-4.91*	8.03	-4.91*	8.02**	-4.91*
17	NDLM-23-6 x Punjab Long Melon	18.30**	6.40*	17.47**	6.38*	17.88**	6.38**
18	NDLM-23-6 x Kashi Vidhi	18.99**	4.77*	19.03**	4.77*	19.01**	4.77*
19	NDLM-23-7 x Kashi Santusthi	3.39	-16.30**	3.5	-17.28**	3.44	-16.80**
20	NDLM-23-7 x Punjab Long Melon	-16.01**	-24.46**	-17.70**	-25.47**	-16.86**	-24.97**
21	NDLM-23-7 x Kashi Vidhi	5.71*	-9.87**	4.55	-10.86**	5.13*	-10.37**
22	NDLM-23-8 x Kashi Santusthi	6.23**	-0.02	6.27	0	6.25**	-0.01
23	NDLM-23-8 x Punjab Long Melon	11.52**	4.97*	11.51**	4.93*	11.52**	4.95*
24	NDLM-23-8 x Kashi Vidhi	15.65**	8.85**	15.67**	8.85**	15.66**	8.85**
25	NDLM-23-9 x Kashi Santusthi	-6.54*	-24.34**	-6.45	-25.23**	-6.49*	-24.79**
26	NDLM-23-9 x Punjab Long Melon	-7.16**	-16.50**	-8.98*	-17.57**	-8.07**	-17.04**
27	NDLM-23-9 x Kashi Vidhi	16.91**	-0.32	16.90**	-0.33	16.90**	-0.33
No. of crosses with significant (+) heterosis		10	4	7	4	10	4
No. of crosses with significant (-) heterosis		14	19	6	19	13	19
Range of heterosis		-16.84 to +23.51	-25.20 to +8.85	-18.54 to +25.04	-26.24 to +8.85	-17.69 to +24.27	-25.72 to +8.85

Contd...

S. No.	Crosses	Number of seeds per fruit					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	10.51*	-9.26*	10.97*	-7.84	10.74*	-8.55*
2	NDLM-23-1 x Punjab Long Melon	-23.25**	-35.37**	-23.08**	-34.32**	-23.16**	-34.85**
3	NDLM-23-1 x Kashi Vidhi	-5.2	-15.58**	-5.88	-15.25**	-5.54	-15.42**
4	NDLM-23-2 x Kashi Santusthi	-56.92**	-64.63**	-57.65**	-64.83**	-57.29**	-64.73**
5	NDLM-23-2 x Punjab Long Melon	-56.25**	-63.16**	-56.08**	-62.50**	-56.16**	-62.83**
6	NDLM-23-2 x Kashi Vidhi	-57.92**	-62.53**	-57.65**	-61.86**	-57.78**	-62.20**
7	NDLM-23-3 x Kashi Santusthi	25.00**	10.53*	22.93**	10.17*	23.96**	10.35*
8	NDLM-23-3 x Punjab Long Melon	20.24**	6.32	20.09**	7.63	20.17**	6.97
9	NDLM-23-3 x Kashi Vidhi	17.97**	5.05	17.65**	5.93	17.81**	5.49
10	NDLM-23-4 x Kashi Santusthi	-53.33**	-61.68**	-53.06**	-61.02**	-53.20**	-61.35**
11	NDLM-23-4 x Punjab Long Melon	13.00*	-4.84	11.66*	-4.66	12.33*	-4.75
12	NDLM-23-4 x Kashi Vidhi	-13.48**	-22.95**	-14.35**	-22.88**	-13.92**	-22.91**
13	NDLM-23-5 x Kashi Santusthi	-53.59**	-61.89**	-53.06**	-61.02**	-53.32**	-61.46**
14	NDLM-23-5 x Punjab Long Melon	-54.50**	-61.68**	-54.34**	-61.02**	-54.42**	-61.35**
15	NDLM-23-5 x Kashi Vidhi	-58.63**	-63.16**	-60.00**	-63.98**	-59.32**	-63.57**
16	NDLM-23-6 x Kashi Santusthi	18.24**	16.00**	17.06**	16.31**	17.65**	16.16*
17	NDLM-23-6 x Punjab Long Melon	28.54**	26.11**	6.18	5.51	17.33**	15.84**
18	NDLM-23-6 x Kashi Vidhi	15.88**	13.68**	15.57**	14.83**	15.72**	14.25**
19	NDLM-23-7 x Kashi Santusthi	-19.23**	-33.68**	-23.47**	-36.44**	-21.36**	-35.06**
20	NDLM-23-7 x Punjab Long Melon	-12.50*	-26.32**	-12.66*	-25.42**	-12.58*	-25.87**
21	NDLM-23-7 x Kashi Vidhi	7.57	-4.21	7.53	-3.18	7.55	-3.7
22	NDLM-23-8 x Kashi Santusthi	14.00**	20.00**	14.37**	21.40**	14.19**	20.70**
23	NDLM-23-8 x Punjab Long Melon	15.80**	21.89**	15.77**	22.88**	15.78**	22.39**
24	NDLM-23-8 x Kashi Vidhi	20.00**	26.32**	19.56**	26.91**	19.78**	26.61**
25	NDLM-23-9 x Kashi Santusthi	-20.92**	-34.74**	-25.00**	-36.44**	-22.98**	-35.59**
26	NDLM-23-9 x Punjab Long Melon	-21.75**	-34.11**	-23.08**	-34.32**	-22.42**	-34.21**
27	NDLM-23-9 x Kashi Vidhi	9.46	-2.53	9.18	-1.69	9.32	-2.11
No. of crosses with significant (+) heterosis		11	7	10	6	11	7
No. of crosses with significant (-) heterosis		11	13	12	16	13	17
Range of heterosis		-57.92 to +28.54	-64.63 to +26.32	-57.65 to +22.93	-64.83 to +26.91	-57.78 to +23.96	-64.73 to +26.61

Contd...

S. No.	Crosses	Total soluble solids (%)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	14.78**	-7.88**	15.91**	-8.93**	15.35**	-8.45**
2	NDLM-23-1 x Punjab Long Melon	-18.60**	-21.17**	-19.63**	-22.32**	-19.09**	-21.75**
3	NDLM-23-1 x Kashi Vidhi	-3.38	-9.91**	-26.62**	-31.70**	-15.16**	-20.92**
4	NDLM-23-2 x Kashi Santusthi	-12.91**	-30.11**	-13.07*	-31.70**	-12.90**	-30.87**
5	NDLM-23-2 x Punjab Long Melon	-25.81**	-28.15**	-27.02**	-29.46**	-26.35**	-28.77**
6	NDLM-23-2 x Kashi Vidhi	-21.50**	-26.80**	-22.54**	-27.90**	-22.05**	-27.35**
7	NDLM-23-3 x Kashi Santusthi	10.07**	0.16	10.95*	-0.45	10.59**	-0.07
8	NDLM-23-3 x Punjab Long Melon	3.26	0	3.46	0	3.4	0
9	NDLM-23-3 x Kashi Vidhi	2.42	-4.50*	2.4	-4.69*	2.41	-4.55*
10	NDLM-23-4 x Kashi Santusthi	-2.53	-21.78**	-1.7	-22.77**	-2.17	-22.35**
11	NDLM-23-4 x Punjab Long Melon	-3.02	-6.08*	-4.16	-7.37*	-3.63	-6.79**
12	NDLM-23-4 x Kashi Vidhi	-0.64	-7.36*	-2.4	-9.15**	-1.6	-8.30**
13	NDLM-23-5 x Kashi Santusthi	-7.76**	-25.97**	-7.39	-27.23**	-7.53**	-26.61**
14	NDLM-23-5 x Punjab Long Melon	-23.26**	-25.68**	-24.25**	-26.79**	-23.80**	-26.30**
15	NDLM-23-5 x Kashi Vidhi	-21.82**	-27.09**	-23.26**	-28.57**	-22.53**	-27.80**
16	NDLM-23-6 x Kashi Santusthi	4.04	-1.35	5.9	0.22	4.89*	-0.61
17	NDLM-23-6 x Punjab Long Melon	5.12*	1.8	5.77	2.23	5.56*	2.09
18	NDLM-23-6 x Kashi Vidhi	6.89**	1.35	6.6	0.89	6.70**	1.12
19	NDLM-23-7 x Kashi Santusthi	23.48**	-0.9	13.64*	-10.71**	18.74**	-5.76*
20	NDLM-23-7 x Punjab Long Melon	-18.84**	-21.40**	-20.09**	-22.77**	-19.47**	-22.13**
21	NDLM-23-7 x Kashi Vidhi	3.86	-3.15	2.16	-4.91*	2.97	-4.04
22	NDLM-23-8 x Kashi Santusthi	1.69	-0.68	1.84	-1.12	1.69	-0.9
23	NDLM-23-8 x Punjab Long Melon	4.23*	1.8	4.37	1.34	4.22	1.57
24	NDLM-23-8 x Kashi Vidhi	14.60**	11.94**	15.17**	11.83**	14.80**	11.88**
25	NDLM-23-9 x Kashi Santusthi	-2.14	-20.95**	-1.41	-21.88**	-1.87	-21.46**
26	NDLM-23-9 x Punjab Long Melon	-6.74**	-9.68**	-9.70*	-12.72**	-8.19**	-11.21**
27	NDLM-23-9 x Kashi Vidhi	6.20**	-0.97	6.95	-0.45	6.58**	-0.67
No. of crosses with significant (+) heterosis		8	1	4	1	8	1
No. of crosses with significant (-) heterosis		9	16	9	18	10	17
Range of heterosis		-25.81 to +23.48	-30.11 to +11.94	-27.02 to +15.91	-31.70 to +11.83	-26.35 to 18.74	30.87 to 11.88

Contd...

S. No.	Crosses	Dry matter (%)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	4.78*	-17.98**	5.54	-17.67**	5.12	-17.82**
2	NDLM-23-1 x Punjab Long Melon	-13.99**	-22.85**	-15.29**	-22.93**	-14.61**	-22.89**
3	NDLM-23-1 x Kashi Vidhi	-7.10**	-21.54**	-8.79	-21.99**	-7.95**	-21.76**
4	NDLM-23-2 x Kashi Santusthi	-4.31	-25.09**	-4.1	-25.19**	-4.24	-25.14**
5	NDLM-23-2 x Punjab Long Melon	-16.08**	-24.72**	-17.36**	-24.81**	-16.62**	-24.71**
6	NDLM-23-2 x Kashi Vidhi	-10.05**	-24.03**	-11.43*	-24.25**	-10.74**	-24.15**
7	NDLM-23-3 x Kashi Santusthi	32.23**	4.49	34.13**	5.64*	33.12**	5.07
8	NDLM-23-3 x Punjab Long Melon	14.27**	2.49	13.64**	3.38	13.92**	2.87
9	NDLM-23-3 x Kashi Vidhi	5.10*	-11.24**	4.84	-10.34**	4.93	-10.83**
10	NDLM-23-4 x Kashi Santusthi	-1.91	-23.22**	-1.93	-23.50**	-2	-23.40**
11	NDLM-23-4 x Punjab Long Melon	-4.59*	-14.42**	-6.2	-14.66**	-5.40*	-14.58**
12	NDLM-23-4 x Kashi Vidhi	-0.37	-15.86**	-1.54	-15.79**	-1.03	-15.89**
13	NDLM-23-5 x Kashi Santusthi	-2.39	-23.60**	-2.41	-23.87**	-2.4	-23.70**
14	NDLM-23-5 x Punjab Long Melon	-14.61**	-23.41*	-15.91**	-23.50**	-15.24**	-23.45**
15	NDLM-23-5 x Kashi Vidhi	-10.20**	-24.16**	-11.65*	-24.44**	-10.96**	-24.33**
16	NDLM-23-6 x Kashi Santusthi	8.96**	-4.31*	8.9	-3.38	8.93**	-3.88
17	NDLM-23-6 x Punjab Long Melon	23.66**	10.92**	22.73**	11.65**	23.20**	11.26**
18	NDLM-23-6 x Kashi Vidhi	19.83**	5.24*	19.92**	6.39*	19.91**	5.82*
19	NDLM-23-7 x Kashi Santusthi	0.8	-21.10**	0.72	-21.43**	0.72	-21.26**
20	NDLM-23-7 x Punjab Long Melon	-14.20**	-23.03**	-15.29**	-22.93**	-14.68**	-22.95**
21	NDLM-23-7 x Kashi Vidhi	8.20**	-8.61**	6.81	-8.65**	7.51**	-8.63**
22	NDLM-23-8 x Kashi Santusthi	3.93	-2.62	4.34	-0.56	4.17	-1.63
23	NDLM-23-8 x Punjab Long Melon	17.72**	10.30**	14.14**	8.78**	16.03**	9.57**
24	NDLM-23-8 x Kashi Vidhi	19.72**	12.17**	18.54**	12.97**	19.27**	12.63**
25	NDLM-23-9 x Kashi Santusthi	-1.35	-22.60**	-1.91	-22.93**	-1.75	-22.83**
26	NDLM-23-9 x Punjab Long Melon	-12.32**	-21.35**	-13.43**	-21.24**	-12.88**	-21.33**
27	NDLM-23-9 x Kashi Vidhi	13.53**	-4.12	13.19**	-3.2	13.32**	-3.7
No. of crosses with significant (+) heterosis		11	4	9	5	9	4
No. of crosses with significant (-) heterosis		9	19	7	18	9	18
Range of heterosis		-16.08 to +32.23	-25.09 to +12.17	-17.36 to +34.13	-25.19 to +12.97	-16.62 to +33.12	-25.14 to +12.63

Contd...

S. No.	Crosses	Ascorbic acid (mg/100g)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	-11.84**	22.03**	-11.69**	26.96**	-11.59**	24.68**
2	NDLM-23-1 x Punjab Long Melon	-1.43	36.44**	-1.41	41.74**	-1.42	39.04**
3	NDLM-23-1 x Kashi Vidhi	-7.35**	28.22**	-8.06**	32.17**	-7.72**	30.09**
4	NDLM-23-2 x Kashi Santusthi	10.64**	55.68**	11.38**	61.74**	11.00**	59.07**
5	NDLM-23-2 x Punjab Long Melon	7.83**	51.69**	7.58**	56.26**	7.60**	54.17**
6	NDLM-23-2 x Kashi Vidhi	0.8	41.78**	1.8	47.83**	1	44.71**
7	NDLM-23-3 x Kashi Santusthi	-27.25**	-4.24	-29.26**	-2.61	-28.09**	-3.1
8	NDLM-23-3 x Punjab Long Melon	-18.62**	0	-21.62**	0.87	-20.05**	0.6
9	NDLM-23-3 x Kashi Vidhi	-11.03**	9.32**	-14.86**	9.57**	-12.98**	9.46**
10	NDLM-23-4 x Kashi Santusthi	2.09	38.14**	2.06	43.74**	1.86	41.01**
11	NDLM-23-4 x Punjab Long Melon	-14.82**	15.25**	-14.61**	20.26**	-14.91**	17.80**
12	NDLM-23-4 x Kashi Vidhi	-13.78**	16.69**	-14.20**	20.87**	-14.08**	18.92**
13	NDLM-23-5 x Kashi Santusthi	-8.52**	39.58**	-10.27**	44.35**	-9.32**	42.13**
14	NDLM-23-5 x Punjab Long Melon	-8.89**	38.98**	-10.27**	44.35**	-9.32**	42.13**
15	NDLM-23-5 x Kashi Vidhi	-3.33*	47.46**	-5.41**	52.17**	-4.39**	49.87**
16	NDLM-23-6 x Kashi Santusthi	-21.67**	3.14	-24.21**	4.35*	-22.77**	4.04
17	NDLM-23-6 x Punjab Long Melon	-16.92**	-8.47**	-16.41**	-6.96**	-16.80**	-7.74**
18	NDLM-23-6 x Kashi Vidhi	-18.98**	-5.93*	-20.74**	-6.96**	-19.61**	-6.02*
19	NDLM-23-7 x Kashi Santusthi	-5.73**	25.42**	-6.05**	30.43**	-6.11**	27.86**
20	NDLM-23-7 x Punjab Long Melon	3.18*	37.29**	2.09	41.74**	2.53*	39.55**
21	NDLM-23-7 x Kashi Vidhi	-19.96**	6.53*	-19.42**	11.91**	-19.58**	9.46**
22	NDLM-23-8 x Kashi Santusthi	-22.53**	1.95	-25.47**	2.61	-24.04**	2.32
23	NDLM-23-8 x Punjab Long Melon	-14.17**	-7.63*	-16.45**	-8.70**	-15.53**	-8.00**
24	NDLM-23-8 x Kashi Vidhi	-22.63**	-10.17**	-24.44**	-11.30**	-23.53**	-10.58**
25	NDLM-23-9 x Kashi Santusthi	3.22*	35.85**	2.32	40.87**	2.77*	38.44**
26	NDLM-23-9 x Punjab Long Melon	-2.6	27.12**	-1.71	33.04**	-2.16	30.09**
27	NDLM-23-9 x Kashi Vidhi	-21.43**	2.54	-23.13**	4.09	-21.98**	3.78
No. of crosses with significant (+) heterosis		4	18	2	19	4	18
No. of crosses with significant (-) heterosis		19	4	19	4	19	4
Range of heterosis		-27.25 to +10.64	-10.17 to +55.68	-29.26 to +11.38	-11.30 to +61.74	-28.09 to +11.00	-10.58 to +59.07

Contd...

S. No.	Crosses	Reducing sugar (%)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	8.42**	-14.79**	8.00**	-16.92**	8.29**	-15.95**
2	NDLM-23-1 x Punjab Long Melon	-23.46**	-30.62**	-34.09**	-32.58**	-29.37**	-31.93**
3	NDLM-23-1 x Kashi Vidhi	-5.38**	-17.90**	-7.59**	-20.38**	-6.70**	-19.31**
4	NDLM-23-2 x Kashi Santusthi	-50.00**	-60.70**	-50.00**	-61.54**	-50.08**	-61.27**
5	NDLM-23-2 x Punjab Long Melon	-54.08**	-58.37**	-60.90**	-60.00**	-57.68**	-59.19**
6	NDLM-23-2 x Kashi Vidhi	-48.28**	-55.14**	-49.11**	-56.15**	-48.96**	-55.87**
7	NDLM-23-3 x Kashi Santusthi	19.27**	1.17	22.12**	1.92	20.49**	1.43
8	NDLM-23-3 x Punjab Long Melon	10.73**	0.39	-2.26	0	3.87**	0.12
9	NDLM-23-3 x Kashi Vidhi	3.59**	-10.12**	4.02	-10.38**	3.72**	-10.31**
10	NDLM-23-4 x Kashi Santusthi	-30.36**	-45.25**	-30.50**	-46.54**	-30.51**	-46.06**
11	NDLM-23-4 x Punjab Long Melon	-3.00**	-12.06**	-15.41**	-13.46**	-9.61**	-12.86**
12	NDLM-23-4 x Kashi Vidhi	-1.35	-14.40**	-3.57	-16.92**	-2.53*	-15.71**
13	NDLM-23-5 x Kashi Santusthi	-35.64**	-49.42**	-36.00**	-50.77**	-35.82**	-50.19**
14	NDLM-23-5 x Punjab Long Melon	-43.35**	-48.64**	-51.13**	-50.00**	-47.66**	-49.54**
15	NDLM-23-5 x Kashi Vidhi	-50.07**	-56.69**	-51.79**	-58.46**	-51.04**	-57.64**
16	NDLM-23-6 x Kashi Santusthi	5.22**	-5.84**	4.70*	-5.77**	5.03**	-5.91*
17	NDLM-23-6 x Punjab Long Melon	16.74**	5.84**	3.76	6.15**	9.75**	5.79*
18	NDLM-23-6 x Kashi Vidhi	14.78**	2.72	13.96**	2.58	14.51**	2.59
19	NDLM-23-7 x Kashi Santusthi	6.93**	-15.95**	7.50**	-17.31**	7.30**	-16.72**
20	NDLM-23-7 x Punjab Long Melon	-27.18**	-33.97**	-37.22**	-35.77**	-32.58**	-35.02**
21	NDLM-23-7 x Kashi Vidhi	5.38**	-8.56**	2.68	-11.54**	3.87**	-10.15**
22	NDLM-23-8 x Kashi Santusthi	5.00**	-1.95	4.1	-2.31	4.54**	-2.2
23	NDLM-23-8 x Punjab Long Melon	11.25**	3.89*	1.5	3.85*	7.61**	3.75
24	NDLM-23-8 x Kashi Vidhi	15.83**	8.17**	14.75**	7.69**	15.13**	7.72**
25	NDLM-23-9 x Kashi Santusthi	-13.67**	-29.57**	-14.56**	-32.31**	-14.26**	-31.16**
26	NDLM-23-9 x Punjab Long Melon	-8.58**	-17.12**	-20.68**	-18.85**	-14.95**	-18.03**
27	NDLM-23-9 x Kashi Vidhi	10.76**	-3.89*	12.05**	-3.46*	11.31**	-3.75
No. of crosses with significant (+) heterosis		13	3	7	3	13	2
No. of crosses with significant (-) heterosis		13	20	13	20	14	19
Range of heterosis		-54.08 to +19.27	-60.70 to +8.17	-60.90 to +22.12	-61.54 to +7.69	-57.68 to +20.49	-61.27 to +7.72

Contd...

S. No.	Crosses	Non- reducing sugar (%)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	7.14	-20.59**	7.87	-17.96**	7.37	-19.38**
2	NDLM-23-1 x Punjab Long Melon	-25.00**	-31.18**	-21.57**	-28.14**	-23.28**	-29.64**
3	NDLM-23-1 x Kashi Vidhi	-6.24	-23.35**	-2.19	-19.76**	-4.35	-21.75**
4	NDLM-23-2 x Kashi Santusthi	67.46**	24.12**	67.72**	27.54**	67.37**	25.67**
5	NDLM-23-2 x Punjab Long Melon	-33.33**	-38.82**	-30.72**	-36.53**	-32.11**	-37.76**
6	NDLM-23-2 x Kashi Vidhi	-23.02**	-37.06**	-20.44**	-34.73**	-21.74**	-35.98**
7	NDLM-23-3 x Kashi Santusthi	29.85**	2.35	26.67**	2.4	28.22**	2.37
8	NDLM-23-3 x Punjab Long Melon	10.26**	1.18	10.46**	1.2	10.34**	1.19
9	NDLM-23-3 x Kashi Vidhi	9.35*	-10.59*	9.73*	-10.00*	9.42*	-10.49*
10	NDLM-23-4 x Kashi Santusthi	-12.70**	-35.29**	-10.24*	-31.74**	-11.58*	-33.61**
11	NDLM-23-4 x Punjab Long Melon	-10.26**	-17.65**	-7.84*	-15.57**	-9.05*	-16.60**
12	NDLM-23-4 x Kashi Vidhi	-0.72	-18.82**	3.65	-14.97**	1.45	-17.01**
13	NDLM-23-5 x Kashi Santusthi	-14.29**	-36.47**	-13.39**	-34.13**	-13.95**	-35.39**
14	NDLM-23-5 x Punjab Long Melon	-30.13**	-35.88**	-26.80**	-32.93**	-28.45**	-34.38**
15	NDLM-23-5 x Kashi Vidhi	-24.46**	-38.24**	-21.90**	-35.93**	-23.19**	-37.17**
16	NDLM-23-6 x Kashi Santusthi	10.82**	-1.59	8.67*	-2.4	9.73*	-2.02
17	NDLM-23-6 x Punjab Long Melon	17.31**	7.65	17.65**	7.78	17.46**	7.71
18	NDLM-23-6 x Kashi Vidhi	18.54**	5.29	18.00**	5.99	18.36**	5.69
19	NDLM-23-7 x Kashi Santusthi	5.56	-21.76**	3.88	-19.76**	4.7	-20.75**
20	NDLM-23-7 x Punjab Long Melon	-25.64**	-31.76**	-22.22**	-28.74**	-23.92**	-30.23**
21	NDLM-23-7 x Kashi Vidhi	13.67**	-7.06	17.52**	-3.59	15.70**	-5.33
22	NDLM-23-8 x Kashi Santusthi	1.81	-0.59	0.61	-1.2	1.41	-0.83
23	NDLM-23-8 x Punjab Long Melon	8.43*	5.88	9.15*	7.19	9.09*	6.7
24	NDLM-23-8 x Kashi Vidhi	12.05**	9.41*	12.20**	10.18*	12.12**	9.66
25	NDLM-23-9 x Kashi Santusthi	-5.51	-29.41**	-5.38	-26.35**	-5.44	-27.86**
26	NDLM-23-9 x Punjab Long Melon	-16.03**	-22.94**	-12.42**	-19.76**	-14.22**	-21.34**
27	NDLM-23-9 x Kashi Vidhi	21.82**	-0.41	19.71**	-1.8	21.01**	-1.01
No. of crosses with significant (+) heterosis		11	1	11	3	11	3
No. of crosses with significant (-) heterosis		10	16	8	15	11	16
Range of heterosis		-30.13 to +67.46	-38.82 to +9.41	-30.72 to +67.72	-36.53 to +27.54	-32.11 to +67.37	-37.76 to +9.66

Contd...

S. No.	Crosses	Total sugar (%)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	7.93**	-17.10**	7.93**	-17.10**	8.03**	-17.03**
2	NDLM-23-1 x Punjab Long Melon	-24.08**	-30.84**	-24.08**	-30.84**	-24.16**	-30.91**
3	NDLM-23-1 x Kashi Vidhi	-5.71**	-20.07**	-5.71**	-20.07**	-5.71**	-20.07**
4	NDLM-23-2 x Kashi Santusthi	-4.78**	-26.86**	-4.78**	-26.86**	-4.88**	-26.93**
5	NDLM-23-2 x Punjab Long Melon	-45.76**	-50.59**	-45.76**	-50.59**	-45.76**	-50.59**
6	NDLM-23-2 x Kashi Vidhi	-38.67**	-48.01**	-38.67**	-48.01**	-38.58**	-47.94**
7	NDLM-23-3 x Kashi Santusthi	23.30**	1.64	23.30**	1.64	23.39**	1.71
8	NDLM-23-3 x Punjab Long Melon	10.54**	0.7	10.54**	0.7	10.63**	0.77
9	NDLM-23-3 x Kashi Vidhi	5.80**	-10.30**	5.80**	-10.30**	5.80**	-10.30**
10	NDLM-23-4 x Kashi Santusthi	-23.48**	-41.22**	-23.48**	-41.22**	-23.48**	-41.22**
11	NDLM-23-4 x Punjab Long Melon	-5.91**	-14.29**	-5.91**	-14.29**	-5.91**	-14.29**
12	NDLM-23-4 x Kashi Vidhi	-1.1	-16.16**	-1.1	-16.16**	-1.1	-16.16**
13	NDLM-23-5 x Kashi Santusthi	-27.44**	-44.26**	-27.44**	-44.26**	-27.44**	-44.26**
14	NDLM-23-5 x Punjab Long Melon	-37.96**	-43.49**	-37.96**	-43.49**	-38.05**	-43.56**
15	NDLM-23-5 x Kashi Vidhi	-40.33**	-49.41**	-40.33**	-49.41**	-40.33**	-49.41**
16	NDLM-23-6 x Kashi Santusthi	7.44**	-4.15*	7.44**	-4.15*	7.52**	-4.05*
17	NDLM-23-6 x Punjab Long Melon	16.97**	6.56**	16.97**	6.56**	16.97**	6.56**
18	NDLM-23-6 x Kashi Vidhi	16.27**	3.75*	16.27**	3.75	16.27**	3.75
19	NDLM-23-7 x Kashi Santusthi	6.40**	-18.27**	6.40**	-18.27**	6.50**	-18.20**
20	NDLM-23-7 x Punjab Long Melon	-26.48**	-33.02**	-26.48**	-33.02**	-26.48**	-33.02**
21	NDLM-23-7 x Kashi Vidhi	8.56**	-7.96**	8.56**	-7.96**	8.56**	-7.96**
22	NDLM-23-8 x Kashi Santusthi	3.69**	-1.41	3.69**	-1.41	3.69**	-1.33
23	NDLM-23-8 x Punjab Long Melon	10.10**	4.68*	10.10**	4.68*	10.09**	4.75*
24	NDLM-23-8 x Kashi Vidhi	14.29**	8.67**	14.29**	8.67**	14.19**	8.67**
25	NDLM-23-9 x Kashi Santusthi	-10.59**	-29.51**	-10.59**	-29.51**	-10.68**	-29.51**
26	NDLM-23-9 x Punjab Long Melon	-11.57**	-19.44**	-11.57**	-19.44**	-11.57**	-19.44**
27	NDLM-23-9 x Kashi Vidhi	15.01**	-2.51	15.01**	-2.51	15.10**	-2.41
No. of crosses with significant (+) heterosis		13	4	13	2	10	2
No. of crosses with significant (-) heterosis		13	20	13	18	13	17
Range of heterosis		-47.76 to +23.30	-50.59 to +8.67	-45.76 to +23.30	-50.59 to +8.67	-45.76 to +23.39	-50.59 to +8.67

Contd...

S. No.	Crosses	Total carotenoid content (µg/100mg)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	6.42*	-24.58**	0.68	-24.98*	3.43	-24.82**
2	NDLM-23-1 x Punjab Long Melon	-26.17**	-35.90**	-26.50**	-36.15**	-26.32**	-36.04**
3	NDLM-23-1 x Kashi Vidhi	-10.00**	-27.19**	-10.58*	-27.58**	-10.29**	-27.40**
4	NDLM-23-2 x Kashi Santusthi	-34.72**	-53.74**	-38.90**	-54.47**	-36.84**	-54.09**
5	NDLM-23-2 x Punjab Long Melon	-43.61**	-51.04**	-44.29**	-51.61**	-43.96**	-51.35**
6	NDLM-23-2 x Kashi Vidhi	-37.40**	-49.36**	-37.97**	-49.76**	-37.66**	-49.55**
7	NDLM-23-3 x Kashi Santusthi	36.65**	3.06	37.53**	2.83	37.09**	2.91
8	NDLM-23-3 x Punjab Long Melon	16.79**	1.4	16.92**	1.57	16.86**	1.46
9	NDLM-23-3 x Kashi Vidhi	5.73*	-14.47**	5.81	-14.31**	5.79*	-14.39**
10	NDLM-23-4 x Kashi Santusthi	-20.77**	-43.85**	-25.37**	-44.38**	-23.11**	-44.12**
11	NDLM-23-4 x Punjab Long Melon	-6.50**	-18.83**	-7.16	-19.35**	-6.85**	-19.13**
12	NDLM-23-4 x Kashi Vidhi	-8.61**	-26.07**	-9.34	-26.57**	-9.01**	-26.36**
13	NDLM-23-5 x Kashi Santusthi	-25.33**	-47.08**	-29.43**	-47.41**	-27.39**	-47.23**
14	NDLM-23-5 x Punjab Long Melon	-35.75**	-44.22**	-36.17**	-44.55**	-35.95**	-44.39**
15	NDLM-23-5 x Kashi Vidhi	-39.06**	-50.70**	-39.83**	-51.27**	-39.40**	-50.95**
16	NDLM-23-6 x Kashi Santusthi	10.32**	-7.22*	-38.76**	-7.33*	-21.25**	-7.29*
17	NDLM-23-6 x Punjab Long Melon	35.78**	17.89**	-21.93**	18.12**	0.21	17.97**
18	NDLM-23-6 x Kashi Vidhi	26.02**	5.98*	-30.04**	5.86*	-10.03**	5.91*
19	NDLM-23-7 x Kashi Santusthi	6.06*	-24.83**	0.23	-25.31**	3.05	-25.10**
20	NDLM-23-7 x Punjab Long Melon	-28.66**	-38.06**	-29.40**	-38.67**	-29.04**	-38.39**
21	NDLM-23-7 x Kashi Vidhi	8.02**	-12.61**	7.37	-13.05**	7.69**	-12.85**
22	NDLM-23-8 x Kashi Santusthi	6.43**	-3.32	6.18	-3.3	6.26*	-3.37
23	NDLM-23-8 x Punjab Long Melon	21.52**	10.39**	21.22**	10.39**	21.40**	10.40**
24	NDLM-23-8 x Kashi Vidhi	39.15**	26.40**	39.94**	27.45**	39.56**	26.92**
25	NDLM-23-9 x Kashi Santusthi	-9.27**	-35.39**	-14.66**	-36.40**	-11.81**	-35.90**
26	NDLM-23-9 x Punjab Long Melon	-14.88**	-26.10**	-15.34**	-26.46**	-15.08**	-26.28**
27	NDLM-23-9 x Kashi Vidhi	18.92**	-3.79	19.29**	-3.39	19.13**	-3.59
No. of crosses with significant (+) heterosis		13	3	5	4	7	4
No. of crosses with significant (-) heterosis		14	20	14	19	16	19
Range of heterosis		-43.61 to +39.15	-53.74 to +26.40	-44.29 to +39.94	-54.47 to +27.45	-43.96 to +39.56	-54.09 to +26.92

Contd...

S. No.	Crosses	Fruit yield per plant (kg)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	21.07**	-26.26**	33.40**	-29.02**	27.05**	-27.65**
2	NDLM-23-1 x Punjab Long Melon	-42.31**	-50.49**	-50.65**	-57.14**	-46.68**	-54.04**
3	NDLM-23-1 x Kashi Vidhi	-15.30**	-36.32**	-31.10**	-43.40**	-23.82**	-39.90**
4	NDLM-23-2 x Kashi Santusthi	-29.22**	-56.88**	-28.27**	-61.76**	-28.69**	-59.40**
5	NDLM-23-2 x Punjab Long Melon	-46.40**	-53.98**	-55.05**	-60.95**	-50.88**	-57.65**
6	NDLM-23-2 x Kashi Vidhi	-38.33**	-53.61**	-51.23**	-59.94**	-45.41**	-56.95**
7	NDLM-23-3 x Kashi Santusthi	51.94**	4.5	76.94**	10.46**	64.53**	7.70*
8	NDLM-23-3 x Punjab Long Melon	16.78**	0.25	22.02**	5.97	19.89**	3.36
9	NDLM-23-3 x Kashi Vidhi	9.34**	-17.80**	4.66	-14.04**	6.8	-15.75**
10	NDLM-23-4 x Kashi Santusthi	-21.87**	-52.42**	-23.04*	-59.06**	-22.34**	-55.79**
11	NDLM-23-4 x Punjab Long Melon	-11.28**	-23.83**	-20.08**	-30.58**	-15.70**	-27.30**
12	NDLM-23-4 x Kashi Vidhi	-0.48	-25.17**	-14.25*	-29.56**	-7.84*	-27.30**
13	NDLM-23-5 x Kashi Santusthi	-22.86**	-53.03**	-23.89*	-59.50**	-23.36**	-56.35**
14	NDLM-23-5 x Punjab Long Melon	-45.13**	-52.89**	-52.85**	-59.06**	-48.99**	-56.00**
15	NDLM-23-5 x Kashi Vidhi	-38.65**	-53.87**	-51.78**	-60.41**	-45.71**	-57.19**
16	NDLM-23-6 x Kashi Santusthi	16.35**	-4.36	22.21**	2.16	19.44**	-1.05
17	NDLM-23-6 x Punjab Long Melon	44.29**	23.86**	41.19**	22.61**	42.90**	23.21**
18	NDLM-23-6 x Kashi Vidhi	47.28**	21.07**	43.74**	20.15**	45.49**	20.51**
19	NDLM-23-7 x Kashi Santusthi	11.33**	-32.18**	11.63	-40.60**	11.48*	-36.54**
20	NDLM-23-7 x Punjab Long Melon	-43.72**	-51.69**	-46.50**	-53.53**	-45.06**	-52.64**
21	NDLM-23-7 x Kashi Vidhi	14.49**	-13.91*	-0.14	-17.99**	6.36	-16.10**
22	NDLM-23-8 x Kashi Santusthi	9.65**	-0.94	8.64	-1.01	8.99**	-0.95
23	NDLM-23-8 x Punjab Long Melon	35.12**	22.05**	32.35**	20.59**	33.50**	21.35**
24	NDLM-23-8 x Kashi Vidhi	40.48**	26.88**	38.15**	25.89**	39.28**	26.60**
25	NDLM-23-9 x Kashi Santusthi	-19.65**	-49.98**	-21.27*	-56.70**	-20.56**	-53.55**
26	NDLM-23-9 x Punjab Long Melon	-23.13**	-34.00**	-33.81**	-42.52**	-28.55**	-38.40**
27	NDLM-23-9 x Kashi Vidhi	35.91**	2.18	24.11**	1.92	29.44**	2.1
No. of crosses with significant (+) heterosis		13	4	9	5	16	5
No. of crosses with significant (-) heterosis		13	17	14	18	14	18
Range of heterosis		-46.40 to +51.94	-56.88 to +26.88	-55.05 to +76.94	-61.76 to +25.89	-50.88 to +64.53	-59.40 to +26.60

Contd...

S. No.	Crosses	Fruit yield (q/ha)					
		Y1		Y2		Pooled	
		BP	MP	BP	MP	BP	MP
1	NDLM-23-1 x Kashi Santusthi	16.41**	-27.40**	32.71**	-29.01**	24.25**	-28.23**
2	NDLM-23-1 x Punjab Long Melon	-43.09**	-49.83**	-50.01**	-57.48**	-46.63**	-53.81**
3	NDLM-23-1 x Kashi Vidhi	-15.83**	-36.06**	-33.45**	-43.83**	-25.44**	-40.09**
4	NDLM-23-2 x Kashi Santusthi	-30.62**	-56.73**	-28.30**	-61.64**	-29.51**	-59.28**
5	NDLM-23-2 x Punjab Long Melon	-47.42**	-53.65**	-51.12**	-58.43**	-49.31**	-56.13**
6	NDLM-23-2 x Kashi Vidhi	-38.76**	-53.48**	-52.49**	-59.90**	-46.25**	-56.81**
7	NDLM-23-3 x Kashi Santusthi	45.10**	2.79	76.82**	10.5	60.58**	6.79
8	NDLM-23-3 x Punjab Long Melon	17.44**	3.53	25.15**	6.44	21.37**	5.04
9	NDLM-23-3 x Kashi Vidhi	8.39*	-17.65**	1.49	-14.34*	4.63	-15.93**
10	NDLM-23-4 x Kashi Santusthi	-23.46**	-52.26**	-24.80**	-59.77**	-24.11**	-56.16**
11	NDLM-23-4 x Punjab Long Melon	-12.95**	-23.26**	-19.20**	-31.28**	-16.14**	-27.42**
12	NDLM-23-4 x Kashi Vidhi	-3.05	-26.35**	-16.57**	-29.58**	-10.42**	-28.03**
13	NDLM-23-5 x Kashi Santusthi	-22.22**	-51.49**	-24.17**	-59.44**	-23.16**	-55.62**
14	NDLM-23-5 x Punjab Long Melon	-43.90**	-50.55**	-51.92**	-59.11**	-47.99**	-54.99**
15	NDLM-23-5 x Kashi Vidhi	-39.07**	-53.71**	-53.97**	-61.15**	-47.19**	-57.57**
16	NDLM-23-6 x Kashi Santusthi	16.36**	-3.56	29.35**	4.88	23.03**	0.82
17	NDLM-23-6 x Punjab Long Melon	40.65**	23.99**	44.14**	22.60**	42.43**	23.27**
18	NDLM-23-6 x Kashi Vidhi	43.70**	19.10**	42.20**	20.02**	45.91**	19.58**
19	NDLM-23-7 x Kashi Santusthi	12.15**	-30.06**	11.71	-40.25**	11.94*	-35.34**
20	NDLM-23-7 x Punjab Long Melon	-45.13**	-51.63**	-51.28**	-58.56**	-48.27**	-55.23**
21	NDLM-23-7 x Kashi Vidhi	13.70**	-13.62**	-0.17	-15.75	6.14	-14.72*
22	NDLM-23-8 x Kashi Santusthi	12.34**	-0.1	8.78	-1.12	10.47**	-0.63
23	NDLM-23-8 x Punjab Long Melon	35.07**	20.12**	32.70**	20.62**	33.82**	20.38**
24	NDLM-23-8 x Kashi Vidhi	47.19**	30.90**	39.22**	26.55**	43.01**	28.64**
25	NDLM-23-9 x Kashi Santusthi	-21.93**	-49.91**	-20.80*	-56.88**	-21.39**	-53.53**
26	NDLM-23-9 x Punjab Long Melon	-24.92**	-33.82**	-33.70**	-43.61**	-29.40**	-38.90**
27	NDLM-23-9 x Kashi Vidhi	35.58**	3	24.01**	4.66	29.27**	3.87
No. of crosses with significant (+) heterosis		13	4	9	4	11	4
No. of crosses with significant (-) heterosis		14	18	14	17	14	18
Range of heterosis		-47.42 to +47.19	-56.73 to +30.90	-53.97 to +76.82	-59.90 to +26.55	-49.31 to +60.58	-59.28 to +28.64

Table 4.5(a): List of the top three crosses with desirable and significant heterosis for twenty- two characters in long melon over two years (Y1, Y2).

Characters	Seasons	Over better parent	Over mid parent
Days to first male flowering	Y1	L8xT3, L3xT1, L6xT2	L9xT3, L6xT1, L7xT3
	Y2	L3xT1, L3xT2, L8xT2	L9xT3, L3xT3, L7xT3
Days to first female flowering	Y1	L8xT3, L7xT3	L8xT3
	Y2	L3xT1, L6xT1, L8xT1	L8xT3
Days to first harvesting	Y1	L8xT3, L9xT3, L6xT3	L8xT3
	Y2	L8xT1, L6xT1, L3xT1	L8xT3
Node number at first male flower appears	Y1	L3xT1, L6xT3, L8xT3	L6xT3, L8xT3, L6xT2
	Y2	L3xT1, L3xT2, L9xT3	L8xT3, L6xT3, L8xT2
Node number at first female flower appears	Y1	L7xT3, L3xT1, L8xT1	L6xT1
	Y2	L7xT3, L3xT1, L8xT1	L6xT1
Days to 50% female flowering	Y1	L5xT2, L5xT1, L5xT3,	L9xT1,
	Y2	L6xT1, L3xT1, L8xT1,	L8xT3,
Number of primary branches per plant	Y1	L8xT3, L6xT2, L6xT3	L8xT3, L6xT2
	Y2	L3xT1, L4xT1, L8xT3	L8xT3, L6xT2
Fruit length (cm)	Y1	L3xT1, L6xT2, L6xT3	L8xT3, L6xT2, L8xT2
	Y2	L9xT3, L3xT2, L3xT1	L8xT3, L6xT2, L8xT2
Fruit breadth (cm)	Y1	L3xT1, L6xT2, L8xT3	L8xT3, L6xT2, L8xT2
	Y2	L3xT1, L8xT3, L6xT3	L8xT3, L6xT2, L6xT3
Vine length (cm)	Y1	L3xT1, L6xT2, L1xT1	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT2, L1xT1	L8xT3, L6xT2, L6xT3
Number of fruits per plant	Y1	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
Average fruit weight (g)	Y1	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2

Number of seeds per fruit	Y1	L3xT1, L3xT2, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L3xT2, L8xT3	L8xT3, L8xT2, L8xT1
Total soluble solids (%)	Y1	L7xT1, L1xT1, L8xT3	L8xT3
	Y2	L7xT1, L1xT1, L8xT3	L8xT3
Dry matter (%)	Y1	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
Ascorbic acid (mg/100g)	Y1	L2xT1, L2xT2, L9xT1	L2xT1, L2xT2, L5xT3
	Y2	L2xT1, L2xT2	L2xT1, L2xT2, L5xT3
Reducing sugar (%)	Y1	L3xT1, L8xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L8xT3, L6xT3	L8xT3, L8xT2, L6xT2
Non-reducing sugar (%)	Y1	L3xT1, L2xT1, L9xT3	L2xT1, L8xT3
	Y2	L3xT1, L2xT1, L9xT3	L2xT1, L8xT3, L6xT2
Total sugar (%)	Y1	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT3, L6xT2	L8xT3, L6xT2
Total carotenoid (µg/100mg)	Y1	L3xT1, L8xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L8xT3, L8xT2	L8xT3, L8xT2, L6xT2
Fruit yield per plant (Kg)	Y1	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L8xT3, L6xT2	L8xT3, L8xT2, L6xT2
Fruit yield (q/ha)	Y1	L3xT1, L8xT3, L6xT3	L8xT3, L8xT2, L6xT2
	Y2	L3xT1, L6xT3, L6xT2	L8xT3, L8xT2, L6xT2

crosses combination, best five crosses based on high negative value over better parent were NDLM-23-5 x Punjab Long Melon (-5.56), NDLM-23-5 x Kashi Santusthi (-5.03), NDLM-23-5 x Kashi Vidhi (-4.82) and NDLM23-1 x Kashi Santusthi (-4.53) in Y1.

For days to 50% female flowering the magnitude of heterosis ranged from -12.34 (NDLM-23-6 x Kashi Santusthi) to 4.01 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -6.95 (NDLM-23-8 x Kashi Vidhi) to 18.79 % (NDLM-23-2 x Kashi Santusthi). Among the 27 crosses, 11 crosses showed significant negative heterosis and 1 cross showed positive significant heterosis over better parent whereas, 18 crosses showed significant positive heterosis and 1 cross showed negative heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-6 x Kashi Santusthi (-12.34), NDLM-23-3 x Kashi Santusthi (-11.13), NDLM23-8 x Kashi Santusthi (-10.24), NDLM-23-8 x Kashi Vidhi (-9.53) and NDLM-23-3 x Kashi Vidhi (-7.69), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-6.95) in Y2.

In case of pooled year data, the magnitude of heterosis for days to 50% flowering ranged from -7.89 (NDLM-23-6 x Kashi Santusthi) to 6.09 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -3.84 (NDLM-23-8 x Kashi Vidhi) to 17.48 % (NDLM-23-8 x Kashi Santusthi). Out of 27 crosses, 14 crosses showed significant negative heterosis and 2 crosses showed significant positive heterosis over better parent whereas, 22 crosses recorded significant positive heterosis and 1 cross observed negative heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-6 x Kashi Santusthi (-7.89), NDLM-23-3 x Kashi Santusthi (-7.47), NDLM-23-8 x Kashi Santusthi (-6.91), NDLM-23-8 x Kashi Vidhi (-6.04) and NDLM-23-3 x Kashi Vidhi (-4.29).

4.5.4 Number of nodes at which first male flower appears

Among crosses the magnitude of heterosis for node at first male flower appears ranged from -21.86 (NDLM-23-3 x Kashi Santusthi) to 7.90 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -8.33 (NDLM-23-6 x Kashi Vidhi) to 53.33 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 16 crosses showed significant negative heterosis and 3 crosses showed positive heterosis over better parent whereas, 4 crosses showed significant negative and 17 significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high

negative value over better parent were NDLM-23-3 x Kashi Santusthi (-21.86), NDLM-23-6 x Kashi Vidhi (-18.72), NDLM-23-8 x Kashi Vidhi (-18.42), NDLM-23-3 x Punjab Long Melon (-18.13) and NDLM-23-8 x Kashi Santusthi (-17.49), whereas, the best cross for negative heterosis over mid-parent was NDLM23-6 x Kashi Vidhi (-8.33), NDLM-23-6 x Kashi Vidhi (-8.00), NDLM-23-6 x Punjab Long Melon (-7.43) and NDLM-23-8 x Punjab Long Melon (-7.00) in Y1.

For this trait the magnitude of heterosis for node at first male flower appears ranged from -20.56 (NDLM-23-3 x Kashi Santusthi) to 8.43 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -9.09 (NDLM-23-6 x Kashi Vidhi) to 55.89 % (NDLM-23-2 x Kashi Santusthi). Out of the 27 crosses, 13 crosses showed significant negative heterosis and 1 cross showed positive significant heterosis over better parent whereas, 16 crosses showed significant positive heterosis and 5 crosses showed negative heterosis over mid-parent. Best five crosses based on high negative value over better parent were NDLM-23-3 x Kashi Santusthi (-20.56), NDLM-23-3 x Punjab Long Melon (-19.72), NDLM-23-9 x Kashi Vidhi (-18.21), NDLM-23-6 x Kashi Vidhi (-17.26) and NDLM-23-8 x Kashi Vidhi (-17.26), whereas, the best cross combinations for negative heterosis over midparent were NDLM-23-6 x Kashi Vidhi (-9.09), NDLM-23-8 x Kashi Vidhi (-9.09), NDLM-23-8 x Punjab Long Melon (-7.74), NDLM-23-8 x Punjab Long Melon (-6.73) and NDLM-23-3 x Kashi Santusthi (-5.05) in Y2. The magnitude of heterosis for node at first male flower appears ranged from -20.08 (NDLM-23-3 x Kashi Santusthi) to 8.12 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -8.70 (NDLM-23-6 x Kashi Vidhi) to 54.57 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 16 crosses showed significant negative heterosis and 2 significant positive heterosis over better parent whereas, 16 crosses showed significant positive heterosis and 4 crosses showed negative heterosis over mid-parent. Best five crosses based on high negative value over better parent were NDLM-23-3 x Kashi Santusthi (20.08), NDLM-23-3 x Punjab Long Melon (-19.00), NDLM-23-6 x Kashi Vidhi (-17.87), NDLM-23-8 x Kashi Vidhi (-17.77) and NDLM-23-9 x Kashi Vidhi (-17.49), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-6 x Kashi Vidhi (-8.70), NDLM23-8 x Kashi Vidhi (-8.60), NDLM-23-6 x Punjab Long Melon (-7.16) and NDLM-23-3 x Kashi Santusthi (-4.92) over year pooled.

4.5.5 Number of nodes at which first female flower appears

The negative heterosis is desirable for this trait. The hybrids exhibited the magnitude of heterosis for node at first female flower appears ranged from -37.99 (NDLM-23-7 x Kashi Vidhi) to 21.56 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from 9.32 (NDLM-23-6 x Kashi Santusthi) to 107.12 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 21 crosses showed significant negative heterosis and 4 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant positive heterosis over mid-parent. Among 27 cross combinations, best five crosses based on high negative value over better parent were NDLM-23-7 x Kashi Vidhi (-37.99), NDLM-23-3 x Kashi Santusthi (-35.90), NDLM-23-8 x Kashi Santusthi (-35.45), NDLM-23-8 x Kashi Vidhi (-30.90) and NDLM-23-9 x Kashi Vidhi (-30.83) in Year 2024.

In year 2025, the magnitude of heterosis for node at first female flower appears ranged from -37.98 (NDLM-23-7 x Kashi Vidhi) to 21.60 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from 9.31 (NDLM-23-6 x Kashi Santusthi) to 109.61 % (NDLM-23-2 x Kashi Santusthi). Among the 27 crosses, 22 crosses showed significant negative heterosis and 3 cross combinations showed positive significant heterosis over better parent whereas, 20 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-7 x Kashi Vidhi (-37.98), NDLM-23-3 x Kashi Santusthi (-36.78), NDLM-23-8 x Kashi Santusthi (-36.21), NDLM-23-5 x Kashi Santusthi (-32.52) and NDLM-23-9 x Kashi Vidhi (-31.50).

On pooled basis, the magnitude of heterosis for node at first female flower appears ranged from -38.02 (NDLM-23-7 x Kashi Vidhi) to 21.58 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from 9.27 (NDLM-23-6 x Kashi Santusthi) to 108.41 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 21 crosses showed significant negative heterosis and 4 significant positive heterosis over better parent whereas, 20 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high negative value over better parent were NDLM-23-7 x Kashi Vidhi (-38.02), NDLM-23-3 x Kashi Santusthi (-36.40), NDLM-23-8 x Kashi Santusthi (-35.76), NDLM-23-5 x Kashi Santusthi (-32.56) and NDLM-23-9 x Kashi Vidhi (-31.16).

4.5.6 Days to first harvesting

The negative heterosis is desirable for this trait. The magnitude of heterosis for days to first fruit harvest ranged from -10.65 (NDLM-23-8 x Kashi Vidhi) to -3.48 % (NDLM-23-7 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -6.86 (NDLM-238 x Kashi Vidhi) to 6.74 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 4 crosses showed significant negative heterosis over better parent whereas, 11 crosses showed significant positive heterosis and significant negative heterosis over mid-parent. Best crosses based on high negative value over better parent were NDLM-23-8 x Kashi Vidhi (-10.65), NDLM-23-9 x Kashi Vidhi (-5.90), NDLM-23-6 x Kashi Vidhi (-5.60) and NDLM-23-6 x Kashi Vidhi (-3.48), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-6.86) in Y1.

The magnitude of heterosis for days to first fruit harvest ranged from -11.71% (NDLM23-8 x Kashi Santusthi) to 3.77 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -5.52 % (NDLM-23-8 x Kashi Vidhi) to 21.92 % (NDLM23-2 x Kashi Santusthi). Among the 27 crosses, 9 crosses showed significant negative heterosis and 1 cross showed positive significant heterosis over better parent whereas, 20 crosses showed significant positive heterosis and 1 cross exhibited negative heterosis over mid-parent. Best five crosses based on high negative value over better parent were NDLM-23-8 x Kashi Santusthi (11.71), NDLM-23-6 x Kashi Santusthi (-11.54), NDLM-23-3 x Kashi Santusthi (-9.97), NDLM23-8 x Kashi Vidhi (-7.48) and NDLM-23-3 x Kashi Vidhi (-4.59), whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-5.52) in Y2.

Over year pooled data showed the magnitude of heterosis for days to first fruit harvest ranged from -9.17 (NDLM-23-8 x Kashi Vidhi) to -2.54 % (NDLM-23-5 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -6.23 (NDLM-23-8 x Kashi Vidhi) to 13.89 % (NDLM-23-2 x Kashi Santusthi). Out of 27 crosses, 11 crosses showed significant negative heterosis over better parent whereas, 19 crosses showed significant positive heterosis and 1 cross showed negative heterosis over mid-parent. Best five crosses based on high negative value over better parent were NDLM-23-8 x Kashi Vidhi (-9.17), NDLM-23-6 x Kashi Santusthi (-6.72), NDLM-23-8 x Kashi Santusthi (-6.04), NDLM-23-3 x Kashi Santusthi (-5.95) and NDLM-23-6 x Kashi Vidhi

(-4.01) whereas, the best cross for negative heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (-6.23).

4.5.7 Number of primary branches per plant

In case of Y1 the magnitude of heterosis for number of primary branches per plant ranged from -27.21 (NDLM-23-2 x Punjab Long Melon) to 24.52 % (NDLM-23-8 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -32.15 (NDLM-23-2 x Punjab Long Melon) to 18.90 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 2 crosses showed significant negative and 5 crosses found positive heterosis over better parent whereas, 16 crosses showed significant negative and 2 crosses observed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-8 x Kashi Vidhi (24.52), NDLM-23-6 x Punjab Long Melon (22.18), NDLM-23-6 x Kashi Vidhi (15.55), NDLM-23-3 x Kashi Santusthi (13.11) and NDLM-23-8 x Punjab Long Melon (10.64), whereas, the best crosses for positive heterosis over midparent were NDLM-23-8 x Kashi Vidhi (24.52), NDLM-23-6 x Punjab Long Melon (22.18).

In case of Y2, the magnitude of heterosis for number of primary branches per plant ranged from -53.53 (NDLM-23-2 x Punjab Long Melon) to 39.55 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -55.15 (NDLM-23-2 x Punjab Long Melon) to 16.11 % (NDLM-23-8 x Kashi Vidhi). Among 27 crosses, 17 crosses recorded significant negative and 5 crosses showed positive heterosis over better parent whereas, 23 crosses showed significant negative and 2 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (39.55), NDLM-23-4 x Kashi Santusthi (16.22), NDLM-23-8 x Kashi Vidhi (15.94), NDLM-23-5 x Kashi Santusthi (13.95) and NDLM-23-6 x Punjab Long Melon (13.08) whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (16.11) and NDLM-23-6 x Punjab Long Melon (9.14).

In case of pooled data, the magnitude of heterosis for number of primary branches per plant ranged from -41.33 (NDLM-23-2 x Punjab Long Melon) to 25.02 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -44.50 (NDLM-23-2 x Punjab Long Melon) to 17.48 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 12 crosses showed significant negative and 6 crosses showed positive heterosis

over better parent whereas, 21 crosses showed significant negative and 2 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (25.02), NDLM-23-8 x Kashi Vidhi (19.86), NDLM-23-6 x Punjab Long Melon (17.21), NDLM-23-6 x Kashi Vidhi (7.71) and NDLM-23-4 x Kashi Santusthi (6.30) whereas, the best five crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (17.48) and NDLM-23-6 x Punjab Long Melon (11.36).

4.5.8 Fruit length (cm)

For this trait the magnitude of heterosis ranged from -38.93 (NDLM-23-2 x Punjab Long Melon) to 47.91 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -52.62 % (NDLM-23-2 x Kashi Santusthi) to 12.54 % (NDLM-23-8 x Kashi Vidhi). Among 27 crosses, 13 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (47.91), NDLM-23-6 x Punjab Long Melon (43.79), NDLM-23-6 x Kashi Vidhi (43.66), NDLM-23-9 x Kashi Vidhi (38.80) and NDLM-23-3 x Punjab Long Melon (29.02) whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (12.54), NDLM-23-6 x Punjab Long Melon (12.22), NDLM-23-8 x Punjab Long Melon (12.00) and NDLM-23-6 x Kashi Vidhi (10.77) in year 2024.

The magnitude of heterosis for fruit length ranged from -44.83 (NDLM-23-2 x Punjab Long Melon) to 59.55 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for midparent heterosis it varied from -56.81 (NDLM-23-2 x Kashi Santusthi) to 12.15 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 6 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (59.55), NDLM-23-9 x Kashi Vidhi (37.20), NDLM-23-3 x Punjab Long Melon (28.06), NDLM-23-8 x Kashi Vidhi (13.88) and NDLM-23-8 x Punjab Long Melon (13.68) whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (12.15), NDLM-23-8 x Punjab Long

Melon (11.95), NDLM-23-6 x Punjab Long Melon (11.72) and NDLM-23-6 x Kashi Vidhi (11.40) in year 2025.

Over the year pooled results, the magnitude of heterosis for fruit length ranged from 41.94 (NDLM-23-2 x Punjab Long Melon) to 53.59 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -54.74 (NDLM-23-2 x Kashi Santusthi) to 12.33 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 9 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (53.59), NDLM-23-9 x Kashi Vidhi (37.99), NDLM-23-3 x Punjab Long Melon (28.56), NDLM-23-8 x Kashi Vidhi (19.30) and NDLM-23-8 x Punjab Long Melon (18.90) while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (12.33) and NDLM-23-8 x Punjab Long Melon (11.95), NDLM-23-6 x Punjab Long Melon (11.94) and NDLM-23-6 x Kashi Vidhi (10.57).

4.5.9 Fruit breadth (cm)

Regarding the magnitude of heterosis for fruit breadth ranged from -26.35 (NDLM-23-2 x Punjab Long Melon) to 13.87 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -30.56 (NDLM-23-2 x Kashi Santusthi) to 7.29 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 13 crosses showed significant negative and 11 crosses showed positive heterosis over better parent whereas, 17 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (13.87), NDLM-23-6 x Kashi Vidhi (12.48), NDLM-23-8 x Kashi Vidhi (10.36), NDLM-23-9 x Kashi Vidhi (9.62) and NDLM-23-6 x Punjab Long Melon (8.86).where, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (7.29), NDLM-23-6 x Punjab Long Melon (5.21), NDLM-23-6 x Kashi Vidhi (4.27) and NDLM-23-8 x Punjab Long Melon (4.17) in first year.

On the other hand, the magnitude of heterosis for fruit breadth ranged from -28.01 (NDLM-23-2 x Punjab Long Melon) to 17.00 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -30.24 (NDLM-23-2 x Punjab

Long Melon) to 6.53 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 10 crosses showed significant negative and 5 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant negative and 3 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (17.00), NDLM-23-6 x Kashi Vidhi (12.22), NDLM-23-8 x Kashi Vidhi (9.54), NDLM-23-9 x Kashi Vidhi (9.16) and NDLM-23-6 x Punjab Long Melon (8.98), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (6.53), NDLM-23-6 x Punjab Long Melon (5.60) and NDLM-23-6 x Kashi Vidhi (4.12) in second year.

The magnitude of heterosis for fruit breadth ranged from -27.02 (NDLM-23-2 x Punjab Long Melon) to 15.35 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for midparent heterosis it varied from -30.28 (NDLM-23-2 x Kashi Santusthi) to 7.05 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 12 crosses showed significant negative and 8 crosses showed positive heterosis over better parent whereas, 21 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (15.35), NDLM-23-6 x Kashi Vidhi (12.16), NDLM-23-8 x Kashi Vidhi (10.07), NDLM-23-8 x Kashi Vidhi (9.32) and NDLM-23-8 x Punjab Long Melon (7.23), while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (7.05) and NDLM-23-6 x Punjab Long Melon (5.53) and NDLM-23-6 x Kashi Vidhi (4.15) over year pooled.

4.5.10 Vine length (cm)

Out of 27 evaluated crosses the results showed the magnitude of heterosis for vine length ranged from -45.49 (NDLM-23-2 x Punjab Long Melon) to 33.86 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -53.17 (NDLM-23-2 x Kashi Santusthi) to 10.32 % (NDLM-23-8 x Kashi Vidhi). Out of crosses, 14 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 3 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (33.86), NDLM-23-6 x Punjab Long Melon (18.45), NDLM-23-1 x Kashi Santusthi (17.65), NDLM-23-8 x Kashi Vidhi (14.88) and NDLM-23-8 x Punjab Long Melon (13.22), while, the best crosses for

positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (10.32) and NDLM-23-8 x Punjab Long Melon (8.73) and NDLM-23-6 x Punjab Long Melon (9.52) in Y1.

For vine length, the magnitude of heterosis ranged from -47.68 (NDLM-23-2 x Punjab Long Melon) to 38.30 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for midparent heterosis it varied from -54.72% (NDLM-23-2 x Kashi Santusthi) to 11.42 % (NDLM23-8 x Kashi Vidhi). Out of 27 crosses, 11 crosses showed significant negative and 7 crosses showed positive heterosis over better parent whereas, 12 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (38.30), NDLM-23-6 x Punjab Long Melon (18.14), NDLM-23-1 x Kashi Santusthi (15.48), NDLM-23-8 x Kashi Vidhi (15.04) and NDLM-23-6 x Kashi Vidhi (13.30), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (11.42), NDLM-23-6 x Punjab Long Melon (10.24), NDLM-23-8 x Punjab Long Melon (9.45) and NDLM-23-6 x Kashi Vidhi (3.94) in Y2.

In over year pooled data, the magnitude of heterosis for vine length ranged from -46.67 (NDLM-23-2 x Punjab Long Melon) to 35.98 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -53.87 (NDLM-23-2 x Kashi Santusthi) to 10.79 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 8 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among crosses combination, best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (35.98), NDLM-23-6 x Punjab Long Melon (18.30), NDLM23-1 x Kashi Santusthi (16.57), NDLM-23-8 x Kashi Vidhi (14.89) and NDLM-23-8 x Punjab Long Melon (13.11), while, the best crosses for positive heterosis over mid-parent were NDLM23-8 x Kashi Vidhi (10.79), NDLM-23-6 x Punjab Long Melon (9.88), NDLM-23-8 x Punjab Long Melon (9.09) and NDLM-23-6 x Kashi Vidhi (3.56).

4.5.11 Number of fruits per plant

Out of 27 evaluated crosses, the magnitude of heterosis for number of fruits per plant ranged from -35.59 (NDLM-23-2 x Punjab Long Melon) to 23.90 % (NDLM-23-6 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -42.32

(NDLM-23-2 x Kashi Santusthi) to 16.69 % (NDLM-23-8 x Kashi Vidhi). Among cross combinations, 13 crosses showed significant negative and 13 crosses recorded positive heterosis over better parent whereas, 18 crosses observed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-6 x Kashi Vidhi (23.90), NDLM-23-3 x Kashi Santusthi (23.16), NDLM-23-6 x Punjab Long Melon (21.98), NDLM-23-8 x Kashi Vidhi (21.40) and NDLM-23-8 x Punjab Long Melon (21.16) while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (16.69), NDLM-23-6 x Punjab Long Melon (16.49), NDLM-23-8 x Punjab Long Melon (16.46) and NDLM-23-6 x Kashi Vidhi (15.74) in year 2024.

Among the 27 crosses results revealed that the magnitude of heterosis for number of fruits per plant ranged from -42.84 (NDLM-23-2 x Punjab Long Melon) to 39.04 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -48.04 (NDLM-23-2 x Kashi Santusthi) to 15.71 % (NDLM-23-8 x Kashi Vidhi). Out of crosses, 14 crosses showed significant negative and 7 crosses showed positive heterosis over better parent whereas, 17 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-3 x Kashi Santusthi (39.04), NDLM-23-6 x Kashi Vidhi (22.06), NDLM-23-6 x Punjab Long Melon (20.45), NDLM-23-8 x Kashi Vidhi (19.69) and NDLM-23-8 x Punjab Long Melon (18.95), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (15.71), NDLM-23-6 x Punjab Long Melon (15.29), NDLM-23-8 x Punjab Long Melon (15.00) and NDLM-23-6 x Kashi Vidhi (14.61) in 2025.

The magnitude of heterosis for the number of fruits per plant ranged from -39.34 (NDLM-23-2 x Punjab Long Melon) to 30.90 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -45.28 (NDLM-23-2 x Kashi Santusthi) to 16.18 % (NDLM-23-8 x Kashi Vidhi). Out of crosses, 14 crosses showed significant negative and 10 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (30.90), NDLM-23-6 x Kashi Vidhi (22.93), NDLM-23-8 x Punjab Long Melon (21.19), NDLM-23-8 x Kashi Vidhi (20.50) and NDLM-23-8 x Punjab

Long Melon (20.00), while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (16.18), NDLM-23-6 x Punjab Long Melon (15.88), NDLM-23-8 x Punjab Long Melon (15.70) and NDLM-23-6 x Kashi Vidhi (15.15) over year pooled.

4.5.12 Average fruit weight (g)

For average fruit weight, the magnitude of heterosis ranged from -16.84 (NDLM-23-2 x Punjab Long Melon) to 23.51% (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -25.20 (NDLM-23-2 x Kashi Santusthi) to 8.85 % (NDLM23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 10 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (23.51), NDLM-23-6 x Kashi Vidhi (18.99), NDLM-23-6 x Punjab Long Melon (18.30), NDLM-23-9 x Kashi Vidhi (16.91) and NDLM-23-8 x Kashi Vidhi (15.65) while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (8.85), NDLM-23-8 x Punjab Long Melon (6.40), NDLM-23-8 x Punjab Long Melon (4.97) and NDLM-23-6 x Kashi Vidhi (4.77) in Y1.

The magnitude of heterosis for average fruit weight ranged from – 18.54 (NDLM-23-2 x Punjab Long Melon) to 25.04% (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -26.24 (NDLM-23-2 x Kashi Santusthi) to 8.85 % (NDLM23-8 x Kashi Vidhi). Among the crosses, 6 crosses exhibited significant negative and 7 crosses exhibited positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive heterosis over better parent NDLM-23-3 x Kashi Santusthi (25.04), NDLM-23-6 x Kashi Vidhi (19.03), NDLM-23-6 x Punjab Long Melon (17.47), NDLM-23-9 x Kashi Vidhi (16.90) and NDLM-23-8 x Kashi Vidhi (15.67) whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (8.85), NDLM-23-6 x Punjab Long Melon (6.38), NDLM-23-8 x Punjab Long Melon (4.93) and NDLM-23-6 x Kashi Vidhi (4.77) in Y2.

Regarding average fruit weight the magnitude of heterosis ranged from -17.69 (NDLM23-2 x Punjab Long Melon) to 24.27% (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -25.72 (NDLM-23-2 x Kashi

Santusthi) to 8.85 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 13 crosses showed significant negative and 10 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (24.27), NDLM-23-6 x Kashi Vidhi (19.03), NDLM-23-6 x Punjab Long Melon (17.88), NDLM-23-9 x Kashi Vidhi (16.90) and NDLM-23-8 x Kashi Vidhi (15.66) while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (8.85), NDLM-23-6 x Punjab Long Melon (6.38), NDLM-23-8 x Punjab Long Melon (4.95) and NDLM-23-6 x Kashi Vidhi (4.77) over year pooled.

4.5.13 Number of seeds per fruit

For this trait the magnitude of heterosis ranged from -23.76 (NDLM-23-2 x Kashi Vidhi) to 28.54 % (NDLM-23-6 x Punjab Long Melon) over better parent while, for mid-parent heterosis it varied from -64.63 (NDLM-23-2 x Kashi Santusthi) to 22.93 % (NDLM-23-3 x Kashi Santusthi). Out of 27 crosses, 11 crosses showed significant negative and 11 crosses showed positive heterosis over better parent whereas, 13 crosses showed significant negative and 7 crosses showed significant positive heterosis over mid-parent. Among 27 cross combinations, best five crosses based on high positive value over better parent were NDLM-23-6 x Punjab Long Melon (28.54), NDLM-23-3 x Kashi Santusthi (25.00), NDLM-23-3 x Punjab Long Melon (20.24), NDLM-23-8 x Kashi Vidhi (20.00) and NDLM-23-6 x Punjab Long Melon (18.28) while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.32), NDLM-23-6 x Punjab Long Melon (26.11), NDLM-23-8 x Punjab Long Melon (21.89), NDLM-23-8 x Kashi Santusthi (20.00) and NDLM-23-6 x Kashi Santusthi (16.00) in Y1.

In second year, the magnitude of heterosis for number of seeds per fruit ranged from 57.65 (NDLM-23-2 x Kashi Santusthi) to 22.93 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -64.83 (NDLM-23-2 x Kashi Santusthi) to 26.91 % (NDLM-23-8 x Kashi Vidhi). Among 27 crosses, 12 crosses showed significant negative and 10 crosses showed positive heterosis over better parent whereas, 16 crosses showed significant negative and 6 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-3 x Kashi Santusthi (22.93), NDLM-23-3 x Punjab Long Melon (20.09), NDLM-23-8 x Kashi Vidhi (19.56), NDLM-23-3 x Kashi Vidhi (17.65) and NDLM-23-6

x Kashi Santusthi (17.06), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.91), NDLM-23-8 x Punjab Long Melon (22.88), NDLM-23-8 x Kashi Santusthi (21.40) NDLM-23-6 x Kashi Santusthi (16.31) and NDLM-23-6 x Kashi Vidhi (14.83).

Over year pooled, the magnitude of heterosis for number of seeds per fruit ranged from -57.78 (NDLM-23-2 x Kashi Vidhi) to 23.96 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -64.73 (NDLM-23-2 x Kashi Santusthi) to 26.61 % (NDLM-23-3 x Kashi Vidhi). In 27 cross combinations, 13 crosses observed significant negative and 11 crosses exhibited positive heterosis over better parent whereas, 17 crosses showed significant negative and 7 crosses recorded significant positive heterosis over midparent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (23.96), NDLM-23-3 x Punjab Long Melon (20.17), NDLM-23-8 x Kashi Vidhi (19.78), NDLM-23-3 x Kashi Vidhi (17.81) and NDLM-23-6 x Kashi Santusthi (17.65), while, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.61), NDLM-23-8 x Punjab Long Melon (22.39), NDLM-23-8 x Kashi Santusthi (20.70) and NDLM-23-6 x Punjab Long Melon (15.84) and NDLM-23-6 x Kashi Vidhi (14.25).

4.5.14 Fruit yield (q/ha)

Out of 27 crosses, the magnitude of heterosis for Fruit yield ranged from -47.42 (NDLM-23-2 x Punjab Long Melon) to 47.19 % (NDLM-23-8 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -56.73 (NDLM-23-2 x Kashi Santusthi) to 30.90 % (NDLM-23-8 x Kashi Vidhi). In 27 cross combinations, 14 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-8 x Kashi Vidhi (47.19), NDLM-23-3 x Kashi Santusthi (45.10), NDLM-23-6 x Kashi Vidhi (43.70), NDLM-23-6 x Punjab Long Melon (40.65) and NDLM-23-9 x Kashi Vidhi (35.58), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (30.90), NDLM-23-6 x Punjab Long Melon (23.99), NDLM-23-8 x Punjab Long Melon (20.12) and NDLM-23-6 x Kashi Vidhi (19.10) in year 2024.

In the year 2025, the magnitude of heterosis for fruit yield ranged from -53.97 (NDLM-23-5 x Kashi Vidhi) to 76.82 % (NDLM-23-3 x Kashi Santusthi) over better

parents, while for mid-parent heterosis, it varied from -59.90 (NDLM-23-2 x Kashi Vidhi) to 26.55 % (NDLM23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 9 crosses showed positive heterosis over the better parent, whereas 17 crosses showed significant negative and 4 crosses showed significant positive heterosis over the mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (76.82), NDLM23-6 x Punjab Long Melon (44.14), NDLM-23-6 x Kashi Vidhi (42.20), NDLM-23-8 x Kashi Vidhi (39.22) and NDLM-23-8 x Punjab Long Melon (32.70), whereas, the best crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.55), NDLM-23-6 x Punjab Long Melon (22.60), NDLM-23-8 x Punjab Long Melon (20.62) and NDLM-23-6 x Kashi Vidhi (20.02).

Over year pooled, the magnitude of heterosis for fruit yield ranged from -49.31 (NDLM23-2 x Punjab Long Melon) to 60.58 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -59.28 (NDLM-23-2 x Kashi Santusthi) to 28.64 % (NDLM-23-8 x Kashi Vidhi). Out of crosses, 14 crosses showed significant negative and 11 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (60.58), NDLM-23-6 x Kashi Vidhi (45.91), NDLM-23-8 x Kashi Vidhi (43.01), NDLM-23-6 x Punjab Long Melon (42.43) and NDLM-23-8 x Punjab Long Melon (33.32) whereas, the best five crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (28.64), NDLM23-6 x Punjab Long Melon (23.27), NDLM-23-8 x Punjab Long Melon (20.38) and NDLM-236 x Kashi Vidhi (19.58).

4.5.15 Total soluble solids (%)

Out of 27 cross combinations, the magnitude of heterosis for total soluble solids ranged from -25.81 % (NDLM-23-2 x Punjab Long Melon) to 23.48 % (NDLM-23-7 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -30.11 % (NDLM-23-2 x Kashi Santusthi) to 11.94 % (NDLM-23-8 x Kashi Vidhi). Out of cross combinations, 9 crosses exhibited significant negative and 8 cross combinations found positive heterosis over better parent whereas, 16 crosses showed significant negative and 1 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-7 x Kashi Santusthi (23.48), NDLM-23-1 x Kashi Santusthi (14.78), NDLM-23-8 x Kashi Vidhi (14.60), NDLM-23-3 x

Kashi Santusthi (10.07) and NDLM-23-6 x Kashi Vidhi (6.89) while, the best cross for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (11.94) in first year.

This trait showed, the magnitude of heterosis ranged from -27.02 (NDLM-23-2 x Punjab Long Melon) to 15.91 % (NDLM-23-1 x Kashi Santusthi) over better parent while, for midparent heterosis it varied from -31.70 (NDLM-23-2 x Kashi Santusthi) to 11.83 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 9 crosses showed significant negative and 4 crosses showed positive heterosis over better parent whereas, 18 crosses exhibited significant negative and 1 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-1x Kashi Santusthi (15.91), NDLM-23-8 x Kashi Vidhi (15.17), NDLM-23-7 x Kashi Santusthi (13.64) and NDLM-23-3 x Kashi Santusthi (10.95), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (11.83) in second year.

The magnitude of heterosis for Total soluble solids ranged from -26.35 (NDLM-23-2 x Punjab Long Melon) to 18.74 % (NDLM-23-7 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -30.87 (NDLM-23-2 x Kashi Santusthi) to 11.88 % (NDLM-23-8 x Kashi Vidhi). Out of crosses, 10 crosses exhibited significant negative and 8 crosses showed positive heterosis over better parent whereas, 17 crosses found significant negative and 1 cross observed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-7 x Kashi Santusthi (18.74), NDLM-23-1 x Kashi Santusthi (15.35), NDLM-23-8 x Kashi Vidhi (14.80), NDLM-23-3 x Kashi Santusthi (10.59) and NDLM-23-6 x Kashi Vidhi (6.70), while, the best cross for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (11.88) over year pooled.

4.5.16 Dry matter content (%)

For dry matter content, the magnitude of heterosis ranged from -16.08 (NDLM-23-2 x Punjab Long Melon) to 32.23 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -25.09 (NDLM-23-2 x Kashi Santusthi) to 12.17 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 9 crosses found significant negative and 11 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses recorded significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (32.23), NDLM-23-6 x Punjab Long Melon (23.66), NDLM-23-6 x Kashi

Vidhi (19.83), NDLM-23-8 x Kashi Vidhi (19.72) and NDLM-23-8 x Punjab Long Melon (17.72), while, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (12.17), NDLM-23-6 x Punjab Long Melon (10.92), NDLM-23-8 x Punjab Long Melon (10.30) and NDLM-23-6 x Kashi Vidhi (5.24) in Y1.

In case of Y2, the magnitude of heterosis for dry matter content ranged from -17.36 (NDLM-23-2 x Punjab Long Melon) to 34.13 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -25.19 (NDLM-23-2 x Kashi Santusthi) to 12.97 % (NDLM-23-8 x Kashi Vidhi). Out of 27 cross combinations, 7 crosses found significant negative and 9 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 5 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-3 x Kashi Santusthi (34.13), NDLM-23-6 x Punjab Long Melon (22.73), NDLM-23-6 x Kashi Vidhi (19.92), NDLM-23-8 x Kashi Vidhi (18.54) and NDLM-23-8 x Punjab Long Melon (14.14), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (12.97), NDLM-23-6 x Punjab Long Melon (11.65), NDLM-23-8 x Punjab Long Melon (8.78), NDLM-23-6 x Kashi Vidhi (6.39) and NDLM-23-3 x Kashi Santusthi (5.64).

In case of pooled data, the magnitude of heterosis for dry matter content ranged from 16.62 (NDLM-23-2 x Punjab Long Melon) to 33.12 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -25.14 (NDLM-23-2 x Kashi Santusthi) to 12.63 % (NDLM-23-8 x Kashi Vidhi). Out of cross combinations, 9 crosses showed significant negative and 9 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 4 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-1 x Kashi Santusthi (33.12), NDLM-23-6 x Punjab Long Melon (23.20), NDLM-23-6 x Kashi Vidhi (19.91), NDLM-23-8 x Kashi Vidhi (19.27) and NDLM-23-6 x Punjab Long Melon (16.03), while, the best cross for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (12.63), NDLM-23-6 x Punjab Long Melon (11.26), NDLM-23-8 x Punjab Long Melon (9.57) and NDLM-23-6 x Kashi Vidhi (5.82).

4.5.17 Ascorbic acid (mg/100g)

Out of 27 hybrids results showed the magnitude of heterosis ranged from -27.25 (NDLM-23-3 x Kashi Santusthi) to 10.64 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -10.17 (NDLM-23-8 x Kashi Vidhi) to 55.68 % (NDLM-23-2 x Kashi Santusthi). In the combinations, 19 crosses observed significant negative and 4 crosses showed positive heterosis over better parent whereas, 4 crosses showed significant negative and 18 crosses recorded significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-2 x Kashi Santusthi (10.64), NDLM-23-2 x Punjab Long Melon (7.83), NDLM-23-9 x Kashi Santusthi (3.22) and NDLM-23-7 x Punjab Long Melon (3.18), while, the best cross for positive heterosis over midparent were NDLM-23-2 x Kashi Santusthi (55.68), NDLM-23-2 x Punjab Long Melon (51.69), NDLM-23-5 x Kashi Vidhi (47.46), NDLM-23-2 x Kashi Vidhi (41.78) and NDLM-23-5 x Kashi Santusthi (39.58) in year 2024.

In year 2025, the magnitude of heterosis for Ascorbic acid content ranged from -29.26 (NDLM-23-3 x Kashi Santusthi) to 11.38 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -11.30 (NDLM-23-8 x Kashi Vidhi) to 61.74 % (NDLM-23-2 x Kashi Santusthi). Out of crosses, 19 crosses showed significant negative and 2 crosses showed positive heterosis over better parent whereas, 4 crosses showed significant negative and 19 crosses showed significant positive heterosis over mid-parent. Five best crosses based on high positive value over better parent NDLM-23-2 x Kashi Santusthi (11.38) and NDLM-23-2 x Punjab Long Melon (7.58), whereas the best cross combinations for positive heterosis over mid-parent were NDLM-23-2 x Kashi Santusthi (61.74), NDLM-23-2 x Punjab Long Melon (56.26), NDLM-23-5 x Kashi Vidhi (52.17), NDLM-23-2 x Kashi Vidhi (47.83) and NDLM-23-5 x Kashi Santusthi (44.55).

Over year pooled data showed the magnitude of heterosis for ascorbic acid content ranged from -28.09 (NDLM-23-3 x Kashi Santusthi) to 11.00 % (NDLM-23-2 x Kashi Santusthi) over better parent, while for mid-parent heterosis it varied from -10.58 (NDLM-238 x Kashi Vidhi) to 59.07 % (NDLM-23-2 x Kashi Santusthi). Among 27 cross combinations, 19 crosses showed significant negative and 4 crosses showed positive heterosis over better parent whereas, 4 crosses showed significant negative and 18 cross showed significant positive heterosis over mid-parent. Five best crosses based on high

positive value over better parent were NDLM-23-2 x Kashi Santusthi (11.00) and NDLM-23-2 x Punjab Long Melon (7.60), NDLM23-9 x Kashi Santusthi (2.77) and NDLM-23-7 x Punjab Long Melon (2.53), while, the best cross for positive heterosis over mid-parent were NDLM-23-2 x Kashi Santusthi (59.07), NDLM-232 x Punjab Long Melon (54.17), NDLM-23-5 x Kashi Vidhi (49.87), NDLM-23-2 x Kashi Vidhi (44.71) and NDLM-23-5 x Kashi Santusthi (42.13).

4.5.18 Reducing sugar (%)

Regarding reducing sugar content, the magnitude of heterosis ranged from -54.08 % (NDLM-23-2 x Punjab Long Melon) to 19.27 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -60.70 % (NDLM-23-2 x Kashi Santusthi) to 8.17 % (NDLM-23-8 x Kashi Vidhi). Among cross combinations, 13 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant negative and 3 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (19.27), NDLM-23-6 x Punjab Long Melon (16.74), NDLM-23-8 x Kashi Vidhi (15.83), NDLM-23-6 x Kashi Vidhi (14.78) and NDLM-23-8 x Punjab Long Melon (11.25), while, the best crosses for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (8.17), NDLM-23-6 x Punjab Long Melon (5.84) and NDLM-23-8 x Punjab Long Melon (3.86) in Y1.

On other hand in case of Y2, the magnitude of heterosis for reducing sugar content ranged from -60.90 (NDLM-23-2 x Punjab Long Melon) to 22.12 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -61.54 (NDLM-232 x Kashi Santusthi) to 7.69 % (NDLM-23-8 x Kashi Vidhi). Among the crosses, 13 crosses exhibited significant negative and 7 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant negative and 3 crosses recorded significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-3 x Kashi Santusthi (22.12), NDLM-23-8 x Kashi Vidhi (14.75), NDLM-23-6 x Kashi Vidhi (13.96), NDLM-23-9 x Kashi Vidhi (12.05) and NDLM-23-1 x Kashi Santusthi (8.00), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (7.69), NDLM-23-6 x Punjab Long Melon (6.15), NDLM-23-8 x Punjab Long Melon (3.85).

In case of over year pooled data, the magnitude of heterosis for reducing sugar content ranged from -57.68 (NDLM-23-2 x Punjab Long Melon) to 20.49 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -61.27 (NDLM-232 x Kashi Santusthi) to 7.72 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 2 cross combinations showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-1 x Kashi Santusthi (20.49), NDLM-23-8 x Kashi Vidhi (15.13) NDLM23-3 x Kashi Vidhi (14.51), NDLM-23-9 x Kashi Vidhi (11.31) and NDLM-23-6 x Punjab Long Melon (9.75) while, the crosses for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (7.72) and NDLM-23-6 x Punjab Long Melon (5.79).

4.5.19 Non reducing sugar (%)

In case of Y1 the magnitude of heterosis for non- reducing sugar content ranged from 30.13 (NDLM-23-5 x Punjab Long Melon) to 67.46 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -38.82 (NDLM-23-2 x Punjab Long Melon) to 24.12 % (NDLM-23-2 x Kashi Santusthi). Among 27 crosses, 10 crosses exhibited significant negative and 11 crosses showed positive heterosis over better parent whereas, 16 crosses showed significant negative and 2 cross showed significant positive heterosis over midparent. Best five crosses based on high positive value over better parent were NDLM-23-2 x Kashi Santusthi (47.46), NDLM-23-3 x Kashi Santusthi (29.85), NDLM-23-9 x Kashi Vidhi (21.82), NDLM-23-6 x Kashi Vidhi (18.54) and NDLM-23-6 x Punjab Long Melon (17.31), while, the cross for positive heterosis over mid-parent were (NDLM-23-2 x Kashi Santusthi (24.12) NDLM-23-8 x Kashi Vidhi (9.41).

In case Y2, the magnitude of heterosis for non-reducing sugar content ranged from 30.72 (NDLM-23-2 x Punjab Long Melon) to 67.72 % (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -36.53 (NDLM-23-2 x Punjab Long Melon) to 27.54 % (NDLM-23-2 x Kashi Santusthi). Among the crosses, 8 crosses showed significant negative and 11 crosses showed positive heterosis over better parent whereas, 15 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive

value over better parent NDLM-23-2 x Kashi Santusthi (67.72), NDLM-23-3 x Kashi Santusthi (26.67), NDLM-23-9 x Kashi Vidhi (19.71), NDLM-23-6 x Kashi Vidhi (18.00) and NDLM-23-6 x Punjab Long Melon (17.65) whereas, the best cross for positive heterosis over mid-parent were NDLM-23-2 x Kashi Santusthi (27.54), NDLM-23-8 x Kashi Vidhi (10.18), NDLM-23-6 x Punjab Long Melon (7.78), NDLM-23-8 x Punjab Long Melon (7.19).

In case of pooled data, the magnitude of heterosis for non-reducing sugar content ranged from -32.11 (NDLM-23-2 x Punjab Long Melon) to 67.37% (NDLM-23-2 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -37.76 (NDLM-23-2 x Punjab Long Melon) to 25.67 % (NDLM-23-2 x Kashi Santusthi). Among the crosses, 11 crosses showed significant negative and 11 crosses showed positive heterosis over better parent whereas, 16 crosses showed significant negative and 1 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-2 x Kashi Santusthi (67.37), NDLM-23-3 x Kashi Santusthi (28.22), NDLM-23-9 x Kashi Vidhi (21.82), NDLM-23-6 x Kashi Vidhi (18.54) and NDLM-23-6 x Punjab Long Melon (21.01), NDLM-23-6 x Kashi Vidhi (18.36) and NDLM-23-6 x Punjab Long Melon (17.46), while the cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Santusthi (25.67).

4.5.20 Total Sugar (%)

Among the 27 crosses, the magnitude of heterosis for total sugar content ranged from 45.76 (NDLM-23-2 x Punjab Long Melon) to 23.30 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -50.59 (NDLM-23-2 x Punjab Long Melon) to 8.67 % (NDLM-23-8 x Kashi Vidhi). Among the crosses, 13 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant negative and 4 cross combinations showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (23.30), NDLM-23-6 x Punjab Long Melon (16.97), NDLM-23-6 x Kashi Vidhi (16.27), NDLM-23-9 x Kashi Vidhi (15.01) and NDLM-23-8 x Kashi Vidhi (14.29), while, the crosses for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (8.67), NDLM-23-6 x Punjab Long Melon (6.56), NDLM-23-8 x Punjab Long Melon (4.68) and NDLM-23-6 x Kashi Vidhi (3.75) in year 2024.

The magnitude of heterosis for total sugar content ranged from -45.76 (NDLM-23-2 x Punjab Long Melon) to 23.30 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -50.59 (NDLM-23-2 x Punjab Long Melon) to 8.67 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 13 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 2 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent NDLM-23-2 x Kashi Santusthi (23.30), NDLM-23-6 x Punjab Long Melon (16.97), NDLM-23-6 x Kashi Vidhi (16.27), NDLM-23-9 x Kashi Vidhi (15.01) and NDLM-23-8 x Kashi Vidhi (14.29), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (8.67) and NDLM-23-6 x Punjab Long Melon (6.56) in year 2025.

Over year pooled data, the magnitude of heterosis for total sugar content ranged from 45.76 (NDLM-23-2 x Punjab Long Melon) to 23.39 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -50.59 (NDLM-23-2 x Punjab Long Melon) to 8.67 % (NDLM-23-8 x Kashi Vidhi). Among the crosses, 10 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 17 crosses showed significant negative and 2 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (23.39), NDLM-23-6 x Punjab Long Melon (16.97), NDLM-23-6 x Kashi Vidhi (16.27), NDLM-23-9 x Kashi Vidhi (15.10) and NDLM-23-8 x Kashi Vidhi (14.19), while, the cross combinations for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (8.67) and NDLM-23-6 x Punjab Long Melon (6.56).

4.5.21 Carotenoid content ($\mu\text{g}/100\text{mg}$)

Regarding carotenoid content, the magnitude of heterosis ranged from -43.61 (NDLM23-2 x Punjab Long Melon) to 39.15 % (NDLM-23-8 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -53.74 (NDLM-23-2 x Kashi Santusthi) to 26.40 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 14 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 20 crosses showed significant negative and 4 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were

NDLM-23-8 x Kashi Vidhi (39.15), NDLM-23-3 x Kashi Santusthi (36.65), NDLM-23-6 x Punjab Long Melon (35.78), NDLM-23-6 x Kashi Vidhi (26.02) and NDLM-23-8 x Punjab Long Melon (21.52) while, the cross combinations for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.40), NDLM-23-6 x Punjab Long Melon (17.89), NDLM-23-8 x Punjab Long Melon (10.39) and NDLM-23-6 x Kashi Vidhi (5.98) in first year.

The magnitude of heterosis for carotenoid content ranged from -44.29 (NDLM-23-2 x Punjab Long Melon) to 39.94 % (NDLM-23-8 x Kashi Vidhi) over better parent while, for midparent heterosis it varied from -54.47 (NDLM-23-2 x Kashi Santusthi) to 27.45 % (NDLM-23-8 x Kashi Vidhi). Out of cross combinations, 14 crosses showed significant negative and 14 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-8 x Kashi Vidhi (39.94), NDLM-23-3 x Kashi Santusthi (37.53), NDLM-23-8 x Punjab Long Melon (21.22), NDLM-23-9 x Kashi Vidhi (19.29) and NDLM-23-3 x Punjab Long Melon (16.92), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (27.45), NDLM-23-6 x Punjab Long Melon (18.12), NDLM-23-8 x Punjab Long Melon (10.39) and NDLM-23-6 x Kashi Vidhi (5.86).

Results revealed the magnitude of heterosis for carotenoid content ranged from -43.96 (NDLM-23-2 x Punjab Long Melon) to 39.56 % (NDLM-23-8 x Kashi Vidhi) over better parent while, for mid-parent heterosis it varied from -54.09 (NDLM-23-2 x Kashi Santusthi) to 26.92 % (NDLM-23-8 x Kashi Vidhi). Out of 27 crosses, 16 crosses showed significant negative and 7 crosses showed positive heterosis over better parent whereas, 19 crosses showed significant negative and 4 crosses showed significant positive heterosis over mid-parent. Among 27 crosses combination, best five crosses based on high positive value over better parent were NDLM-23-8 x Kashi Vidhi (39.56), NDLM-23-3 x Kashi Santusthi (37.09), NDLM-23-8 x Punjab Long Melon (21.40), NDLM-23-9 x Kashi Vidhi (19.13) and NDLM-23-2 x Punjab Long Melon (16.86), while, the cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (26.92), NDLM-23-6 x Punjab Long Melon (17.97), NDLM-23-8 x Punjab Long Melon (26.92) and NDLM-23-6 x Kashi Vidhi (5.91) in over year pooled.

4.5.22 Fruit yield per plant (kg)

Among the 27 crosses, the magnitude of heterosis for fruit yield per plant ranged from 46.40 (NDLM-23-2 x Punjab Long Melon) to 51.94 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -56.88 (NDLM-23-2 x Kashi Santusthi) to 26.88 % (NDLM-23-8 x Kashi Vidhi). Out of cross combinations, 13 crosses showed significant negative and 13 crosses showed positive heterosis over better parent whereas, 17 crosses showed significant negative and 4 cross showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (51.94), NDLM-23-6 x Kashi Vidhi (47.28), NDLM-23-6 x Punjab Long Melon (44.29), NDLM-23-8 x Kashi Vidhi (40.48) and NDLM-23-9 x Kashi Vidhi (35.91), while, the cross for positive heterosis over mid-parent were NDLM-23-8 x Kashi Vidhi (26.88), NDLM-23-6 x Punjab Long Melon (23.86), NDLM-23-8 x Punjab Long Melon (22.05) and NDLM-23-6 x Kashi Vidhi (21.07) in Y1.

While in case Y2, the magnitude of heterosis for fruit yield per plant ranged from -55.05 (NDLM-23-2 x Punjab Long Melon) to 76.94 % (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -61.76 (NDLM-23-2 x Kashi Santusthi) to 25.89% (NDLM-23-8 x Kashi Vidhi). Among the crosses, 14 crosses showed significant negative and 9 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 5 crosses showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent NDLM-23-3 x Kashi Santusthi (76.94), NDLM-23-6 x Kashi Vidhi (43.74), NDLM-23-8 x Kashi Vidhi (38.15), NDLM-23-1 x Kashi Santusthi (33.40) and NDLM-23-8 x Punjab Long Melon (32.35), whereas, the best cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (25.89), NDLM23-6 x Punjab Long Melon (22.16), NDLM-23-8 x Punjab Long Melon (20.59), NDLM-23-6 x Kashi Vidhi (20.15) and NDLM-23-3 x Kashi Santusthi (10.46).

The pooled showed the magnitude of heterosis for fruit yield per plant ranged from 50.88 (NDLM-23-2 x Punjab Long Melon) to 64.53% (NDLM-23-3 x Kashi Santusthi) over better parent while, for mid-parent heterosis it varied from -59.40 (NDLM-23-2 x Kashi Santusthi) to 26.60 % (NDLM-23-8 x Kashi Vidhi). Among cross combinations, 14 crosses showed significant negative and 16 crosses showed positive heterosis over better parent whereas, 18 crosses showed significant negative and 5 crosses

showed significant positive heterosis over mid-parent. Best five crosses based on high positive value over better parent were NDLM-23-3 x Kashi Santusthi (64.53), NDLM-23-6 x Kashi Vidhi (45.49), NDLM-23-6 x Punjab Long Melon (42.90), NDLM-23-8 x Kashi Vidhi (39.28) and NDLM-23-8 x Punjab Long Melon (33.50), while, the cross for positive heterosis over mid-parent was NDLM-23-8 x Kashi Vidhi (26.60), NDLM-23-6 x Punjab Long Melon (23.21), NDLM-23-8 x Punjab Long Melon (21.35), NDLM-23-6 x Kashi Vidhi (20.51) and NDLM-23-3 x Kashi Santusthi (7.70).

A perusal of the results showed that crosses that had significant and negative estimates of heterosis for one or both types of heterosis for total yields of fruit also had significant and positive estimates of heterosis for other important yield-related traits. On other hand, none of the crosses exhibited significant heterosis for all the traits. The above the results are in conformity with the findings of Yadav *et al.*, (2021), Chaithra *et al.*, (2022), Saha *et al.*, (2022).

4.6 Morphological Characterization of Long Melon Parents and Their Hybrids

Observations on 16 botany-based morphometric characters were recorded as per the DUS guidelines of long melon (PPV&FRA, 2009). Data were recorded from each replication, avoiding the border rows, at specified stages of the crop growth period when the characters had their full expression. For the assessment of colour characteristics, the Royal Horticultural Society (RHS, 2001) colour chart was used. All observations on the fruit, leaves and seeds were recorded from the first inflorescence to the first harvesting, whereas observations on fruits were recorded at the commercial and physiological maturity stages. The data were observed for all the 16 morph metric traits from the following plant parts: leaf length, leaf width, leaf shape, depth of leaf lobe, petiole length, flower colour, sex expression, male sterility, ovary length, fruit colour, fruit shape, fruit strips, fruit taste, fruit creasing, seed length, seed width viz., MG (measurement by a single observation on a group of plants or parts of plants), MS (measurement on a number of individual plants or parts of plants), VG (visual assessment by a single observation on a group of plants or parts of plants), VS (visual assessment by observations on individual plants or parts of plants)-as discussed in the DUS guidelines of melons.

4.6.1 Leaf characters:

Among the 12 parents and their hybrids, considerable variation was observed for all the important characters. Based on leaf shape genotypes/crosses were grouped as

Table 4.6: Morphological characterization of different genotypes and their crosses based on minimal descriptors of NBPGR.

S. No.	Genotype/ Hybrids	Morphological Characters															
		Leaf Length	Leaf Width	Leaf Shape	Depth of Leaf Lobe	Petiole Length	Flower Colour	Ovary Length	Fruit Colour	Fruit Shape	Fruit Strips	Fruit Taste	Fruit Creasing	Seed Length	Seed Width	Sex Expression	Male Sterility
1.	NDLM-23-1	Long	Medium	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
2.	NDLM-23-2	Long	Medium	Cordate	Shallow	Short	Dark Yellow	Long	Creamy	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
3.	NDLM-23-3	Long	Broad	Palmately	Shallow	Medium	Dark Yellow	Long	Dark Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
4.	NDLM-23-4	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
5.	NDLM-23-5	Medium	Narrow	Cordate	Shallow	Short	Light Yellow	Medium	Creamy	Slightly Elongated	Absent	Non Bitter	Absent	Short	Short	Monocious	Absent
6.	NDLM-23-6	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
7.	NDLM-23-7	Long	Broad	Palmately	Inter-mediate	Short	Dark Yellow	Long	Creamy	Elongated Curve	Absent	Non Bitter	Absent	Short	Short	Monocious	Absent
8.	NDLM-23-8	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
9.	NDLM-23-9	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
10.	Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
11.	Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
12.	Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
13.	NDLM-23-1 x Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
14.	NDLM-23-1 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
15.	NDLM-23-1 x	Long	Broad	Palmately	Inter-	Medium	Light	Long	Light Green	Elongated	Absent	Non	Present	Short	Short	Monocious	Absent

	Kashi Vidhi			lobed	mediate		Yellow			Curve		Bitter					
16.	NDLM-23-2 x Kashi Santusthi	Medium	Narrow	Cordate	Shallow	Short	Dark Yellow	Long	Creamy	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
17.	NDLM-23-2 x Punjab Long Melon	Medium	Narrow	Cordate	Shallow	Short	Dark Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
18.	NDLM-23-2 x Kashi Vidhi	Long	Narrow	Cordate	Shallow	Short	Light Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
19.	NDLM-23-3 x Kashi Santusthi	Long	Broad	Palmately	Inter-mediate	Medium	Dark Yellow	Long	Dark Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
20.	NDLM-23-3 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Dark Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
21.	NDLM-23-3 x Kashi Vidhi	Long	Broad	Palmately	Intermediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
22.	NDLM-23-4 x Kashi Santusthi	Long	Medium	Palmately lobed	Inter-mediate	Medium	Light Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
23.	NDLM-23-4 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
24.	NDLM-23-4 x Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
25.	NDLM-23-5 x Kashi Santusthi	Long	Medium	Cordate	Shallow	Short	Light Yellow	Medium	Creamy	Slightly Elongated	Absent	Non Bitter	Absent	Short	Short	Monocious	Absent
26.	NDLM-23-5 x Punjab Long Melon	Long	Medium	Cordate	Shallow	Short	Light Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
27.	NDLM-23-5 x Kashi Vidhi	Medium	Narrow	Cordate	Shallow	Short	Light Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
28.	NDLM-23-6 x Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
29.	NDLM-23-6 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent

30.	NDLM-23-6 x Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Light Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
31.	NDLM-23-7 x Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Creamy	Slightly Elongated	Absent	Non Bitter	Absent	Long	Short	Monocious	Absent
32.	NDLM-23-7 x Punjab Long Melon	Long	Medium	Palmately lobed	Inter-mediate	Short	Dark Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
33.	NDLM-23-7 x Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Creamy	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
34.	NDLM-23-8 x Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
35.	NDLM-23-8 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
36.	NDLM-23-8 x Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Long	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
37.	NDLM-23-9 x Kashi Santusthi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Long	Light Green	Slightly Elongated	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
38.	NDLM-23-9 x Punjab Long Melon	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent
39.	NDLM-23-9 x Kashi Vidhi	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Long	Short	Monocious	Absent
40.	Thar Sheetal	Long	Broad	Palmately lobed	Inter-mediate	Medium	Dark Yellow	Medium	Light Green	Elongated Curve	Absent	Non Bitter	Present	Short	Short	Monocious	Absent

Cordate, Palmately lobed, Palmately. Genotypes/crosses namely NDLM-23-2, NDLM-23-5, NDLM23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-2 x Kashi Vidhi, NDLM-23-5 x Kashi Santusthi, NDLM-23-5 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi) showed cordate shape, palmately leaf shape was observed in NDLM-23-3, NDLM-237, NDLM-23-3 x Kashi Santusthi, NDLM-23-5 x Kashi Vidhi while other genotype/crosses had shown palmately lobed leaf shape. On the basis of leaf length genotypes/crosses were classified in three grouped viz., short, medium and long. The genotypes NDLM-23-5, NDLM23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi expressed medium leaf blade length and all other genotypes/crosses showed long leaf blade length. The leaf blade width was classified into three stages like narrow, medium and broad. The genotypes NDLM-23-5, NDLM-23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon and NDLM-23-2 x Kashi Vidhi and NDLM-23-5 x Kashi Vidhi exhibited narrow leaf blade length and medium leaf blade length showed by NDLM-23-1, NDLM-23-2, NDLM-234 x Kashi Santusthi, NDLM-23-5 x Punjab Long Melon, NDLM-23-7 x Punjab Long Melon genotypes/crosses and other all genotypes /crosses had shown broad leaf blade width. The genotypes/crosses were also classified three shallow, intermediate and deep on the basis of depth of leaf lobe, narrow depth of leaf lobe expressed by NDLM-23-2, NDLM-23-3, NDLM23-5 NDLM-23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-2 x Kashi Vidhi, NDLM-23-5 x Kashi Santusthi, NDLM-23-5 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi) while other genotypes showed intermediate depth of leaf lobe. On the basis of leaf petiole length were categorized as short, medium and long, short petiole length exhibited by NDLM-23-2, NDLM-23-3, NDLM-23-5, NDLM-23-5, NDLM-23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-2 x Kashi Vidhi, NDLM-23-5 x Kashi Santusthi, NDLM-23-5 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi, NDLM-23-7 x Punjab Long Melon) and other genotypes/crosses observed as medium petiole length.

4.6.2 Flower characters

The states of expression of a particular trait along with example genotypes of long melon are presented in Table 4.6.1 In the present study all the genotypes/crosses were observed monoecious sex expression with fertile pollens. The male sterility was found absent in all the genotypes/crosses. In case of the flower observations NDLM-23-1, NDLM-23-4, NDLM-235, NDLM-23-6, Kashi Vidhi, NDLM-23-1 x Kashi Vidhi, NDLM-23-2 x Kashi Vidhi, NDLM23-4 x Kashi Santusthi, NDLM-23-4 x Kashi Vidhi, NDLM-

23-5 x Kashi Santusthi, NDLM23-5 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi, NDLM-23-6 x Kashi Santusthi, NDLM-23-6 x Punjab Long Melon, NDLM-23-6 x Kashi Vidhi was observed light yellow flower colour and other genotypes flowers were dark yellow.

4.6.3 Fruit characters

In the genotypes/crosses observation the ovary length was studied based on three length ranges *viz.*, short, medium and long. The genotypes NDLM-23-1, NDLM-23-2, NDLM-23-3, NDLM-23-4, NDLM-23-6, NDLM-23-15, NDLM-23-8, NDLM-23-1 x Punjab Long Melon, NDLM-23-1 x Kashi Vidhi, NDLM-23-2 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-3 x Kashi Santusthi, NDLM-23-6 x Kashi Santusthi, NDLM-23-2 x Punjab Long Melon, NDLM-23-1 x Kashi Vidhi, NDLM-23-8 x Kashi Santusthi, NDLM-23-1 x Kashi Vidhi, NDLM-23-9 x Kashi Santusthi had long ovary length and others genotypes/crosses had medium ovary length. In the case of morphological characters of fruit, fruit strips were absent, fruit taste was non-bitter and fruit creasing was present in all the genotypes/crosses except NDLM-23-5, NDLM-23-7, NDLM-23-5 x Kashi Santusthi, NDLM-23-7 x Kashi Santusthi. Fruits were found creamy in colour (NDLM-23-2, NDLM-23-5, NDLM-23-7, NDLM-23-2 x Kashi Santusthi, NDLM-23-5 x Kashi Santusthi, NDLM-23-7 x Kashi Santusthi) and dark green (NDLM-23-3, NDLM-23-3 x Kashi Santusthi, NDLM-23-3 x Punjab Long Melon) and other genotypes/crosses had medium light green fruit colour. Fruit shape was expressed in three groups *viz.*: Slightly elongated and elongated curve. The maximum genotypes had Elongated Curve fruit shape except slightly elongated NDLM-23-3, NDLM-23-5, NDLM-23-1 x Kashi Santusthi, NDLM-23-4 x Kashi Santusthi, NDLM-23-5 x Kashi Santusthi, NDLM-23-5 x Punjab Long Melon, NDLM-23-7 x Kashi Santusthi, NDLM-23-7 x Punjab Long Melon, NDLM-23-8 x Punjab Long Melon, NDLM-23-9 x Kashi Santusthi.

4.6.4. Seed characters

The seed length and seed width were expressed as short and long. All the genotypes/crosses were short in width and also in case of seed length, had short length except (NDLM-23-8, Punjab Long Melon, Vidhi, NDLM-23-3 x Kashi Vidhi, NDLM-23-5 x Punjab Long Melon, NDLM-23-5 x Kashi Vidhi, NDLM-23-7 x Kashi Santusthi, NDLM-23-8 x Kashi Vidhi, NDLM-23-9 x Kashi Vidhi) had long seed length.

The studies of Yousif *et al.* 2022, Merheb *et al.* 2020, Omari *et al.* 2018, Ali-Shtayeh *et al.* 2015, Ajuru *et al.* 2013 also described the variability in long melon in respect of morphological, yield and yield contributing traits. It was further proposed that the characterization of germplasm based on economically significant traits would contribute to the effective quantification and systematic organization of genetic diversity. Earlier morphological characterization of tomato (Athinodorou *et al.*, 2021), Pea tomato (Salim *et al.*, 2020), cow pea (Rambabu *et al.*, 2017), (Singh *et al.*, 2014) has been done for their application for distinctness, uniformity and stability testing.

SUMMARY AND CONCLUSIONS

The present research work entitled “**Genetic analysis for yield and its components in Long melon (*Cucumis melo* var. *utilissimus*)**” was conducted during *Summer* seasons of 2024 (Y₁) and 2025 (Y₂) at the Main Experiment Station (MES) of the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) India.

The present experiments were conducted in a Randomized Block Design (RBD) with three replications to appraise the performance of 27 F₁ hybrids and their 12 parents (9 lines and 3 testers). The crop was sown in rows spaced at 3 meters apart with a plant-to-plant spacing of 0.50 meter. Sowing was done on 12 February, 2024 and 10 February 2025. All the recommended agronomic package of practices and protection measures were followed to raise good crops.

The experimental materials for the present investigation comprised of nine promising and diverse pure lines/varieties with three testers of long melon selected on the basis of genetic variability from the germplasm stock maintained in the Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) India. The selected parental lines *i.e* NDLM-23-1 (L1), NDLM-23-2 (L2), NDLM-23-3 (L3), NDLM-23-4 (L4), NDLM-23-5 (L5), NDLM-23-6 (L6), NDLM-23-7 (L7), NDLM-23-8 (L8), NDLM-23-9 (L9) and testers Kashi Santusthi (T1), Punjab Long Melon (T2) and Kashi Vidhi (T3) were crossed in the all possible combination to get 27 F₁ seed for the study of genetic variance, combining ability effects, heterobeltiosis and relative heterosis among F₁'s and parents for fruit yield and quality attributing traits.

The data were recorded on fifteen quantitative and seven qualitative traits *viz.*, days to first male flowering, days to first female flower appearing, days to 50 % flowering, node number to first male flower appears, node number to first female flower appears, days to first fruit harvest, number of primary branches per plant, fruit length (cm), fruit breadth (cm), vine length (m), number of fruits per plant, average fruit weight (g), number of seeds per fruits, fruit yield per plant (kg), fruit yield (q/ha) and quality/biochemical traits namely Total Soluble Solids (%), dry matter (%), ascorbic acid

Summary and conclusion

(mg/100g fresh fruit), reducing Sugar (%), non-reducing sugar (%), total sugar (%), total carotenoid content ($\mu\text{g}/100\text{mg}$). The analysis of variance revealed that mean squares due to genotypes were found significant for all the traits in the both seasons (Y_1 , Y_2) and (Pooled) except.

1. The proportional contribution of lines in pooled varied from 54.15 per cent (non-reducing sugar) to 90.06 per cent (node number to first male flower appears). The maximum five contributions of lines were observed for node number to first male flower appears (90.06 %), days to first harvestining (89.61%), days to 50 % flowering (89.51%), number of seeds per fruit (87.35%), days to first female flower appears (86.83%).
2. The proportional contribution of testers towards the variability for different characters in pooled ranged from 0.01 per cent (node number to first female flower appears) to 4.64 per cent (number of fruits per plants). The maximum five contribution of tester were observed for the number of fruits per plants (4.64%), days to first female flower appears (3.68%), ascorbic acid (%), fruit yield per plant (3.48%) and fruit breadth (3.17%).
3. In pooled proportional contribution of line x testers for different traits varied from 7.73 per cent (days to 50 % flowering) to 44.27 per cent (non-reducing sugar). The maximum five contribution of lines $\times$ testers were observed for non-reducing sugar (44.27%), node number to first female flowering (18.6%), total sugar (18.14%), total soluble solids (17.47%), and average fruit weight (17.35%).
4. In case of pooled, estimates of sca variance (σ^2_s) were higher than gca variances (σ^2_g) for all the characters except days to days to 50 % female flowering.
5. The value of average degree of dominance were more than unity (1) for all the characters except days to first harvesting, node number to first male flower appears and days to 50 % female flowering.
6. The magnitude of over dominance was highest for non-reducing sugar (4.52), node number to first female flower appears (1.85), total sugars (1.83), average fruit weight (1.74), total soluble solids (1.74), number of primary branches per plant (1.68), fruit yield per hectare (1.65), fruit length (1.64), fruit yield per plant (1.6), dry matter (1.59),), number of fruits per plant (1.56), fruit breadth (1.55),

vine length (1.49), total carotenoid content (1.47), ascorbic acid (1.45), days to first male flowering (1.43), reducing sugars (1.37), number of seeds per fruits (1.27), node number to first male flower appears (1.06), days to first harvesting (0.98), days to first female flowering (0.91) and days to 50 % flowering (0.9).

7. The general predictability ratio was less than one for all the characters. Additive variance (σ^2A) was lower than dominant variance (σ^2D) for the all characters.
8. Analysis of variances for combining ability revealed that the partitioning of variances due to lines, tester and lines $\times$ testers showed highly significant differences for all twenty-two characters in both Y1, Y2 and pooled.
9. The parents NDLM-23-8, NDLM-23-6, NDLM-23-3 and Kashi Vidhi exhibited significant and positive gca effects for growth, yield and quality traits. NDLM-23-2, NDLM-23-5, NDLM-23-1 and NDLM-23-7 exhibited significant and positive gca effects for ascorbic acid content in both the seasons and over seasons (pooled).
10. NDLM-28-8 and NDLM-28-6 exhibited significant and negative gca effects for the earliness characters viz., days to first male flowering, days to first female flowering, days to first harvesting, node number at first male flower appears, node number to first female flower appears and days to 50 % flowering in both the seasons.
11. Out of 27 crosses the best five cross combinations were NDLM-23-8 $\times$ Kasi Vidhi, NDLM-23-8 $\times$ Punjab Long Melon, NDLM-23-6 $\times$ Punjab Long Melon, NDLM-23-1 $\times$ Kashi Santusthi, NDLM-23-3 $\times$ Kashi Santusthi and NDLM-23-9 $\times$ Kasi Vidhi was found specific combiner in both the seasons.
12. A wide range of variation in the estimates of heterobeltiosis and relative heterosis in positive and negative direction were observed for all the traits studied. Among 27 cross combinations, best crosses based on positive heterosis and negative heterosis over better parent were NDLM-23-8 $\times$ Kashi Vidhi followed by NDLM-23-3 $\times$ Kashi Santusthi, NDLM-23-6 $\times$ Kashi Vidhi, NDLM-23-6 $\times$ Punjab Long Melon and NDLM-23-8 $\times$ Punjab Long Melon for most of the characters whereas, based on positive and negative heterosis over mid parent best crosses NDLM-23-8

Summary and conclusion

× Kashi Vidhi, NDLM-23-8 × Punjab Long Melon, NDLM-23-6 × Punjab Long Melon, NDLM-23-6 × Kashi Santusthi for all the characters.

13. Selecting long melon based on morphological traits like fruit shape, size and texture enhances the effectiveness of hybridization. These visible differences reflect genetic variation and support efficient hybrid development, leading to improved varieties with better yield, resistance, and adaptability for future crop improvement programs.

Based on the above findings it might be concluded that the genetic variance showed the non-additive genetic variance was dominant for maximum characters which shows that hybrid breeding will be more beneficial. Parents NDLM-23-8, NDLM-23-6, NDLM-23-3 and Kashi Vidhi was found good general combiner for growth, yield and quality traits.

Hybrids NDLM-23-8 × Kasi Vidhi, NDLM-23-8 × Punjab Long Melon, NDLM-23-6 × Punjab Long Melon, NDLM-23-1 × Kashi Santusthi, NDLM-23-3 × Kashi Santusthi and NDLM-23-9 × Kasi Vidhi was found good specific combiner. Crosses NDLM-23-8 × Kasi Vidhi, NDLM-23-8 × Punjab Long Melon, NDLM-23-6 × Punjab Long Melon, NDLM-23-6 × Kashi Vidhi, NDLM-23-6 × Kashi Santusthi and NDLM-23-3 × Kashi Santusthi was found best crosses on the basis of heterosis. Preponderance of dominant genetic variance along with over dominance in the parents for most of the traits suggests that heterosis breeding approach might be more rewarding than selection in long melon.

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APPENDICES

Mean performance, general mean, range, coefficient of variation, critical difference and standard error for twenty-two characters of line $\times$ tester set of 27 F_1 's and their 12 parents in long melon over two years (Y_1 , Y_2) and pooled

S. No.	Parent/ Hybrids	Days to first male flowering			Days to first female flowering			Days to first harvesting			Node number at which first male flower appears			Node number at which first female flower appears			Days to 50 % female flowering		
		2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled
Parents																			
1	NDLM-23-1	37.10	38.12	37.61	41.10	42.12	41.61	47.12	47.00	47.06	3.78	3.70	3.74	6.50	6.53	6.51	44.99	49.02	47.00
2	NDLM-23-2	37.64	38.65	38.15	41.94	42.96	42.45	48.00	47.26	47.63	4.26	4.27	4.27	5.72	5.74	5.73	45.30	49.70	47.50
3	NDLM-23-3	36.46	38.66	37.56	39.60	42.42	41.01	46.16	45.08	45.62	3.53	3.55	3.54	4.77	4.79	4.78	43.10	48.39	45.75
4	NDLM-23-4	36.96	40.39	38.67	40.42	43.22	41.83	46.50	46.42	46.46	3.67	3.92	3.79	6.46	6.47	6.46	44.40	49.00	46.70
5	NDLM-23-5	37.85	38.87	38.36	42.10	43.89	43.00	49.10	48.66	48.88	4.53	4.62	4.57	6.93	6.95	6.94	47.70	50.47	49.09
6	NDLM-23-6	36.02	35.52	35.77	39.62	38.03	38.83	45.67	40.93	43.30	3.20	3.16	3.18	4.15	4.10	4.12	42.90	44.36	43.63
7	NDLM-23-7	37.87	38.55	38.21	41.37	41.04	41.21	46.87	45.70	46.29	3.66	3.67	3.67	6.44	6.45	6.44	43.72	49.82	46.77
8	NDLM-23-8	35.88	33.67	34.78	40.37	37.71	39.04	45.47	40.76	43.11	3.05	3.01	3.03	3.75	3.70	3.72	42.80	44.23	43.51
9	NDLM-23-9	36.80	37.83	37.32	40.29	41.04	40.67	46.40	45.50	45.95	3.64	3.68	3.66	5.06	5.08	5.07	43.53	48.77	46.15
10	Kashi Santusthi	36.83	37.94	37.38	40.32	43.46	41.89	46.35	45.65	46.00	3.66	3.44	3.55	5.20	5.22	5.21	43.70	48.84	46.27
11	Punjab Long Melon	35.98	35.53	35.76	40.49	38.47	39.48	45.50	41.02	43.26	3.11	3.08	3.10	4.06	4.03	4.04	42.88	44.35	43.61
12	Kashi Vidhi	36.27	35.89	36.08	39.72	39.11	39.42	47.14	41.07	44.10	3.38	3.26	3.32	4.66	4.64	4.65	43.05	44.76	43.91

	Mean	36.81	37.47	37.14	40.61	41.12	40.87	46.69	44.59	45.64	3.62	3.61	3.62	5.31	5.31	5.31	44.00	47.64	45.82
	Min	35.88	33.67	34.78	39.60	37.71	38.83	45.47	40.76	43.11	3.05	3.01	3.03	3.75	3.70	3.72	42.80	44.23	43.51
	Max	37.87	40.39	38.67	42.10	43.89	43.00	49.10	48.66	48.88	4.53	4.62	4.57	6.93	6.95	6.94	47.70	50.47	49.09
Hybrids																			
1	L1xT1	36.34	37.36	36.85	40.07	42.97	41.52	46.14	45.00	45.57	3.44	3.47	3.45	4.77	4.79	4.78	43.04	49.17	46.11
2	L1xT2	37.02	39.27	38.15	40.92	42.96	41.94	47.07	46.50	46.79	3.73	3.75	3.74	5.48	5.50	5.49	44.55	48.83	46.69
3	L1xT3	36.79	39.24	38.02	40.27	42.22	41.25	47.04	45.40	46.22	3.61	3.64	3.62	5.03	5.06	5.04	43.49	48.53	46.01
4	L2xT1	37.90	38.92	38.41	42.17	44.64	43.41	48.27	49.04	48.65	4.60	4.63	4.62	6.95	6.98	6.97	49.10	51.70	50.40
5	L2xT2	37.86	38.87	38.37	42.00	43.03	42.52	48.12	48.60	48.36	4.57	4.61	4.59	6.80	6.84	6.82	47.59	51.21	49.40
6	L2xT3	37.69	38.72	38.21	41.94	43.49	42.72	48.03	47.30	47.67	4.43	4.47	4.45	6.72	6.74	6.73	45.32	49.34	47.33
7	L3xT1	33.73	31.71	32.72	40.45	36.02	38.24	45.43	41.10	43.27	2.86	2.82	2.84	3.33	3.30	3.31	42.22	43.40	42.81
8	L3xT2	33.84	33.15	33.50	39.87	38.57	39.22	45.73	43.47	44.60	2.89	2.85	2.87	3.34	3.31	3.33	42.22	45.78	44.00
9	L3xT3	36.00	36.33	36.17	38.50	38.85	38.68	46.02	43.10	44.56	3.17	3.15	3.16	4.10	4.08	4.09	42.90	44.67	43.78
10	L4xT1	37.11	38.80	37.95	41.52	42.53	42.03	47.62	46.95	47.28	3.94	3.95	3.95	5.63	5.65	5.64	45.00	49.77	47.39
11	L4xT2	36.23	38.29	37.26	39.69	41.99	40.85	47.21	45.01	46.11	3.35	3.38	3.37	4.52	4.55	4.53	43.00	48.31	45.66
12	L4xT3	36.34	39.03	37.69	40.00	42.24	41.12	46.50	45.90	46.21	3.41	3.44	3.42	5.70	5.72	5.71	43.04	48.79	45.92
13	L5xT1	37.33	38.36	37.85	41.90	42.00	41.95	48.02	47.26	47.64	4.20	4.23	4.21	4.67	4.69	4.68	45.30	49.07	47.18
14	L5xT2	37.12	38.13	37.63	41.57	43.81	42.69	47.59	47.02	47.31	4.04	4.08	4.06	5.66	5.68	5.67	45.05	49.27	47.16
15	L5xT3	37.70	38.68	38.19	42.00	43.00	42.50	48.11	47.42	47.77	4.44	4.46	4.45	6.77	6.79	6.78	45.40	49.14	47.27

16	L6xT1	35.86	33.84	34.85	40.36	37.69	39.03	45.45	40.38	42.91	3.03	3.00	3.02	3.67	3.64	3.65	42.42	42.81	42.62
17	L6xT2	33.20	31.66	32.43	39.34	36.90	38.12	44.18	40.10	42.14	2.78	2.77	2.77	3.24	3.22	3.23	42.13	42.43	42.28
18	L6xT3	33.57	33.88	33.73	38.82	37.03	37.93	44.50	40.17	42.34	2.75	2.70	2.73	3.90	3.87	3.89	42.16	43.62	42.89
19	L7xT1	36.70	37.73	37.22	40.23	41.24	40.74	46.30	45.10	45.70	3.57	3.60	3.59	4.85	4.87	4.86	43.12	48.03	45.57
20	L7xT2	37.07	37.79	37.43	41.54	41.40	41.47	47.05	46.90	46.98	3.75	3.57	3.66	5.48	5.50	5.49	44.95	49.32	47.14
21	L7xT3	35.94	36.95	36.45	39.45	41.86	40.66	45.50	44.90	45.20	3.08	3.09	3.08	3.99	4.00	3.99	42.87	47.36	45.12
22	L8xT1	34.00	34.02	34.01	39.94	38.74	39.34	46.16	40.30	43.23	3.02	2.94	2.98	3.36	3.33	3.35	42.30	43.84	43.07
23	L8xT2	33.43	31.54	32.49	39.33	37.01	38.17	44.08	40.17	42.12	2.79	2.74	2.76	3.26	3.23	3.25	42.13	42.15	42.14
24	L8xT3	32.80	32.78	32.79	36.10	35.45	35.78	42.12	38.00	40.06	2.76	2.70	2.73	3.22	3.19	3.21	42.00	40.50	41.25
25	L9xT1	37.00	39.04	38.02	40.85	42.67	41.76	46.80	46.51	46.66	3.66	3.74	3.70	5.47	5.50	5.49	44.50	49.10	46.80
26	L9xT2	36.75	37.76	37.26	39.44	41.36	40.40	46.31	45.35	45.83	3.59	3.60	3.59	5.00	5.02	5.01	43.40	48.41	45.90
27	L9xT3	35.65	35.49	35.57	39.97	39.46	39.71	44.36	44.35	44.36	3.03	3.01	3.02	3.50	3.48	3.49	42.41	46.81	44.61
	Mean	35.96	36.57	36.27	40.30	40.71	40.51	46.29	44.49	45.39	3.50	3.50	3.50	4.76	4.76	4.76	43.76	47.09	45.43
	Min	32.80	31.54	32.43	36.10	35.45	35.78	42.12	38.00	40.06	2.75	2.70	2.73	3.22	3.19	3.21	42.00	40.50	41.25
	Max	37.90	39.27	38.41	42.17	44.64	43.41	48.27	49.04	48.65	4.60	4.63	4.62	6.95	6.98	6.97	49.10	51.70	50.40
1	Thar Sheetal	33.92	32.91	33.42	38.22	37.21	37.72	45.22	40.22	42.72	3.00	2.97	2.99	3.36	3.33	3.34	42.28	43.52	42.90
	SE(d) $\pm$	0.67	0.71	0.45	0.79	0.83	0.64	0.82	0.78	0.58	0.11	0.18	0.10	0.11	0.25	0.13	0.89	0.78	0.58
	C.D.at 5%	1.35	1.41	0.89	1.57	1.65	1.28	1.64	1.55	1.15	0.21	0.36	0.20	0.22	0.49	0.26	1.78	1.55	1.17
	C.V. (%)	2.28	2.36	1.50	2.39	2.48	1.93	2.17	2.14	1.55	3.70	6.24	3.53	2.70	6.16	3.29	2.49	2.02	1.57

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S. No.	Parent/ Hybrids	Number of primary branches per plant			Fruit length (cm)			Fruit breath (cm)			Vine length (m)			Number of fruits per plant			Average fruit weight (g)		
		2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled
Parents																			
1	NDLM-23-1	5.38	4.36	4.87	17.96	16.92	17.44	2.17	2.16	2.16	1.55	1.53	1.54	16.62	15.60	16.11	79.67	78.66	79.16
2	NDLM-23-2	5.22	4.26	4.74	16.66	15.63	16.14	2.10	2.09	2.10	1.34	1.31	1.32	16.30	15.27	15.78	79.35	78.33	78.84
3	NDLM-23-3	5.57	4.58	5.08	23.02	22.00	22.51	2.55	2.53	2.54	1.90	1.88	1.89	21.22	20.21	20.71	89.10	88.05	88.58
4	NDLM-23-4	5.42	4.46	4.94	18.15	17.12	17.64	2.30	2.28	2.29	1.62	1.60	1.61	17.40	16.40	16.90	80.04	79.00	79.52
5	NDLM-23-5	4.42	4.40	4.41	16.00	15.02	15.51	2.00	2.01	2.01	1.25	1.23	1.24	15.00	14.02	14.51	79.00	78.02	78.51
6	NDLM-23-6	5.66	6.62	6.14	26.04	27.03	26.54	2.67	2.70	2.69	2.30	2.33	2.32	24.30	26.29	25.29	93.10	93.12	93.11
7	NDLM-23-7	5.47	4.46	4.96	20.23	19.22	19.72	2.33	2.30	2.31	1.66	1.63	1.64	19.07	18.05	18.56	80.10	79.04	79.57
8	NDLM-23-8	5.92	6.90	6.41	30.30	34.29	32.29	2.80	2.83	2.81	2.42	2.46	2.44	25.00	27.07	26.04	99.52	99.55	99.54
9	NDLM-23-9	5.50	4.53	5.01	20.90	19.87	20.38	2.50	2.47	2.48	1.76	1.74	1.75	20.01	19.00	19.51	85.60	84.54	85.07
10	Kashi Santusthi	5.49	4.56	5.02	20.86	19.82	20.34	2.49	2.45	2.47	1.70	1.68	1.69	19.57	18.54	19.05	85.60	84.55	85.07
11	Punjab Long Melon	5.77	6.65	6.21	26.35	27.37	26.86	2.78	2.82	2.80	2.33	2.37	2.35	24.84	26.80	25.82	95.10	95.80	95.45
12	Kashi Vidhi	5.60	6.54	6.07	25.00	26.02	25.51	2.60	2.62	2.61	2.20	2.25	2.23	23.00	25.02	24.01	90.15	90.20	90.18
	Mean	5.45	5.19	5.32	21.79	21.69	21.74	2.44	2.44	2.44	1.84	1.83	1.84	20.19	20.19	20.19	86.36	85.74	86.05
	Min	4.42	4.26	4.41	16.00	15.02	15.51	2.00	2.01	2.01	1.25	1.23	1.24	15.00	14.02	14.51	79.00	78.02	78.51

	Max	5.92	6.90	6.41	30.30	34.29	32.29	2.80	2.83	2.81	2.42	2.46	2.44	25.00	27.07	26.04	99.52	99.55	99.54
Hybrids																			
1	L1xT1	5.58	4.59	5.09	23.10	22.07	22.58	2.55	2.53	2.54	2.00	1.94	1.97	22.78	21.75	22.27	89.16	88.20	88.68
2	L1xT2	5.40	4.46	4.93	18.11	17.08	17.59	2.20	2.24	2.22	1.60	1.56	1.58	16.99	15.93	16.46	80.00	79.02	79.51
3	L1xT3	5.53	4.59	5.06	22.00	21.04	21.52	2.50	2.48	2.49	1.78	1.76	1.77	20.50	19.52	20.01	85.65	84.64	85.15
4	L2xT1	4.90	4.00	4.45	16.00	15.04	15.52	2.00	2.03	2.02	1.18	1.15	1.17	15.00	14.55	14.78	79.09	78.03	78.56
5	L2xT2	4.20	3.09	3.64	16.09	15.10	15.59	2.05	2.03	2.04	1.27	1.24	1.25	16.00	15.32	15.66	79.09	78.04	78.57
6	L2xT3	5.20	4.29	4.75	16.60	15.59	16.10	2.10	2.08	2.09	1.32	1.30	1.31	16.13	15.15	15.64	79.13	78.10	78.62
7	L3xT1	6.30	6.39	6.35	34.05	35.10	34.57	2.90	2.96	2.93	2.54	2.60	2.57	26.13	28.10	27.11	110.05	110.10	110.08
8	L3xT2	6.24	6.29	6.27	34.00	35.05	34.53	2.89	2.90	2.90	2.53	2.55	2.54	26.10	28.06	27.08	105.80	105.84	105.82
9	L3xT3	5.77	6.00	5.88	26.29	27.30	26.80	2.70	2.74	2.72	2.31	2.35	2.33	24.32	27.30	25.81	93.11	93.15	93.13
10	L4xT1	5.38	5.30	5.34	17.90	16.93	17.41	2.14	2.12	2.13	1.47	1.45	1.46	16.43	15.44	15.93	79.65	78.64	79.14
11	L4xT2	5.60	4.79	5.20	25.30	24.34	24.82	2.62	2.60	2.61	2.24	2.21	2.22	23.11	22.10	22.61	90.63	89.60	90.12
12	L4xT3	5.58	4.89	5.23	23.37	22.34	22.85	2.60	2.57	2.58	2.09	2.06	2.08	22.89	21.93	22.41	90.05	89.01	89.53
13	L5xT1	5.29	5.20	5.25	17.00	16.03	16.52	2.13	2.10	2.12	1.37	1.34	1.35	16.30	15.31	15.80	79.43	78.40	78.91
14	L5xT2	5.35	5.25	5.30	17.55	16.52	17.04	2.14	2.12	2.13	1.40	1.38	1.39	16.36	15.37	15.87	79.43	78.38	78.90
15	L5xT3	5.17	4.56	4.86	16.07	16.03	16.05	2.07	2.04	2.05	1.30	1.28	1.29	16.05	15.01	15.53	79.10	78.09	78.59
16	L6xT1	5.97	6.01	5.99	33.32	34.32	33.82	2.85	2.90	2.87	2.46	2.49	2.47	26.17	28.19	27.18	100.55	100.60	100.57
17	L6xT2	7.05	7.52	7.28	37.89	38.90	38.39	3.03	3.07	3.05	2.76	2.80	2.78	30.30	32.28	31.29	112.50	112.54	112.52

18	L6xT3	6.54	6.68	6.61	37.40	38.44	37.92	3.00	3.03	3.01	2.60	2.64	2.62	30.10	32.09	31.09	110.78	110.84	110.81
19	L7xT1	5.55	4.52	5.04	22.55	21.52	22.03	2.54	2.53	2.53	1.89	1.87	1.88	21.09	20.10	20.59	88.50	87.51	88.00
20	L7xT2	5.40	5.20	5.30	18.11	17.10	17.61	2.18	2.15	2.17	1.56	1.54	1.55	16.62	15.57	16.09	79.87	78.84	79.35
21	L7xT3	5.77	5.70	5.74	30.03	29.00	29.52	2.78	2.75	2.76	2.35	2.30	2.33	24.87	23.88	24.38	95.30	94.30	94.80
22	L8xT1	6.12	6.20	6.16	33.70	34.73	34.21	2.88	2.90	2.89	2.50	2.53	2.51	25.77	27.71	26.74	105.72	105.79	105.75
23	L8xT2	6.55	7.00	6.77	37.82	38.98	38.40	3.00	3.03	3.02	2.74	2.78	2.76	30.29	32.20	31.24	110.99	111.01	111.00
24	L8xT3	7.36	8.00	7.68	38.00	39.05	38.53	3.09	3.10	3.10	2.78	2.83	2.80	30.35	32.40	31.37	115.10	115.15	115.12
25	L9xT1	5.42	4.40	4.91	18.12	17.10	17.61	2.28	2.25	2.27	1.62	1.60	1.61	17.20	16.15	16.68	80.00	79.10	79.55
26	L9xT2	5.44	4.50	4.97	22.34	21.32	21.83	2.52	2.50	2.51	1.80	1.77	1.78	20.55	19.50	20.02	88.29	87.20	87.75
27	L9xT3	6.00	6.20	6.10	34.70	35.70	35.20	2.85	2.86	2.85	2.47	2.50	2.48	26.67	28.61	27.64	105.40	105.44	105.42
	Mean	5.73	5.39	5.56	25.46	25.25	25.35	2.54	2.54	2.54	2.00	1.99	1.99	22.04	22.20	22.12	92.31	91.69	92.00
	Min	4.20	3.09	3.64	16.00	15.04	15.52	2.00	2.03	2.02	1.18	1.15	1.17	15.00	14.55	14.78	79.09	78.03	78.56
	Max	7.36	8.00	7.68	38.00	39.05	38.53	3.09	3.10	3.10	2.78	2.83	2.80	30.35	32.40	31.37	115.10	115.15	115.12
1	Thar Sheetal	6.19	6.89	6.54	33.77	34.82	34.30	2.88	2.91	2.89	2.52	2.54	2.53	26.01	28.00	27.00	105.74	105.79	105.77
	SE(d) $\pm$	0.28	0.12	0.15	0.61	1.29	0.66	0.05	0.12	0.06	0.03	0.10	0.05	0.47	1.01	0.58	2.16	3.96	2.21
	C.D.at 5%	0.55	0.24	0.30	1.21	2.57	1.31	0.10	0.24	0.13	0.07	0.20	0.10	0.93	2.01	1.16	4.31	7.90	4.40
	C.V. (%)	5.99	2.75	3.35	3.02	6.46	3.30	2.50	5.72	3.09	2.07	6.30	3.27	2.65	5.67	3.30	2.91	5.38	2.98

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S. No.	Parent/ Hybrids	No. of seeds per fruit			Total soluble solids (%)			Dry matter (%)			Ascorbic acid (mg/100mg)			Reducing sugar (%)		
		2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled
Parents																
1	NDLM-23-1	200.00	199.00	199.50	3.49	3.46	3.48	4.11	4.09	4.10	1.63	1.65	1.64	1.42	1.40	1.41
2	NDLM-23-2	180.00	183.00	181.50	3.28	3.26	3.27	4.06	4.03	4.04	1.66	1.67	1.67	1.25	1.22	1.23
3	NDLM-23-3	420.00	423.00	421.50	4.04	4.02	4.03	4.22	4.19	4.21	1.45	1.48	1.46	2.18	2.17	2.18
4	NDLM-23-4	350.00	355.00	352.50	3.53	3.52	3.52	4.15	4.10	4.12	1.60	1.62	1.61	1.91	1.88	1.90
5	NDLM-23-5	170.00	177.00	173.50	3.18	3.16	3.17	4.00	3.92	3.96	1.80	1.85	1.82	1.05	1.04	1.05
6	NDLM-23-6	466.00	469.00	467.50	4.21	4.24	4.23	4.69	4.72	4.70	1.30	1.28	1.29	2.30	2.34	2.32
7	NDLM-23-7	357.00	360.00	358.50	3.55	3.50	3.52	4.16	4.12	4.14	1.57	1.60	1.58	1.99	1.94	1.97
8	NDLM-23-8	500.00	501.00	500.50	4.34	4.35	4.35	5.00	5.07	5.03	1.24	1.23	1.24	2.40	2.44	2.42
9	NDLM-23-9	392.00	400.00	396.00	3.59	3.55	3.57	4.19	4.18	4.19	1.54	1.56	1.55	2.10	2.06	2.08
10	Kashi Santusthi	390.00	392.00	391.00	3.56	3.52	3.54	4.18	4.15	4.17	1.55	1.58	1.57	2.02	2.00	2.01
11	Punjab Long Melon	400.00	403.00	401.50	4.30	4.33	4.31	4.79	4.84	4.81	1.27	1.26	1.27	2.33	2.66	2.50
12	Kashi Vidhi	423.00	425.00	424.00	4.14	4.17	4.16	4.51	4.55	4.53	1.37	1.35	1.36	2.23	2.24	2.24
	Mean	354.00	357.25	355.63	3.77	3.76	3.76	4.34	4.33	4.33	1.50	1.51	1.50	1.93	1.95	1.94
	Min	170.00	177.00	173.50	3.18	3.16	3.17	4.00	3.92	3.96	1.24	1.23	1.24	1.05	1.04	1.05
	Max	500.00	501.00	500.50	4.34	4.35	4.35	5.00	5.07	5.03	1.80	1.85	1.82	2.40	2.66	2.50

Hybrids																
1	L1xT1	431.00	435.00	433.00	4.09	4.08	4.08	4.38	4.38	4.38	1.44	1.46	1.45	2.19	2.16	2.18
2	L1xT2	307.00	310.00	308.50	3.50	3.48	3.49	4.12	4.10	4.11	1.61	1.63	1.62	1.78	1.75	1.76
3	L1xT3	401.00	400.00	400.50	4.00	3.06	3.53	4.19	4.15	4.17	1.51	1.52	1.51	2.11	2.07	2.09
4	L2xT1	168.00	166.00	167.00	3.10	3.06	3.08	4.00	3.98	3.99	1.84	1.86	1.85	1.01	1.00	1.00
5	L2xT2	175.00	177.00	176.00	3.19	3.16	3.18	4.02	4.00	4.01	1.79	1.80	1.79	1.07	1.04	1.06
6	L2xT3	178.00	180.00	179.00	3.25	3.23	3.24	4.06	4.03	4.04	1.67	1.70	1.68	1.15	1.14	1.14
7	L3xT1	525.00	520.00	522.50	4.45	4.46	4.46	5.58	5.62	5.60	1.13	1.12	1.13	2.60	2.65	2.63
8	L3xT2	505.00	508.00	506.50	4.44	4.48	4.46	5.47	5.50	5.48	1.18	1.16	1.17	2.58	2.60	2.59
9	L3xT3	499.00	500.00	499.50	4.24	4.27	4.26	4.74	4.77	4.75	1.29	1.26	1.27	2.31	2.33	2.32
10	L4xT1	182.00	184.00	183.00	3.47	3.46	3.46	4.10	4.07	4.08	1.63	1.65	1.64	1.41	1.39	1.40
11	L4xT2	452.00	450.00	451.00	4.17	4.15	4.16	4.57	4.54	4.55	1.36	1.38	1.37	2.26	2.25	2.26
12	L4xT3	366.00	364.00	365.00	4.11	4.07	4.09	4.49	4.48	4.48	1.38	1.39	1.38	2.20	2.16	2.18
13	L5xT1	181.00	184.00	182.50	3.29	3.26	3.27	4.08	4.05	4.07	1.65	1.66	1.65	1.30	1.28	1.29
14	L5xT2	182.00	184.00	183.00	3.30	3.28	3.29	4.09	4.07	4.08	1.64	1.66	1.65	1.32	1.30	1.31
15	L5xT3	175.00	170.00	172.50	3.24	3.20	3.22	4.05	4.02	4.03	1.74	1.75	1.74	1.11	1.08	1.10
16	L6xT1	551.00	549.00	550.00	4.38	4.49	4.43	5.11	5.14	5.12	1.22	1.20	1.21	2.42	2.45	2.44
17	L6xT2	599.00	498.00	548.50	4.52	4.58	4.55	5.92	5.94	5.93	1.08	1.07	1.07	2.72	2.76	2.74
18	L6xT3	540.00	542.00	541.00	4.50	4.52	4.51	5.62	5.66	5.64	1.11	1.07	1.09	2.64	2.67	2.66

19	L7xT1	315.00	300.00	307.50	4.40	4.00	4.20	4.21	4.18	4.20	1.48	1.50	1.49	2.16	2.15	2.16
20	L7xT2	350.00	352.00	351.00	3.49	3.46	3.47	4.11	4.10	4.11	1.62	1.63	1.62	1.70	1.67	1.68
21	L7xT3	455.00	457.00	456.00	4.30	4.26	4.28	4.88	4.86	4.87	1.26	1.29	1.27	2.35	2.30	2.33
22	L8xT1	570.00	573.00	571.50	4.41	4.43	4.42	5.20	5.29	5.24	1.20	1.18	1.19	2.52	2.54	2.53
23	L8xT2	579.00	580.00	579.50	4.52	4.54	4.53	5.89	5.79	5.84	1.09	1.05	1.07	2.67	2.70	2.69
24	L8xT3	600.00	599.00	599.50	4.97	5.01	4.99	5.99	6.01	6.00	1.06	1.02	1.04	2.78	2.80	2.79
25	L9xT1	310.00	300.00	305.00	3.51	3.50	3.50	4.13	4.10	4.11	1.60	1.62	1.61	1.81	1.76	1.78
26	L9xT2	313.00	310.00	311.50	4.01	3.91	3.96	4.20	4.19	4.19	1.50	1.53	1.51	2.13	2.11	2.12
27	L9xT3	463.00	464.00	463.50	4.40	4.46	4.43	5.12	5.15	5.13	1.21	1.20	1.21	2.47	2.51	2.49
	Mean	384.15	379.85	382.00	3.97	3.92	3.95	4.68	4.67	4.68	1.42	1.42	1.42	2.03	2.02	2.03
	Min	168.00	166.00	167.00	3.10	3.06	3.08	4.00	3.98	3.99	1.06	1.02	1.04	1.01	1.00	1.00
	Max	600.00	599.00	599.50	4.97	5.01	4.99	5.99	6.01	6.00	1.84	1.86	1.85	2.78	2.80	2.79
1	Thar Sheetal	475.00	472.00	473.50	4.44	4.48	4.46	5.34	5.32	5.33	1.18	1.15	1.16	2.57	2.60	2.59
	SE(d) $\pm$	20.43	19.69	19.92	0.09	0.19	0.10	0.10	0.22	0.12	0.02	0.03	0.02	0.02	0.05	0.02
	C.D.at 5%	40.76	39.28	39.73	0.19	0.38	0.19	0.20	0.43	0.23	0.05	0.06	0.04	0.05	0.10	0.05
	C.V. (%)	6.63	6.43	6.48	2.90	5.99	3.04	2.63	5.77	3.07	2.03	2.56	1.60	1.37	3.07	1.45

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S. No.	Parent/ Hybrids	Non- reducing sugar (%)			Total sugar (%)			Total carotenoid content (µg/100mg)			Fruit yield per plant (kg)			Fruit yield (q/ha)		
		2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled	2024	Y2	Pooled
Parents																
1	NDLM-23-1	1.12	1.14	1.13	2.54	2.54	2.54	7.33	7.26	7.29	1.36	1.29	1.32	81.52	79.51	80.52
2	NDLM-23-2	1.07	1.10	1.09	2.32	2.32	2.32	6.17	6.10	6.13	1.33	1.58	1.45	78.15	71.89	75.02
3	NDLM-23-3	1.34	1.35	1.35	3.52	3.52	3.52	8.95	8.90	8.92	1.89	1.85	1.87	116.82	111.33	114.08
4	NDLM-23-4	1.24	1.23	1.24	3.15	3.15	3.15	8.13	8.09	8.11	1.39	1.40	1.40	83.68	78.69	81.18
5	NDLM-23-5	1.03	1.02	1.03	2.08	2.08	2.08	5.78	5.77	5.77	1.20	1.15	1.17	72.07	65.65	68.86
6	NDLM-23-6	1.51	1.50	1.51	3.81	3.81	3.81	9.98	8.01	13.99	2.26	2.48	2.37	136.68	144.45	140.57
7	NDLM-23-7	1.26	1.29	1.28	3.25	3.25	3.25	8.19	8.15	8.17	1.53	1.50	1.51	91.71	88.36	90.03
8	NDLM-23-8	1.66	1.64	1.65	4.06	4.06	4.06	10.78	10.84	10.81	2.49	2.70	2.60	146.66	161.94	154.30
9	NDLM-23-9	1.27	1.30	1.29	3.37	3.37	3.37	8.45	8.40	8.42	1.71	1.63	1.67	105.80	96.98	101.39
10	Kashi Santusthi	1.26	1.27	1.27	3.28	3.28	3.28	8.41	8.87	8.64	1.68	1.58	1.63	102.85	95.29	99.08
11	Punjab Long Melon	1.56	1.53	1.55	3.89	3.89	3.89	10.30	10.34	10.32	2.36	2.57	2.46	145.38	151.52	148.45
12	Kashi Vidhi	1.39	1.37	1.38	3.62	3.62	3.62	9.60	9.64	9.62	2.07	2.43	2.25	125.29	150.35	137.82
	Mean	1.31	1.31	1.31	3.24	3.24	3.24	8.51	8.36	8.85	1.77	1.85	1.81	107.22	108.00	107.61
	Min	1.03	1.02	1.03	2.08	2.08	2.08	5.78	5.77	5.77	1.20	1.15	1.17	72.07	65.65	68.86

	Max	1.66	1.64	1.65	4.06	4.06	4.06	10.78	10.84	13.99	2.49	2.70	2.60	146.66	161.94	154.30
Hybrids																
1	L1xT1	1.35	1.37	1.36	3.54	3.54	3.54	8.95	8.93	8.94	2.03	2.10	2.07	119.73	126.46	123.10
2	L1xT2	1.17	1.20	1.19	2.95	2.95	2.95	7.61	7.60	7.60	1.36	1.27	1.31	82.73	75.75	79.24
3	L1xT3	1.30	1.34	1.32	3.41	3.41	3.41	8.64	8.62	8.63	1.75	1.68	1.72	105.45	100.06	102.76
4	L2xT1	2.11	2.13	2.12	3.12	3.12	3.12	5.49	5.42	5.46	1.19	1.13	1.16	71.36	68.33	69.84
5	L2xT2	1.04	1.06	1.05	2.11	2.11	2.11	5.81	5.76	5.78	1.27	1.16	1.21	76.44	74.06	75.25
6	L2xT3	1.07	1.09	1.08	2.22	2.22	2.22	6.01	5.98	6.00	1.28	1.19	1.23	76.73	71.43	74.08
7	L3xT1	1.74	1.71	1.73	4.34	4.34	4.34	12.23	12.24	12.23	2.88	3.27	3.08	169.51	196.85	183.18
8	L3xT2	1.72	1.69	1.71	4.30	4.30	4.30	12.03	12.09	12.06	2.76	3.14	2.95	170.74	189.63	180.18
9	L3xT3	1.52	1.50	1.51	3.83	3.83	3.83	10.15	10.20	10.18	2.26	2.55	2.41	135.80	152.60	144.20
10	L4xT1	1.10	1.14	1.12	2.51	2.51	2.51	6.66	6.62	6.64	1.31	1.21	1.26	78.73	71.66	75.19
11	L4xT2	1.40	1.41	1.41	3.66	3.66	3.66	9.63	9.60	9.61	2.10	2.06	2.08	126.55	122.43	124.49
12	L4xT3	1.38	1.42	1.40	3.58	3.58	3.58	8.77	8.74	8.75	2.06	2.09	2.08	121.46	125.45	123.46
13	L5xT1	1.08	1.10	1.09	2.38	2.38	2.38	6.28	6.26	6.27	1.29	1.20	1.25	80.00	72.26	76.13
14	L5xT2	1.09	1.12	1.11	2.41	2.41	2.41	6.62	6.60	6.61	1.30	1.21	1.26	81.55	72.85	77.21
15	L5xT3	1.05	1.07	1.06	2.16	2.16	2.16	5.85	5.80	5.83	1.27	1.17	1.22	76.34	69.21	72.78
16	L6xT1	1.67	1.63	1.65	4.09	4.09	4.10	11.01	11.03	11.02	2.63	3.03	2.83	159.05	186.84	172.94
17	L6xT2	1.83	1.80	1.82	4.55	4.55	4.55	13.99	14.06	14.02	3.41	3.63	3.52	204.48	218.40	211.44

18	L6xT3	1.79	1.77	1.78	4.43	4.43	4.43	12.58	12.60	12.59	3.33	3.56	3.44	196.41	213.81	205.11
19	L7xT1	1.33	1.34	1.34	3.49	3.49	3.49	8.92	8.89	8.90	1.87	1.76	1.81	115.35	106.45	110.90
20	L7xT2	1.16	1.19	1.18	2.86	2.86	2.86	7.35	7.30	7.32	1.33	1.38	1.35	79.77	73.82	76.80
21	L7xT3	1.58	1.61	1.60	3.93	3.93	3.93	10.37	10.35	10.36	2.37	2.43	2.40	142.46	150.10	146.28
22	L8xT1	1.69	1.65	1.67	4.21	4.21	4.21	11.47	11.51	11.49	2.73	2.93	2.83	164.75	176.15	170.46
23	L8xT2	1.80	1.79	1.80	4.47	4.47	4.47	13.10	13.14	13.12	3.36	3.57	3.47	198.10	214.89	206.49
24	L8xT3	1.86	1.84	1.85	4.64	4.64	4.64	15.00	15.17	15.09	3.49	3.73	3.62	215.87	225.45	220.66
25	L9xT1	1.20	1.23	1.22	3.01	3.01	3.01	7.67	7.57	7.62	1.38	1.28	1.33	82.60	76.81	79.71
26	L9xT2	1.31	1.34	1.33	3.44	3.44	3.44	8.77	8.75	8.76	1.82	1.70	1.76	109.15	100.46	104.81
27	L9xT3	1.69	1.64	1.67	4.16	4.16	4.17	11.42	11.50	11.46	2.81	3.02	2.92	169.86	186.45	178.16
	Mean	1.45	1.45	1.45	3.47	3.47	3.48	9.35	9.35	9.35	2.10	2.17	2.13	126.33	130.32	128.33
	Min	1.04	1.06	1.05	2.11	2.11	2.11	5.49	5.42	5.46	1.19	1.13	1.16	71.36	68.33	69.84
	Max	2.11	2.13	2.12	4.64	4.64	4.64	15.00	15.17	15.09	3.49	3.73	3.62	215.87	225.45	220.66
1	Thar Sheetal	1.70	1.67	1.69	4.27	4.27	4.27	11.87	11.90	11.89	2.75	2.96	2.86	164.92	178.15	171.53
	SE(d) ±	0.06	0.06	0.06	0.06	0.06	0.03	0.22	0.47	0.26	0.06	0.15	0.08	4.04	8.65	4.89
	C.D.at 5%	0.11	0.11	0.11	0.11	0.11	0.06	0.43	0.93	0.52	0.13	0.30	0.16	8.05	17.25	9.76
	C.V. (%)	4.74	4.96	4.88	2.01	2.01	1.03	2.87	6.09	3.41	3.81	8.89	4.92	4.07	8.48	4.86

Name	: Suman Poonia	Id. No	: H-14109/22
Semester	: II	Degree	: Doctor of Philosophy
Year of Admission	: 2023	Department	: Vegetable Science
Major subject	: Vegetable Science	Minor subject	: Genetics & Plant Breeding
Title	: Genetic Analysis for Yield and its component in Long melon (<i>Cucumis melo</i> var. <i>utilissimus</i>)		
Advisor	: Dr. Aastik Jha		

ABSTRACT

The present investigation entitled "Genetic analysis for yield and its component in long melon (*Cucumis melo* var. *utilissimus*)" was conducted during the summer seasons of 2024 and 2025 at the Main Experiment Station, Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.), India. The study aimed to evaluate the genetic variability, combining ability effects, and heterosis for yield and quality traits in long melon. The experimental material comprised nine promising and diverse pure lines (NDLM-23-1 to NDLM-23-9) and three testers (Kashi Santusthi, Punjab Long Melon, and Kashi Vidhi) crossed in all possible combinations to generate 27 F₁ hybrids. The experiment was conducted in a Randomized Block Design with three replications, maintaining 3-meter row spacing and 0.50-meter plant-to-plant spacing. Data were recorded on fifteen quantitative traits including flowering characteristics, morphological parameters, yield components, and seven qualitative biochemical traits. Analysis of variance revealed significant differences among genotypes for all traits in both seasons and pooled analysis. The proportional contribution of lines varied from 54.15% (non-reducing sugar) to 90.06% (node number to first male flower), while testers contributed 0.01% to 4.64% of the total variability. Line × tester interactions ranged from 7.73% to 44.27% across different traits. Combining ability analysis indicated that specific combining ability (SCA) variance was higher than general combining ability (GCA) variance for all traits except days to 50% female flowering, suggesting predominance of non-additive gene action. The average degree of dominance exceeded unity for most traits, indicating over-dominance. Parents NDLM-23-8, NDLM-23-6, NDLM-23-3, and Kashi Vidhi exhibited significant positive GCA effects for growth, yield, and quality traits, while NDLM-23-8 and NDLM-23-6 showed significant negative GCA effects for earliness characters. The best five cross combinations based on SCA

effects were NDLM-23-8 × Kashi Vidhi, NDLM-23-8 × Punjab Long Melon, NDLM-23-6 × Punjab Long Melon, NDLM-23-1 × Kashi Santusthi, and NDLM-23-3 × Kashi Santusthi. Wide variation in heterobeltiosis and relative heterosis was observed, with NDLM-23-8 × Kashi Vidhi showing the highest heterosis for most characters. The study concludes that morphological traits like flower color, fruit shape and texture can effectively guide hybridization programs in long melon. The identified superior cross combinations and parents with desirable combining ability can be utilized in future breeding programs for developing improved varieties with enhanced yield, quality, and adaptability. The predominance of non-additive gene action suggests that hybrid breeding would be more effective than pure line selection for long melon improvement.



Major Advisor & Chairman

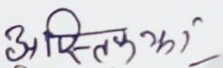
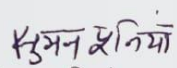


(Suman Poonia)
Student

नाम	: सुमन पूनिया	पहचान संख्या	: H-14109/22
सेमेस्टर	: द्वितीय	उपाधि	: डॉक्टर ऑफ़ फिलॉसफी
प्रवेश वर्ष	: 2023	विभाग	: सब्जी विज्ञान
मुख्य विषय	: सब्जी विज्ञान	गौण विषय	: आनुवंशिकी एवं पादप प्रजनन
शीर्षक	: ककड़ी (कुकुमिस मेलो वेराइटी यूटिलिसिमस) में उत्पादन एवं उसके घटकों का आनुवंशिक विश्लेषण		
सलाहकार	: डॉ. आस्तिक झा		

सार

प्रस्तुत अनुसंधान अध्ययन "ककड़ी (कुकुमिस मेलो वेराइटी यूटिलिसिमस) में उत्पादन एवं उसके घटकों का आनुवंशिक विश्लेषण" शीर्षक से आचार्य नरेन्द्र देव कृषि एवं प्रौद्योगिकी विश्वविद्यालय, नरेन्द्र नगर, कुमारगंज, अयोध्या (उ.प्र.), भारत के सब्जी विज्ञान विभाग के मुख्य प्रयोग केन्द्र में 2024 एवं 2025 की ग्रीष्मकालीन ऋतुओं के दौरान संपादित किया गया। प्रस्तुत अनुसंधान का मुख्य उद्देश्य ककड़ी में उत्पादन एवं गुणवत्ता संबंधी लक्षणों हेतु आनुवंशिक विविधता, संयोजन क्षमता प्रभाव एवं संकर ओज का मूल्यांकन करना था। प्रयोगात्मक सामग्री में नौ उत्तम एवं विविधतापूर्ण शुद्ध वंशक्रम (एनडीएलएम-23-1 से एनडीएलएम-23-9) तथा तीन परीक्षक जनक (काशी संतुष्टि, पंजाब लॉन्ग मेलन एवं काशी विधि) सम्मिलित थे। इन समस्त जनकों को सभी संभावित संयोजनों में संकरित करके 27 पहली पीढ़ी संकर तैयार किए गए। प्रयोग यादृच्छिक पूर्ण खण्ड अभिकल्प में तीन पुनरावृत्तियों के साथ संपादित किया गया। फसल व्यवस्था में 3 मीटर कतार अंतराल एवं 0.50 मीटर पौधे से पौधे की दूरी बनाए रखी गई। पन्द्रह मात्रात्मक गुणों जिसमें पुष्पन अभिलक्षण, आकारिकी मापदंड, उत्पादन घटक सम्मिलित थे एवं सात गुणात्मक जैव-रासायनिक गुणों पर प्रेक्षण लिए गए। प्रसरण विश्लेषण से दोनों मौसमों एवं सम्मिलित विश्लेषण में समस्त लक्षणों के लिए जीनोटाइप्स के मध्य अत्यधिक सार्थक अंतर प्रदर्शित हुआ। वंशक्रमों का आनुपातिक योगदान कुल विचरण में 54.15 प्रतिशत (अपचायक शर्करा) से 90.06 प्रतिशत (प्रथम नर पुष्प तक पर्व संख्या) के मध्य रहा। परीक्षक जनकों का योगदान कुल विचरण के 0.01 प्रतिशत से 4.64 प्रतिशत तक था। वंशक्रम × परीक्षक अन्योन्य प्रभाव विभिन्न गुणों के लिए 7.73 प्रतिशत से 44.27 प्रतिशत के मध्य परिवर्तित हुआ। संयोजन क्षमता विश्लेषण से स्पष्ट हुआ कि 50 प्रतिशत मादा पुष्पन दिवस के अतिरिक्त समस्त गुणों के लिए विशिष्ट संयोजन क्षमता विचरण सामान्य संयोजन क्षमता विचरण से अधिक था, जो गैर-योज्य जीन क्रिया की प्रधानता को दर्शाता है। अधिकांश गुणों के लिए औसत प्रभुत्व स्तर एकता से अधिक था, जो अति-प्रभुत्व की उपस्थिति को इंगित करता है। जनक एनडीएलएम-23-8, एनडीएलएम-23-6, एनडीएलएम-23-3 एवं काशी विधि ने वृद्धि, उत्पादन एवं गुणवत्ता संबंधी गुणों के लिए सार्थक धनात्मक सामान्य संयोजन क्षमता प्रभाव प्रदर्शित किया। वहीं एनडीएलएम-23-8 एवं एनडीएलएम-23-6 ने प्रारंभिकता संबंधी गुणों के लिए वांछनीय ऋणात्मक सामान्य संयोजन क्षमता प्रभाव दिखाया। विशिष्ट संयोजन क्षमता प्रभावों के आधार पर सर्वोत्तम पांच संकर संयोजन क्रमशः एनडीएलएम-23-8 × काशी विधि, एनडीएलएम-23-8 × पंजाब लॉन्ग मेलन, एनडीएलएम-23-6 × पंजाब लॉन्ग मेलन, एनडीएलएम-23-1 × काशी संतुष्टि एवं एनडीएलएम-23-3 × काशी संतुष्टि थे। हेटेरोबेल्टिओसिस एवं सापेक्ष संकर ओज में व्यापक विविधता प्रेक्षित हुई। एनडीएलएम-23-8 × काशी विधि संकर संयोजन ने अधिकांश अध्ययनित गुणों के लिए सर्वाधिक संकर ओज प्रदर्शित किया। अध्ययन निष्कर्ष से स्पष्ट होता है कि आकारिकी गुण जैसे पुष्प वर्ण, फल आकार एवं गूदा संरचना ककड़ी में संकरण कार्यक्रमों का प्रभावी निर्देशन कर सकते हैं। पहचाने गए उत्कृष्ट संकर संयोजन एवं उत्तम संयोजन क्षमता वाले जनकों का उपयोग भविष्य के प्रजनन कार्यक्रमों में उन्नत उत्पादन, गुणवत्ता एवं अनुकूलन क्षमता युक्त किस्मों के विकास हेतु किया जा सकता है। गैर-योज्य जीन क्रिया की प्रधानता यह सुझाती है कि ककड़ी के आनुवंशिक सुधार के लिए शुद्ध वंश चयन की अपेक्षा संकर प्रजनन अधिक प्रभावकारी होगा।

 (आस्तिक झा) प्रमुख सलाहकार	 (सुमन पूनिया) छात्रा
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