PERFORMANCE OF DIFFERENT GLADIOLUS CULTIVARS ON GROWTH, FLOWERING AND CORM PRODUCTION UNDER CHHATTISGARH PLAINS CONDITION

M.Sc. (Hort) Thesis

by

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INDIRA GANDHI KRISHI VISHWAVIDYALAYA,
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Thesis

Submitted to the

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by

Shravan Kumar

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CERTIFICATE – I

This is to certify that the thesis entitled **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** submitted in partial fulfillment of the requirements for the degree of **"Master of Science in Horticulture"** of the Indira Gandhi Krishi Vishwavidyalaya Raipur (Chhattisgarh) is a record of the bonafide research work carried out by **Shravan Kumar** under my guidance and supervision. The subject of the thesis has been approved by Student's Advisory Committee and the Director of Instruction.

No part of the thesis has been submitted for any other degree or diploma (certificate awarded etc.) or has been published/published part has been fully acknowledged. All the assistance and help received during the course investigations have been duly acknowledged by him.

Date: 21.7.17

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Member (Dr. Sunil Nair) _____

Member (Dr. R. R. Saxena) _____

CERTIFICATE – II

This is to certify that the thesis entitled **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** submitted by **Shravan Kumar** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, in partial fulfilment of the requirements for the degree of **M.Sc. (Hort.)** in the **Department of Floriculture And Landscape Architecture** has been approved by the external examiner and Student's Advisory Committee after oral examination.

Anushka

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Date: 25/9/17

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Approved/ Not Approved

Director of Instructions _____

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Research is an evolving concept. My endeavor in this regard is challenging as well as exhilarating. It implies the testing of our nerves. Every result arrived at is a modest beginning for a higher goal. My work in the same spirit is just a step in the ladder. It is a drop in the ocean. The words at my command are indeed not adequate, either in the form of spirit or to express the depth of my humbleness, before Almighty God, whose endless blessings have made me to carry on this tedious task. I shall like to pen down my gratitude for all those who directly or indirectly helped me in completion of this work.

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Date:

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%	per cent
@	At the rate of
°C	Degree Celsius
et al.	Co-workers
i.e.	That is
viz.,	Namely
+	Plus
<	More than
>	Less than
=	Equal to
×	Multiplied by

LIST OF ABBREVIATIONS

Abbreviations	Description
ANOVA	Analysis of variance
CD	Critical difference
cm	Centimetre
cm^2	Centimetre square
g	Gram
cv.	Cultivar
DAP	Days after planting
et. al.	And others/ co-workers
Fig.	Figure
ha	Hectare
i.e.	That is
l.	Litre
m^2	Metre square
S.Em	Standard error of mean
viz.,	Namely

ABSTRACT

a) Title of the Thesis : **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"**

b) Full Name of the Student : Shravan Kumar

c) Major Subject : Floriculture and Landscape Architecture

d) Name and Address of the Major Advisor : Dr. T. Tirkey, Assistant Professor
Department of Floriculture and Landscape Architecture

e) Degree to be Awarded : M.Sc. (Hort.) Floriculture and Landscape Architecture

Signature of the Student

Signature of Major Advisor

Date: 21/7/2017

Signature of Head of the Department

ABSTRACT

The present investigation entitled **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** was conducted in *Rabi* season during 2016-17 at Research cum Instructional Farm, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experiment was laid out in Randomized Block Design (RBD), with three replications having 14 treatments (Gladiolus cultivars). The different cultivars evaluated were cultivar Candyman, White Prosperity, Dull Queen, Saffron, Summer Sunshine, Red Majesty, American Beauty, Fancy Pink, Her Majesty, Punjab Dawn, Gunjan, GS-2, Novalux and Advantage. The observation recorded on vegetative growth characters, flowering and flower quality, corm and cormels yield and vase life of cut flower of gladiolus

and the data was analysed of all character to evaluate the performance of different gladiolus cultivars.

The cultivar Punjab Dawn (8.67) taken minimum number of days to 50% sprouting and highest plant height (100.21 cm) was recorded in cultivar Candyman. The maximum number of leaves was (8.03) recorded in cultivar Candyman and maximum length of leaves (47.70 cm) as well as width of leaves was recorded in cultivar White Prosperity (2.81 cm).

With respect to flowering and flower quality parameter, cultivar Nova Lux taken minimum number of days to spike emergence (60.49), cultivar American Beauty (67.09) showed minimum number of days to first floret colour show and full bloom of first floret (68.25). Length of spike was significantly higher in cultivar Saffron (78.13 cm). However length of rachis and intermodal length was recorded maximum with cultivar White Prosperity (69.81 cm) and (3.02) respectively. Whereas maximum number of florets per spike was recorded in cultivar Candyman (15.03). However, diameter of florets was significantly higher in the cultivar Fancy Pink (10.73 cm) and Gunjan have recorded maximum flowering duration (32.22 days).

As regarding to corms and cormels production, maximum number of corms per plant was recorded in cultivar Advantage (4.69). Whereas maximum weight (80.56 g) and diameter of corm was recorded with cultivar Candyman (6.46 cm). The cultivar White Prosperity was superior in number of cormels production (132.46) and weight of cormels (45.14 g) per plant.

In case of vase life of cut flower under ambient condition with the tap water, the minimum number of days to basal floret open was recorded in cultivar Saffron (2.21), whereas the cultivar Advantage gave maximum days to 50% withering of florets (9.86). The maximum days to vase life of gladiolus in ambient condition was recorded in the cultivar Candyman (8.26).

शोध सारांश

अ	शोध शीर्षक	:	**"छत्तीसगढ़ के मैदानी इलाकों के कृषि जलवायु स्थिति में ग्लेडियोलस की विभिन्न किस्मों का वानस्पतिक विकास, पुष्पण तथा शल्क कंद उत्पादन का प्रदर्शन"**
ब	छात्र का पूर्ण नाम	:	श्रवण कुमार
स	प्रमुख विषय	:	पुष्प उत्पादन एवं भू–दृष्य वास्तुकला
द	मुख्य सलाहकार का नाम	:	डॉ. टी. तिर्की
	व पूरा पता		पुष्प उत्पादन एवं भू–दृष्य वास्तुकला विभाग
			इंदिरा गांधी कृषि विष्वविद्यालय, रायपुर (छ. ग.)
इ	प्रदान की जाने वाली उपाधि	:	एम. एससी. (उद्यानिकी) पुष्प उत्पादन एवं भू–दृष्य वास्तुकला

छात्र का हस्ताक्षर

मुख्य सलाहकार का हस्ताक्षर

दिनांक: 21/7/2017

विभागाध्यक्ष का हस्ताक्षर

सारांश

वर्तमान प्रयोग शीर्षक "छत्तीसगढ़ के मैदानी इलाकों के कृषि जलवायु स्थिति में ग्लेडियोलस की विभिन्न किस्मों का वानस्पतिक विकास, पुष्पण तथा शल्क कंद उत्पादन का प्रदर्शन" को उद्यानिकी अनुसंधान एवं शैक्षणिक प्रक्षेत्र इंदिरा गांधी कृषि विष्वविद्यालय, रायपुर 2016–17 के रबी में किया गया था। यह प्रयोग यादृच्छिक ब्लॉक डिजाइन (आर. बी. डी.) में रखा गया था जिसमें 14 उपचार (ग्लेडियोलस किस्मों) का तीन अनुकरण थे। विभिन्न किस्मों जिनका मूल्यांकन किया गया जो निम्नानुसार है : कैंडीमेन, व्हाईट प्रासपेरिटी, डल क्वीन, सैफरान, समर सनषाईन, रेड मैजेस्टी, अमेरिकन ब्यूटी, फैंसी पिंक, हर मैजेस्टी, पंजाब डॉन, गुंजन, जी एस.–2, नोवा लक्स और एडवांटेज।

वानस्पति वृद्धि लक्षण, पुष्प और पुष्प गुणवत्ता, शल्क कंद और प्रकन्द प्रप्ति, कटे ग्लेडियोलस पुष्प का फूलदान और विभिन्न ग्लेडियोलस किस्मों के प्रदर्शन का मूल्यांकन करने के लिए सभी लक्षणों के आंकड़ो का विश्लेषण किया गया था।

पंजाब डॉन किस्म 50 प्रतिशत् अकुरण के लिए सबसे कम दिन लिया तथा अधिकतम पौध ऊँचाई (100.21 सेमी.) किस्म केन्डीमेन में दर्ज किया गया। अधिकतम पत्तियों की संख्या (8.03) किस्म केन्डीमेन

तथा अधिकतम पत्तियों की लंबाई (47.70 सेमी.) एवं चौड़ाई (2.81 सेमी.) किस्म व्हाइट प्रासपेरिटी में पाया गया।

पुष्प और पुष्प गुणवत्ता के लक्षणों में शीघ्रतम स्पाईक का उद्‌भव (60.49) दिन किस्म नोवा लक्स में पाया गया। प्रथम पुष्पक रंग प्रदर्षन (67.09) दिन और प्रथम पुष्पक खिलना (68.25) दिन किस्म अमेरिकन ब्यूटी में पाया गया। अधिकतम स्पाईक की लंबाई (78.13 सेमी.) किस्म सेफरॉन, अधिकतम रेचिस की लंबाई (69.81 सेमी.) और अधिकतम पुष्पक के व्यास गांठ की लंबाई (3.02 सेमी.) किस्म व्हाइट प्रासपेरिटी में पाया गया। सर्वाधिक पुष्पकों की संख्या (15.03) किस्म केन्डीमेन, सर्वाधिक पुष्पक की व्यास (10.73 सेमी.) किस्म फैन्सी पिंक तथा अधिकतम फूलों की अवधि (32.22) दिन किस्म गुंजन में दर्ज किया गया।

अधिकतम कंदों की संख्या प्रति पौध (4.69) किस्म एडवान्टेज, अधिकतम कंदों का व्यास (6.46 सेमी.) तथा अधिकतम कंदों का भार (80.56 ग्राम) किस्म केन्डीमेन में पाया गया। सर्वाधिक प्रकन्द की संख्या (132.46) तथा प्रकन्द भार (45.14 ग्राम) किस्म व्हाइट प्रासपेरिटी में दर्ज किया गया।

यदि कटे पुष्प का फूलदान नल की पानी और आस – पास की स्थिति में प्रथम निचली पुष्पक्रम के खिलने के लिए कम समय (2.21) किस्म सेफरॉन में पाया गया। 50 प्रतिषत फूलों का मुरझाना (9.86) किस्म एडवांटेज तथा अधिकतम फूलदान (8.26) दिन किस्म केन्डीमेन में पाया गया।

CHAPTER-I

INTRODUCTION

India has a long tradition of floriculture and references to flowers and gardens are found in ancient Sanskrit scriptures like Rigveda, Ramayana and Mahabharata. The social and economic aspects of flower growing were however,

recognized much later. In the modern era, flowers symbolize beauty, purity, peace and love. It plays a cardinal role in human behaviour and culture, bringing tranquility and peace of mind. Flowers have become integral part of our day to day life. Its use particularly for religious and social offering has been on the increase due to changing lifestyle. This has lead to the appreciation of the economic importance of the flowers in addition to its aesthetic value and it has emerged as an important agri-business venture. In this regard gladiolus has also gained much importance as is suitably designated as the "Queen of bulbous flower."

Gladiolus is a flower of glamour and fascinating spike bear a large number of florets, which exhibit varying sizes and forms with smooth, ruffled or deeply crinkled tepals. The name gladiolus was derived from the Latin word "gladiolus" means sword and hence it is often called as "sword lily" owing to the shape of its leaves. The genus *Gladiolus* L. is a popular flowering plants belonging to the family Iridaceae and is a native of South Africa and Asia Minor. More than 180 known species of the gladiolus present days.

Gladiolus is a flower of breathtaking beauty with a wide range of colours, size and form. Its attractive inflorescence has won for it, a place of pride in gardens and commercial value as a cut flower. Except true blue and green practically all colours are available in gladiolus. Gladiolus flowers have a good vase life and withstand transporting very well. They are extensively used in flower arrangements, making of bouquets and for indoor decorations (Arora *et al.* 2002). Gladiolus is also good for flower beddings in gardens, pot cultures, rockeries etc (Abbasi *et al.* 2005). The major producing countries are United States (Florida and California), Holland, Italy, France, Bulgaria, India, and Israel (Riaz *et al.* 2007).

In India cultivation of flower crops covered around 278 thousand hectare, with an average production of 2184 thousand MT and average productivity was 8 MT/ha. (Anon., 2015-16a). The major gladiolus commercial growing states are West Bengal, Maharashtra, Uttar Pradesh, Uttaranchal, Punjab, Haryana, Sikkim, Jammu and Kashmir, Karnataka, Gujarat, Himachal Pradesh, Tamil Nadu, Madhya Pradesh, Delhi and Rajasthan. Whereas in Chhattisgarh, the total cultivated area for different flower is (10699 ha) with a production of 50968 MT and particularly gladiolus is cultivated in area (1660 ha) with a production of 5182 MT (Anon., 2015-16b).

Chhattisgarh state is one of the potential areas for commercial cultivation of gladiolus crops. There is heavy demand of flowers during marriage ceremonies, festivals and other social function. There is a large gap between supply and demand which the local growers which may utilize their advantage. Gladiolus is one of the dominating flowers in the flower market of Chhattisgarh it is blessed with many natural advantages like abundant sunshine and favourable temperatures for its growth. There is much scope for increase of gladiolus cultivation in Chhattisgarh.

The Gladiolus corm, actually is a swollen stem where, nutrients are stored, and is covered by 4 to 6 fibrous tunics. Each of the tunics that overlap each other down the side of the corm covers its own growth point (meristem) and protects it from mechanical damage, loss of moisture and damage from insects and diseases. Cormels develop at the base of the new corm. These can continue to grow into small new corms, with cormels, in the next growing season, (these are the ones that are replanted for corm production).

While production of high quality flowers is important, it is equally critical to maintain the vase life of cut flowers which, in general are highly perishable and vulnerable to large post harvest losses. Thus, post harvest handling in order to maintain freshness and original colour of flower for longer period after cutting is one of the important aspects in cut flower industry (Mukhopadhyay, 1995). Since gladiolus spikes possess many florets, it requires considerable amount of sugar for their opening. There may be poor opening of florets if the spikes remain deficient

in food reserve, resulting in shorter vase life (Nelofar and paul, 2008). The post harvest factors may influence 30% of the potential lasting quality of the cut flower (Pratap *et al.* 2008).

Gladiolus is very rich in its varietal wealth and every year there is an addition of new varieties, hence varietal evaluation becomes necessary to find out suitable variety for a particular region. The performance of any crop or cultivar largely depends on genotypic and environmental interaction. As a result, cultivars which perform well in one region may not perform the same in other regions of varying climatic conditions. In view of the above facts, the present investigation entitled- **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** will be undertaken at Horticulture Research cum Instructional Farm, College of Agriculture, IGKV, Raipur (C.G.) with the following objectives:

Objectives of Investigation

1. To find out the performance of different cultivars of gladiolus.

2. To find out the suitable cultivars for cut flower under Chhattisgarh plains.

3. To evaluate vase life of different cultivars under ambient condition.

CHAPTER-II

REVIEW OF LITERATURE

This experiment entitled **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** was undertaken during the period October 2016 – April 2017. Different cultivars of gladiolus can be grown in a particular agroclimatic region but all are not suited for cut flower purpose or corm production. New varieties are being developed in different parts of the world, which need to be tested under different set of agroclimatic conditions. Because, the cultivars vary in their size of the plant, colour, flower size, growing period etc. there is a need for evaluation of different cultivars of gladiolus before they are recommended for a particular agro-climatic region.

For this reason, many workers have done the work of evaluating different cultivars of gladiolus for studying their performance under different regions. The literature pertaining to their work has been reviewed and presented under the following headings.

2.1 To find out the performance of different cultivars of gladiolus.

2.2 To find out the suitable cultivars for cut flower under Chhattisgarh plains.

2.3 To evaluate vase life of different cultivars under ambient condition.

2.1 To find out the performance of different cultivars of gladiolus.

Bose and Yadav (1989) reported that the natural dormancy period lasted from 17-27 weeks. Early cultivars tended to have short dormancy period and late cultivars have long ones.

Misra and Singh (1989) reported that positive correlation of reducing sugars with sprouting percentage. Bigger sized corms sprouted earlier than the smaller sized corms. Corm size 5-6cm recorded the earliest days to sprouting (16.11 days) which was at par with days taken by 4-5cm (16.78 days) and smallest

sized corms (2-3cm) took the maximum days (18.33 days) to sprouting. The earlier sprouting of larger corms might be due to the higher amount of stored reducing sugars and endogenous gibberellin in the large sized corms as compared to smaller ones.

Saini *et al.* (1991) studied the performance of six gladiolus cultivars under Hissar conditions and found that maximum plant height was recorded by the cv. George Mazure (99.70 cm) and minimum by cv. Miniature (59.70 cm).

Rajendra *et al.* (1998) found that ten gladiolus cultivars for their suitability as cut flowers in Karnataka. The results showed that cultivar Happy End (78.4 days) was earliest with respect to the number of days taken for spike initiation followed by American Beauty (83.9 days).

Pant *et al.* (1998) evaluated forty cultivars of gladiolus for morphological traits at Chaubattia and found that cultivar Apple Blossom (92.76 cm) recorded maximum spike length followed by Picardy (87.44 cm) and Oscar (86.87 cm).

Shiramagond and Hanamashetti (1999) evaluated eight gladiolus cultivars for their performance in terms of flower and yield characteristics at Arabhavi, Karnataka and among all the cultivars, Summer Pearl (146.38) recorded maximum number of cormels per plant followed by American Beauty (125.13).

Safiullah (2001) reported that ten Dutch hybrid cultivars of Gladiolus grandiflorus namely Blad Jack, My Love, T512, Deciso, Spic and Span, May Housley, Nova Lux, Her Majesty, Rose Delight and Trader Horn were evaluated for their performance in Rawalakot, Pakistan during 1998-99 and observed Nova Lux and Rose Delight were the most promising for the number of leaves per plant.

Gupta *et al.* (2001) evaluated eleven cultivars of gladiolus (*Gladiolus floribundus* L.) found that maximum spike length was recorded for cultivar Pacific white (72.5 cm) and minimum for Interpit Bicolor (38.2 cm).

Patil (2001) studied the performance of 9 Gladiolus cultivars (Sancerre, Poonam, Sapana, Tropic Seas, Happy End, Suchitra, Yellow Stone, Sylvia, and IARI Sel-1) were evaluated by in Satara, Maharashtra and among the cultivars,

Sancerre and Yellow Stone had the highest number of corms per plant, i.e. 2.4 and 2.6 respectively).

Ahmed *et al.* (2002) revealed that ten exotic cultivars of gladiolus namely Wine and Roses, Wing's sensation, Red beauty, Oscar, Praha, City light, Green wood packer, Blue Isle, Priscilla and Victor Borge were evaluated for their performance and found cultivar Wine and Roses (53.06 g) recorded maximum weight of corm.

Patil (2003) reported at Maharashtra, India, that identifies the most suitable among nine Gladiolus cultivars for cut flower export. Among the cultivars, Spike length was highest in Sancerre (115.5 cm) and lowest in Happy End (74.2 cm).

Kamble *et al.* (2004) found that the Yellow Summer Sunshine sprouted earlier (16.08 days) followed by Interpret (17.17 days) whereas it was delayed in American Beauty (18.33 days). The variation on days to sprouting was expected to occur as it is controlled by genetic composition of variety.

Nair and Singh (2004) reported at Andamans, India, that identify the most promising cultivar of gladiolus for cultivation of this ornamental crop. Cultivar Pusa Suhagin (73.01 cm) recorded the maximum length of spike.

Padma and Kumar (2004) tested 25 cultivars of gladiolus for 3 consecutive years (1993, 1994 and 1995) for their suitability in the high altitude and tribal area of Visakhapatnam district in Andhra Pradesh and showed that Bigtime Supreme recorded the maximum leaf length (47.9 cm), followed by True Love (46.9 cm).

Dilta *et al.* (2004) found that the performance of 10 gladiolus cultivars with respect to two corm sizes i.e. A-grade (>5.00 to <=6.00 cm) and B-grade (>2.50 to <=3.50 cm) was evaluated under field conditions in Himachal Pradesh. The maximum plant height was recorded in cv. Candiman (111.34 cm) while the minimum in Black Beauty (83.62 cm) which was at par with cv. American Beauty (84.17 cm).

Kamble *et al.* (2004) evaluate gladiolus cultivars for flowering and flower quality and among the nine cultivars studied cv. Snow White (66.70) takes less

number of days to first floret opening followed by American Beauty (68.13) while cv. Magic (98.13) took more number of days.

Rajiv (2005) evaluated thirty one gladiolus cultivars for cut flower and corm production purposes at the ICAR Research Complex for NEH Region, Umiam (Meghalaya) and noticed that cv. Smoky Lady (71.22 days) took less number of days for first floret to show colour where as cv. Pusa Dhanvantri (115.00 days) was very late in first floret showing colour.

Ram *et al.* (2005) an experiment was conducted in Lucknow, Uttar Pradesh to evaluate the performance of 8 gladiolus cultivars where cultivar White Prosperity recorded the highest value for number of corms (1.79) and cormels per plant (32.25).

Rao and Janakiram (2006) evaluated the performance of Orchidiolas along with IIHR- developed cultivars under open field conditions and reported that maximum rachis length was observed in Dhiraj (46.83 cm) and lowest in Taltal (32.94 cm).

Pratap and Rao (2006) an experiment was conducted in Hyderabad to evaluate ten gladiolus cultivars and he observed maximum floret diameter in Hybrid 94-101(10.85 cm) which was significantly at par with a few other genotypes like Bindiya, Swarnima and IIHR 89-22-1.

Ranpise *et al.* (2007) a study was conducted during kharif 2001 in Maharashtra to assess the performance of gladiolus cultivars for cut flower and corm production and found Hunting Song (15.8 cm) had the biggest floret diameter among the cultivars. 2.2.9 Longevity of spike on plant.

Nimbalkar *et al.* (2007) thirty six gladiolus genotypes were evaluated to study the variability among the different genotypes along with the correlation and path analysis for 13 economic contributing characters. Genotype GK-GL-94-66 (180.58 g) recorded maximum weight of corms per plant followed by GK-GL-9428 (163. 92 g).

Ramachandrudu and Thangam (2008) an experiment was conducted in summer, rainy and winter seasons at ICAR Research Complex, Old Goa to find out suitable varieties for year round cultivation. The variety Rose Supreme (78.05 cm) recorded the maximum plant height whereas minimum was observed in variety Dhiraj (62.38 cm).

Balaram *et al.* (2009) an experiment was under taken to evaluate 35 gladiolus genotypes (11 Indian and 24 exotic) genotypes and found that Sapna (47.00) took less number of days to first floret showing colour.

Kumar and Kulakarni (2009) conducted an experiment to study the Genetic variability in gladiolus for growth and flowering characters and noticed that the length of leaf was maximum in Melody x Summer Sunshine (67.32 cm) followed by Summer Sunshine x Pricella (67.57 cm), American Beauty x Vedanapoli (67.00 cm) and Vedanapoli x Pricella (66.06 cm).

Satya and Ajit (2009) evaluated eleven gladiolus cultivars and noticed that the maximum length of rachis was recorded by Friendship (51.38 cm) while minimum in Rose Spire (24.30 cm).

Rajiv (2009) carried out an investigation during 2003-04 at experimental farm of the ICAR Research Complex for NEH Region, Umiam (Meghalaya) to study the performance of 16 exotic cultivars of gladiolus for cut flower and cormel production. The cultivar 'Friendship Pink' (13.00 days) gave long field durability.

Monika *et al.* (2009) evaluated nine gladiolus cultivars to study the genetic variability and found that maximum number of corms per plant were produced in cv. True Love (2.20) followed by cv. Asia (2.00) and cv. Rose Supreme (2.00).

Pandey *et al.* (2009) an experiment was carried out to evaluate performances of twelve gladiolus cultivars at Jammu, in respect of their morphological characters. The analyzed data indicated that 'Advance Red' (21.00) was superior over rest of the cultivars in number of cormels/plant.

Riaz *et al.* (2010) a field experiment were conducted to evaluate the agronomic performance and resistance of gladiolus germplasm against corm rot

disease. Among the 23 Gladiolus varieties tested, Glad Red depicted highest field life of flowers (42.5 days), followed by Friendship (42.5 days), Peter Pears (38.7 days) and Chinon (37.3 days).

Kishan (2010) conducted an experiment in which twenty eight genotypes of gladiolus were planted for morphological variation and evaluation and observed that cultivar American Beauty (24.33 g) has maximum cormel weight.

Pandey *et al.* (2010) reported that the cultivar Pusa Gunjan was earliest in full opening of first floret (89.00 days) where as cv. Spic Span took maximum number of days for opening of first floret (111.30 days).

Poon *et al.* (2010) evaluated twenty-one genotypes under field conditions for parameters of corm and cormel production at Indian Institute of Horticultural Research (IIHR), Bangalore. Genotype Hybrid selection 87-1-1' recorded the maximum corm diameter (8.00 cm).

Naik *et al.* (2011) a field study was conducted with fourteen promising cultivars planted under three environments, viz, shade-house, polyhouse and the open condition, and tested for various characters related to earliness. Genotypes Pacifica (6.13 cm) and Eighth Wonder (6.09 cm) were stable for corm diameter, with high mean values.

Hossain *et al.* (2011) an experiment was carried out during 2008-09 to compare the morphology of five gladiolus genotypes and noticed maximum width of leaves in genotype GL-04 (3.05 cm).

Rahul *et al.* (2011) an experiment carried out and he observed that the maximum weight of corms per plot was recorded in Rigency (0.964 kg) followed by Picardy (0.780 kg) and Tiger Flame (0.741 kg) and minimum weight of corms was recorded in Eurovision (0.519 kg).

Gawali *et al.* (2012) a field trial was conducted to study the performance of eight gladiolus varieties under Vidarbha conditions in respect to growth, flower yield and vase life of gladiolus spikes where he recorded maximum number of florets per spike in Phule Ganesh (14.40) followed by Pink Perfection (14.07).

Hossain *et al.* (2012) during the period from November 2008 to October 2009 investigated the morphology of vegetative propagating materials, flower and production of true seed through crossing among them the different gladiolus genotypes and showed that the highest cormel weight was recorded in genotype White (6.40g), followed by Yellow (6.39g), Violet (5.75g) and Red (5.30g) where as the Orange genotype (5.20g) produced the lowest weight of cormel per corm.

Pandey *et al.* (2012) evaluated fifty six gladiolus cultivars (32 exotic and 24 Indian) were for cut flower and corm production in Jammu and found that cv. Eurovision (133.00 cm) was found superior with respect to plant height.

Gawali *et al.* (2012) a field trial was conducted by to study the performance of eight gladiolus varieties under Vidarbha conditions for growth, yield and vaselife of gladiolus spikes and noticed that the variety Phule Tejas took significantly minimum period for spike emergence (59.70 days), where as the variety Pink Perfection took maximum number of days for spike emergence (83.40 days).

Saleem *et al.* (2013) reported the five potential, exotic cultivars of gladiolus, 'Cantate', 'Corveira', 'Eminence', 'Essential' and 'Fado' to determine the cultivar effects on yield and quality, to compare their relative performance and recommend their suitability for commercial production. Among the tested cultivars, 'Essential' (8.8) has greater number of leaves plant^{-1}.

Singh *et al.* (2013) an investigation was carried out at Horticulture Research Farm, Banaras Hindu University, Varanasi comprised of nineteen varieties of gladiolus. Parameter like width of longest leaf was found maximum with cv. Fidelio and minimum with var. Gulal.

Shaukat *et al.* (2013) studied the performance of most suitable cultivars under the climatic conditions of Bagh. Five cultivars of gladiolus namely (Amsterdam, Applause, Fidelio, Peter pears and Priscilla) and based on the floral characteristics cultivar Applause (90.00cm) obtained maximum spike length.

Singh and Singh (2013) an experiment was conducted to evaluate five cultivars of double petalled tuberose (Polianthes tuberosa Linn.) namely, Pearl Double, Suvasini, Vaibhav, Hyderabad Double and Swarn Rekha. The cultivar Hyderabad Double recorded maximum rachis length (67.80 cm) where as minimum rachis length was noticed in Pearl Double (22.83 cm).

Bhujbal *et al.* (2013) an experiment was carried out to assess of variability, heritability and genetic advances of 31 gladiolus genotypes and found that cultivar Arka Kesar (67.00) produced maximum number of cormels per plant followed by IIHR77-59-32 (64.00).

Rajiv (2014) an experiment was carried out with six cultivars of gladiolus, viz. Casa Blanca, Golden Goddess, Fidelio, Rosibee Red, Spic-N-Span and White Friendship to evaluate their performance for vegetative growth, flowering, corm and cormels characters for off season under sub-tropical mid hills of Meghalaya during 2007-08 and among the quality flowering characters, cultivar Casa Blanca (51.10 cm) produced longest rachis.

2.2 To find out the suitable cultivars for cut flower under Chhattisgarh plains.

Jhon *et al.* (1996) an experiment was conducted at Shalimar, India to evaluate forty one gladiolus cultivars for cut flower and cormel production in which Classic, Red Majesty, Rose Supreme, Oscar, Sunny Boy and White Prosperity were the most suitable cultivars for cut flower production, with flower spikes ranging in length from 106.06 cm for Oscar to 120.13 cm for White Prosperity.

Singh *et al.* (1997) a varietal trial was conducted with five cultivars of gladiolus in Port Blair and noticed that Miss America (42.55 cm) had the maximum spike length.

Singh *et al.* (1998) studied the performance of gladiolus in the low hills of Nagaland during summer on growth parameters of gladiolus (cultivars Friendship and Oscar) growing outdoors. Spike length and number of florets/spike were higher in Oscar (77.61 cm and 18.16, respectively) than in Friendship (69.15 cm and 12.66, respectively).

Nagaraju and Parthasarathy (2001) evaluated 43 gladiolus cultivars in Meghalaya, for morphological and floral characteristics and found Blue Moon (173.7 cm), Pumpkin Pie (172.0 cm), Apollo (164.7 cm), Jester (159.0 cm), Poonam (155.7 cm), Powder Puff (157.7 cm), Tropic Sea (157.7 cm), Pumpkin Pie (69.50 cm), G.S. Porter (61.8 cm), Green Bay (61.5 cm), Jester (61.2 cm) and Aldeburma (59.5 cm) were the tallest plants after flowering.

Dimri (2002) studied the performance of 8 gladiolus cultivars ('Jester', 'American Beauty', 'Friendship', 'Tiger Flame', 'Sunny Flame', 'Chiper White', 'Wine and Rose' and 'Han-van Mec Green'), in the low hills of Uttaranchal and highest average number of florets per spike was recorded in 'Wine and Rose' (16.62).

Kem *et al.* (2003) the studies conducted on the performance of various cultivars of gladiolus under valley conditions of Uttaranchal revealed that cultivar Melody (4.0) produces more number of corms per plant where as cv. Sylvia produces less number of corms per plant.

Baweja and Brahma (2003) evaluated 15 gladiolus cultivars in a field experiment conducted in Solan, Himachal Pradesh, and noticed cultivar Ben Venuto (17.82) recorded the highest number of florets per spike.

Kem *et al.* (2003) a field experiment was carried out at Uttaranchal to evaluate the performance of gladiolus cultivars Aldebaran, Day Dream, Friendship (Pink), George Mazure, Gold Dust, Ice Gold, Melody, Neelam, Oscar, Pusa Suhagan, Sancerre, Snow Princess, Sylvia, Surya Kiran and Vick Lin where Oscar recorded highest number of florets per spike (19.6).

Nair and Shiva (2003) conducted an experiment at Port Blair, to evaluate gladiolus cultivars for cut flower production and recorded that the maximum number of corms per plant were produced by Green Willow (1.60).

Mandal *et al.* (2004) conducted an experiment on ten gladiolus cultivars planted as intercrops in a 2.5-year-old arecanut (cv. Mohitnagar) plantation during

2001-03, at Mondouri, West Bengal. Among all the cultivars Sunset Jubilee (23.04 days) recorded the highest values for longevity of spikes in the field.

Rupa Rani (2005) an experiment was conducted in Jharkhand to assess twenty gladiolus cultivars for quality flower production. The longest leaf length was observed in American Beauty (43.11 cm) and the shortest in Rose Supreme (21.26 cm) while Summer Pearl, Blorina, Yellow Pearl and Blulind were at par.

Biswanath (2005) studied the performance of gladiolus cultivars (Candyman, Pusa Suhagin, Little Prince, Morella and Sunset Jubilee) in the Terai region of West Bengal, under greenhouse conditions and recorded greatest plant height in Pusa Suhagin, Morella and Sunset Jubilee (145.15, 143.67 and 143.38 cm, respectively).

Kishan *et al.* (2005) a field experiment was conducted to study the performance of 23 gladiolus cultivars at I.A.R.I., New Delhi and recorded maximum length of rachis in cv. Anjali (56.66 cm) and minimum in Rose Spire (24.33 cm).

Rajiv and Yadav (2005) evaluated thirty one gladiolus cultivars (20 Indian and 11 exotic) for cut flower and corm production purposes in Meghalaya and recorded that cultivar Light Purple recorded maximum cormel weight (11.36 g) per mother corm.

Rupa Rani (2005) an experiment was conducted in Jharkhand, to assess 16 gladiolus (Gladiolus primulinus) cultivars for quality flower production. The cultivar Thoinbolina took the least number of days for opening of basal floret (74.18 days) and Her Majesty took maximum number of days (93.79 days) for opening of basal floret.

Manoj (2006) an investigation was carried out with 22 hybrids at Baraut to study their performance and their suitability for cut flower production. Cv. Congo Song (16.60) produced maximum number of florets per spike followed by Jester (15.73), Pacifica (14.57), whereas Day Dream (7.08) produced less number of florets per spike.

Mukesh *et al.* (2007) conducted an experiment on thirty-six gladiolus cultivars for growth and flower production purposes at Horticultural Research Centre, S.V.B.P.U.A.T., Uttar Pradesh and noticed that the cultivar Jyotsana (73.50 cm) is significantly superior with respect to plant height.

Lepcha *et al.* (2007) carried an experiment to evaluate 13 gladiolus genotypes for vegetative, floral, corm and cormel characters under rain-fed conditions of Uttarakhand hills and found genotype Charmflow (56.50) recorded maximum number of cormels per plant followed by Summer Pearl (51.75).

Kishan (2007) studied the performance of 30 gladiolus hybrids, including the control cultivar 'Mayur', were compared in terms of growth, flowering and corm yield parameters to screen promising ones for cultivation under Delhi Conditions. The results revealed that hybrid Yellow Stone x Melody produced maximum number of leaves (9.33) plant-1.

Mukesh *et al.* (2007) evaluated thirty-six gladiolus cultivars for growth and flower production purposes at Horticultural Research Centre, S.V.B.P.U.A.T., Uttar Pradesh The minimum days required for opening of first floret (70.50 days) were recorded in cultivar Gunjan, followed by Gulal (71.40 days). The maximum number of days for opening of first floret was recorded in cultivar Sweta (92.50 days).

Swain *et al.* (2008) reported that the twelve gladiolus exotic cultivars were evaluated for cut flower and corm production purposes in Orissa and found that cultivar Red Majesty (75.50 days) took minimum number of days for full opening of first floret, while Prijkica (116.68 days) took maximum number of days.

Punam *et al.* (2009) evaluated ten gladiolus cultivars and the longest spike length was recorded in the cultivar Candyman (82.40cm) which was at par with cultivars IIHR-87-221(81.67cm), Eigth Wonder (80.97cm) and Arka Kesar (80.40cm), where as the cultivar Pacifica (46.38cm) exhibited shortest spike length.

Pragya *et al.* (2010) an experiment was carried out at the experimental farm Mukteshwar (Uttarakhand) to evaluate the performance of 37 gladiolus cultivars for cut flower and corm production and recorded that the cultivars Novalux (62.33), Super Star (66.00) and Red Beauty (69.00), Pusa Gunjan (70.33 and 77 days) and Pusa Shabnam (70.67) were found earliest for spike initiation.

Pragya *et al.* (2010) carried out an experiment in Mukteshwar (Uttarakhand) to evaluate the performance of 37 gladiolus cultivars for cut flower and corm production and found cultivar Chantiler produced maximum leaf breadth (3.06 cm).

Mahesh and Anop (2011) a study was conducted in Rajasthan to evaluate 12 germplasms of gladiolus for cut-flower and corm production and noticed that the cultivar Dhanvantari (54.89 cm) produced longest leaf length.

Shaukat *et al.* (2012) studied that eight cultivars of Gladiolus namely Amsterdam, Red beauty, White Prosperity, Fidelio, Nova Lux, High Style, Wind Song and Priscilla were evaluated at Kashmir for their adaptability and performance. Results on floral characteristics showed that cultivar White Prosperity (70.89) and High Style (71.77) were earlier for spike emergence, Priscilla took maximum number of days (90.67) to spike emergence

Neha *et al.* (2012) a field trial was conducted to evaluate eight varieties of gladiolus for flower and corm production. The maximum longevity of flowers on plant was noticed in the variety Phule Neelrekha (16.13) followed by Pink Perfection (15.60) and minimum in Nova Lux (10.07).

Sankari *et al.* (2012) was conducted to evaluate 42 genotypes of gladiolus for growth and floral parameters in Eastern Ghats of Tamil Nadu, under Yercaud conditions. Significant differences were recorded for all the traits studied among the genotypes. Cultivar 'Candyman' (7.0 cm) was found to be superior in corm diameter.

Susila (2013) a study was undertaken by to find out the suitable gladiolus varieties for cultivation in Visakhapatnam district and observed genotype Sindhur (9.7) produced maximum number of leaves per plant and minimum in Aarthi (6.0).

Mushtaq *et al.* (2013) evaluated four exotic cultivars of Gladiolus alatus viz., Madriver, Fado, Florared and Pietmohlen for their performance under Rainfed conditions in Rawalpindi. Among these cultivars Madriver (52.92 cm) produced maximum leaf length which was statistically at par with Pietmohlen and Fado while Florared (47.00 cm) had minimum leaf length.

2.3 To evaluate vase life of different cultivars under ambient condition.

Lukaszewska (1981) reported improved opening of florets and increased vase life of gladiolus placed in 5% sucrose or glucose with an antiseptic and concluded that sucrose (5%) in vase solution is found to increase the vase life of gladiolus.

Gowda and Murthy (1993) reported that gladiolus spikes treated with sucrose 2% + $Al_2 (SO_4)_3$ (0.5 mM) improved the vase life by about 7-8 days over control.

Reddy *et al.* (1993) reported a longer vase life of 10 days with 4% sucrose + 200 ppm 8-HQS as compared to 6.3 days for control in gladiolus cv. Sylvia.

Singh *et al.* (2000) found that sucrose concentration beyond 2% did not show any significant increase in vase life, floret size and opening of floret. The biocide when used alone only slightly increase vase life. It is inferred that 2% sucrose along with 200 ppm 8-HQC was best combination for improving vase life and opening of florets in gladiolus.

Singh and Beura (2002) have observed that the combination of sucrose 4%, $CaSO_4$ and $AgNO_3$ significantly enhanced the diameter, full opening and longevity of florets and solution uptake by cut gladiolus spikes. Sucrose 4% + $CaSO_4$ 100 ppm, proved most effective for vase life and total blooming period recorded maximum vase life and total blooming period of 22.3 days, respectively.

Srivastava *et al.* (2005) observed that in gladiolus cv. Nova Lux, among all the pulsing treatments, sucrose (2%) + $Al_2 (SO_4)_3$ (200 ppm) was found better for most of the floral traits.

Namita *et al.* (2006) observed that the maximum vase life of 9.72 days and highest florets diameter of 9.60 cm were found in treatment T_1 (Sucrose 4% + $Al_2 (SO_4)_3$, $16H_2O$ 400 ppm), which was significantly superior to rest of the treatments. The maximum number (7.54) of florets opening at one time was recorded in treatment T_1.

Gupta *et al.* (2007) reported that out of 12 combinations of holding solution tested, two combinations, i.e. aluminium sulphate (300 ppm) and sucrose (3%) + aluminium sulphate (300 ppm) showed better vase life and flower diameter in all the cultivars than their respective control.

Pal and Sirohi (2007) the findings of the spikes of gladiolus (Gladiolus grandiflorus cv. White Prosperity) were cut when the first bud started to open and then placed in vase solutions consisting of different concentrations of aluminium sulfate, cupric sulfate, citric acid and sucrose and controls were placed in distilled water. Spikes treated with aluminium sulfate + cupric sulfate at 250 ppm + citric acid at 200 mg/l + sucrose at 7% recorded the maximum values for vase life.

Khan *et al.* (2009) conducted an experiment to determine the optimum level of sucrose concentration and pH to extend the vase life of gladiolus flower. Flowers in 3.0% sucrose solution took maximum days to 50% florets senescence (8.47 days) which was statistically identical to 4.5% sucrose solution. Poor performance was observed for the vase solution having high pH (7.0) and without sucrose.

Ranpise *et al.* (2010) conducted an experiment to develop an appropriate pulsing solution for prolonging the vase life of gladiolus flower and to study the changes associated with extended vase life during the winter season. The treatments comprised sucrose at 2.5, 5.0 and 7.5%, AgNo3 at 250 and 500 ppm and control. Results showed that the 5.0% sucrose pulsing treatment was most effective with maximum vase life (17.25 days), followed by the 2.5% sucrose and 500 ppm

AgNo3 treatments with 15.75 days of vase life compared to the control (9.50 days).

Sanjeev *et al.* (2010) a study conducted on White Prosperity gladiolus, the treatment of 4% sucrose + 250 ppm 8-hydroxy quinoline citrate tended to increase vase life (10.07 days).

Vijayalaxmi *et al.* (2011) found that citric acid 250 ppm + sucrose 4% gave best results among different combination of holding solution. Aluminium sulphate was also found to be good for improving post- harvest life of cut tuberose spikes.

Beniwal (2011) an experiment was conducted to find out the effect of floral preservatives on vase life of gladiolus spikes cv. Punjab Dawn. Among all the pulsing treatments i.e. T_1-Control (with distilled water), T_2-Sucrose 5%, T_3Sucrose 5% + $AgNO_3$ (100 mg/l), T_4-Sucrose 5% + $AgNO_3$ (200 mg/l), T_5-Sucrose 5% + $Al_2 (SO_4)_3.16H_2O$ (100 mg/l), T_6-Sucrose 5% + $Al_2 (SO_4)_3.16H_2O$ (200 mg/l), T_7-Sucrose 5% + Citric acid (100 mg/l) and T_8-Sucrose 5% + Citric acid (200 mg/l), treating of cut spikes with sucrose 5% + $Al_2 (SO_4)_3.16H_2O$ (200 mg/l) was found to be the most effective in extending vase life upto 9.50 days.

Anuj and Jitendra (2012) the laboratory experiment was conducted by using different concentrations of sucrose, $AgNO_3$ and 8-HQC to find out the influence of various preservatives on different post harvest attributes in gladiolus cv. White Prosperity. The data revealed that maximum vase life of cut spike of gladiolus was recorded with sucrose 2 per cent + 8-HQC 400 ppm, whereas minimum with control.

CHAPTER- III

MATERIALS AND METHODS

This chapter deals with the concise description of the materials used and the techniques adopted during the course of investigation. The present investigation entitled **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** was conducted at Department of Horticulture, Collage of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *Rabi* season October-April (2016-17). The details regarding material used and techniques employed in present investigation are briefly described in this chapter.

3.1 Experimental site

The experimental site was located at the Horticulture Research cum Instructional Farm of the Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh where adequate facilities for irrigation and drainage existed.

3.2 Geographical location

Raipur, the capital of Chhattisgarh state of India is situated in the central part of Chhattisgarh and lies between $21^0$16' N latitude and $81^0$36' E longitude at an altitude of 289.56 m above mean sea level.

3.3 Agro – climatic condition

Raipur is located in dry sub humid agro-climatic region. The annual rainfall of the region ranges from 1200-1325 mm of which is receive from third week of June to first week of September and very little during October and February. May is the hottest month and December is the coolest. The pattern of rainfall particularly during June to September varies greatly. The maximum temperature of this region may reach as high as 46^0 C during summer and minimum may fall to 6^0 C during winter. The atmospheric humidity is high from June to October. Weekly average meteorological data during the span of experimentation (2016-2017), as

recorded at meteorological observatory, IGKV, Raipur have been presented in Appendix-I and depicted through Fig.3.1.

3.4 Experimental details

The experiment was laid out in Randomized Block Design (RBD). The other details are as follows:

Crop	- Gladiolus (*Gladiolus hybridus* L.)
Gross planting area	- 172.42 m^2 (23.30 m x 7.40 m)
Net planting area	- 90.72 m^2
Replication	- 3
Total number of plots	- 42
Number of treatments	- 14 (cultivars)
Net plot size	- 1.80 m x 1.20 m
Distance between plots	- 0.5 m
Distance between replication	- 1 m
Distance between row to row	- 30 cm
Distance between plant to plant	- 20 cm
Number of corms planted per plot	- 30
Total number of corms utilized	- 1260
Depth of planting	- 5 cm
Date of planting	- 28 October 2016

The experiment was laid out in RBD with 14 treatments (cultivars) and three replication to evaluate the performance of these varieties.

Treatments:

T_1 – Candyman	T_2 – Nova Lux	T_3 – Gunjan
T_4 – Advantage	T_5 – Punjab Dawn	T_6 – Summer Sunshine
T_7 – Her Majesty	T_8 – Dull Queen	T_9 – Saffron
T_{10} – GS-2	T_{11} – American Beauty	T_{12} – White Prosperity
T_{13} – Red Majesty	T_{14} – Fancy Pink	

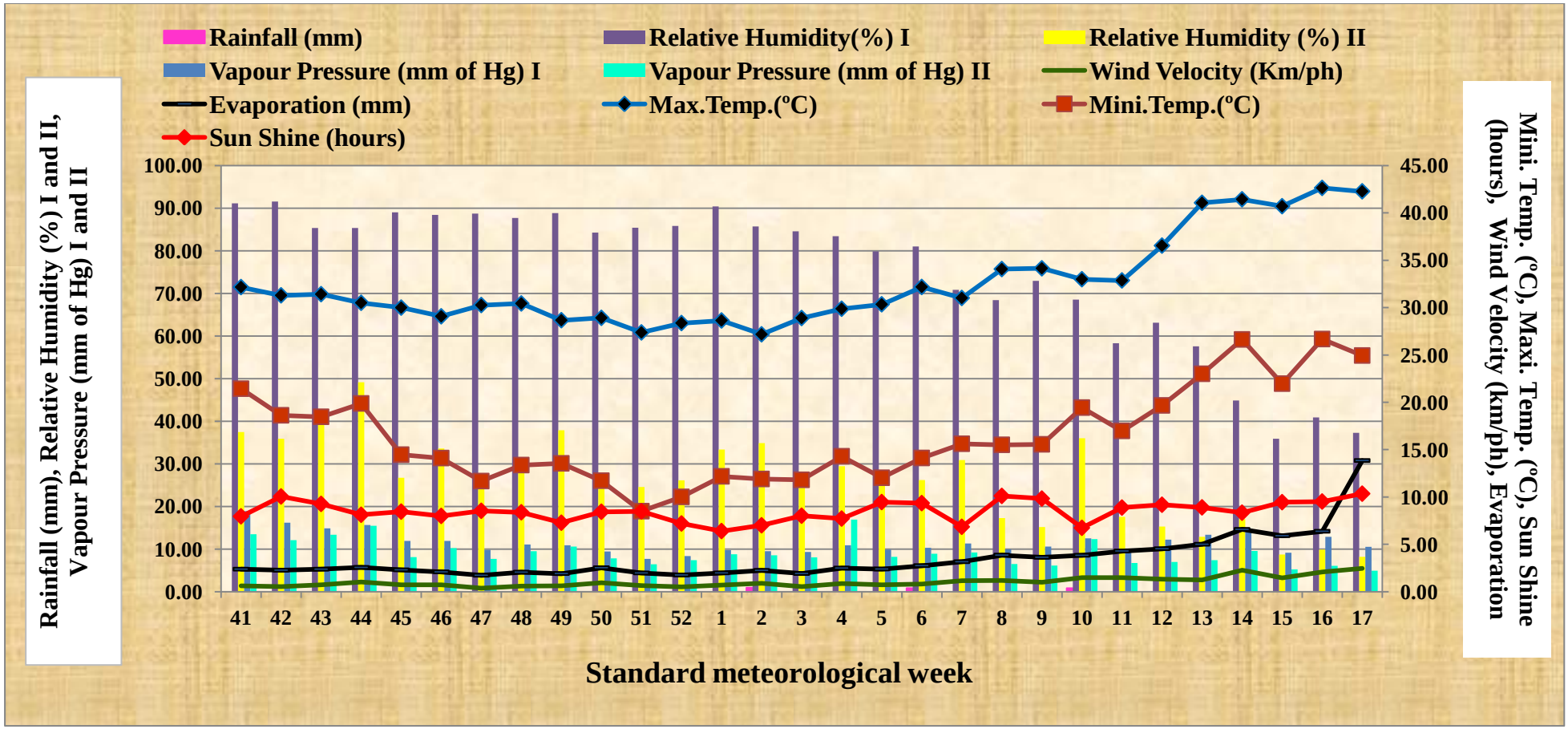


Fig 3.1: Weekly meteorological observations during the crop growth period 2016-17

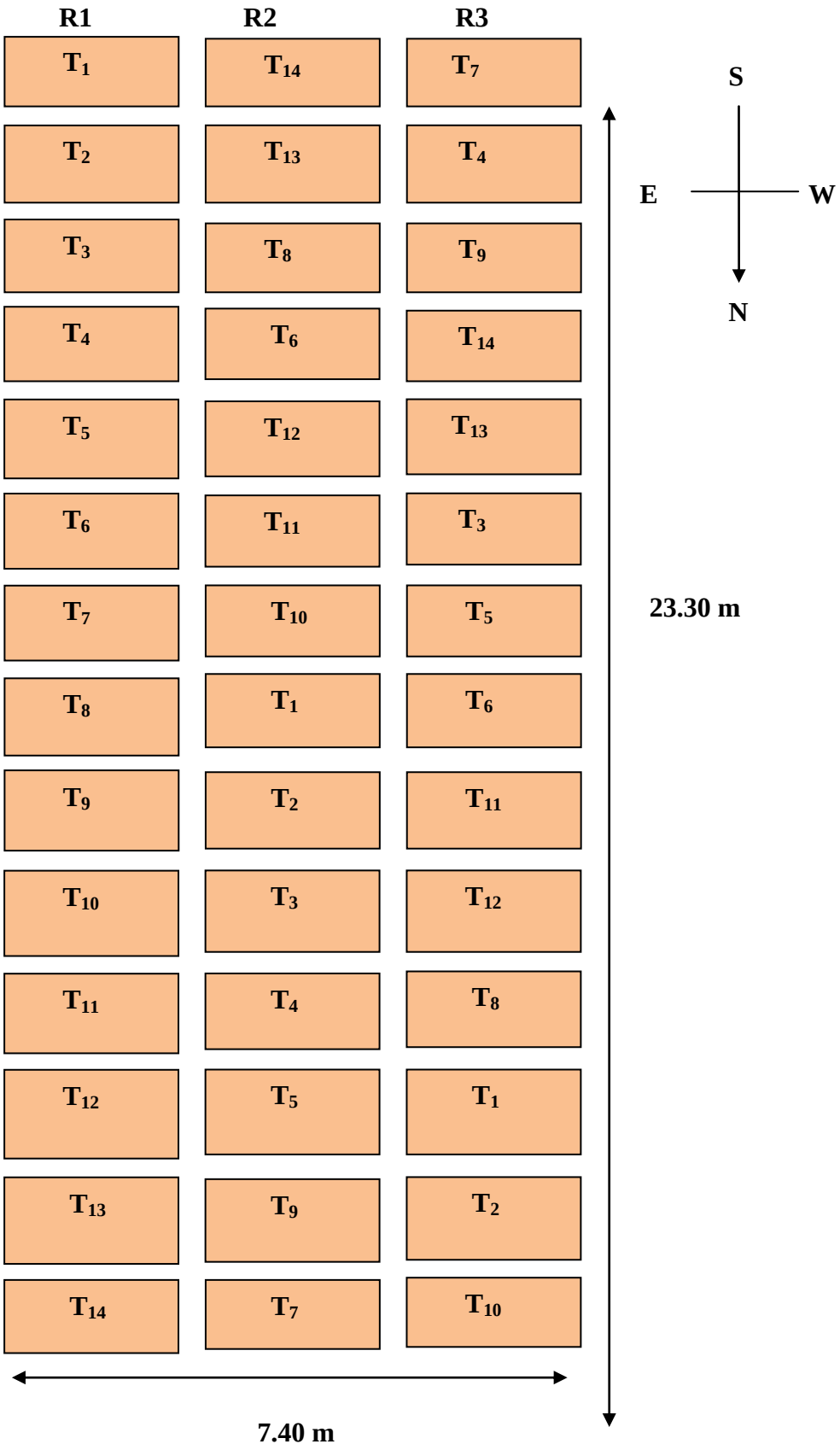


Fig.3.2: Layout plan of the experiment

Fig 3.3: A view of experimental field

3.5 Cultural operations

3.5.1 Field preparation

Field preparation is done by ploughing the field with mould board plough once, followed by harrowing, leveling and collection of crop debris. During harrowing, well rotten FYM was incorporated in soil at the rate of 15 tonnes per hectare. Then the field was divided into three blocks spaced at one meter distance. Each block was further sub-divided into thirteen sub-plots at a distance of 0.5 m.

3.5.2 Planting

The usual method of propagation of gladiolus is through corms and cormels. Healthy uniform sized corms ranged between 3cm to 5cm were planted after treating with Carbendazim @ 1gm/ liter of water and 10-15 minute dipping.

3.5.3 Manure and fertilizer application

Recommended fertilizer of doses nitrogen ($40g/m^2$), phosphorus ($20gm/m^2$) and potassium ($20gm/m^2$) were applied during the course of the experiment. Full doses of potassium and phosphorus were given as basal application at the time of planting and nitrogen was given in 2 split doses at 3 and 6 leaf stages as suggested by Mukherjee *et al*.1994. FYM was given as basal application at the rate of $5kg/m^2$ as recommended by Arora (1992).

3.5.4 Irrigation

Pre emergence irrigation was given just after planting of corms and then irrigation was given to crop at an interval of 8-10 days as per the requirement through controlled flooding method.

3.5.5 Weeding and earthing up

Intercultural operations followed by weeding and earthing up was done at 40 and 60 days respectively after planting in order to avoid crop weed competition and to cover up the exposed corms and also to prevent the crop from lodging.

3.5.6 Plant protections measures

Botrytis blight was noticed during growing period. Mencozeb and Carbendazim @ 0.1% were sprayed in order to protect the crop from the fungal disease.

3.5.7 Harvesting of spikes

Gladiolus spike were harvested when lower 1-2 florets has shown colour. Harvesting of spikes is done at 2-3 days intervals.

3.5.8 Lifting of corms and cormels

The maturity of corms is identified by browning of leaves and wilting of plants. The corms and cormels were lifted about 60 days after cutting of spikes. The corms are lifted with the tools like digging fork, garden spade or khurpi with utmost care so as to avoid any mechanical injury to the corms. The infected and injured corms and cormels, stone and pebbles were removed. The corms and cormels were separated and then graded according to the size. The corms are then dried in shade for one week.

3.6 Observations recorded

In all observations for 22 characters were recorded for this investigation on flowering and on corm production of gladiolus, the details of which are given below:

3.6.1 Growth parameters

3.6.1.1 Days to 50 percent sprouting of mother corms

Number of days to 50 percentage sprouting of corms in each treatment was recorded for five corms than averaged.

3.6.1.2 Plant height (cm)

The height of the five tagged plant was measured in each treatment from the soil surface to the tip of the longest leaves with the help of meter scale at 20, 40 and 60 days after planting and their average was worked out.

3.6.1.3 Number of leaves per plant

The total number of leaves in 5 tagged plants in each plot was counted at 20, 40, and 60 days after planting than average was desired.

3.6.1.4 Length of leaves (cm)

Length of the leaf is measured in cm of 3rd leaf of every plant selected for observation from the point of attachment to the tip of the leaf. These observation from the five plants at 20, 40, and 60 days after planting than averaged are recorded for the statistical analysis.

3.6.1.5 Width of leaves (cm)

It was measured from three positions of leaf blade top middle and lower positions on 20, 40 and 60 days after planting was recorded from five tagged plants and average was worked out.

3.6.2 Flowering yield and quality parameters

3.6.2.1 Days taken to spike emergence

Days to first spike emergence from plantation of corms to flower spike initiation was recorded from five tagged plants and average was worked out.

3.6.2.2 Days taken to first floret colour show

Number of days taken from plantation of corms to color break of the first floret was recorded from five tagged plants.

3.6.2.3 Days taken to first floret open/bloom

Number of days taken from plantation of corms to opening of first floret in each spike was recorded from five tagged plants and average was worked out.

3.6.2.4 Length of spikes (cm)

Spike length was measured from base of spike to the top most floret at the time of complete opening of flower.

3.6.2.5 Length of rachis (cm)

Length of rachis was measured from five spikes of tagged plants from the point of emergence of first floret to the last floret and expressed in centimeters.

3.6.2.6 Inter nodal length of floret (cm)

Intermodal length between the florets was measured by meter scale from five tagged plants and average was worked out.

3.6.2.7 Number of florets per spikes

Total number of florets per spike was counted from five tagged plants and average was worked out.

3.6.2.8 Diameter of floret (cm)

Diameter of three basal florets from each spike of five tagged plants was measured by vernier calipers and average was worked out.

3.6.2.9 Days taken to flower duration

Number of days to flower duration was counted from first basal floret open to end floret wilting shown in five tagged plant average was worked out.

3.6.3 Corms and Cormels yield

3.6.3.1 Number of corms per plant

The number of corms per plant were counted for five plants and then averaged

3.6.3.2 Weight of corms per plant (g)

Corms from five plants were weighed and then averaged.

3.6.3.3 Diameter of corms (cm)

Diameter of corm was measured with the help of vernier calipers

3.6.3.4 Number of cormels per plant

The numbers of cormels per plant were counted for five plants and then average was worked out.

3.6.3.5 Weight of cormels per plant (g)

Cormels from five plants were weighed and then average was recorded.

3.6.4 To evaluate vase life of different cultivars

3.6.4.1 Days to basal floret open

Days to basal floret open were recorded from the date of placing, the cut spike in vase solution to complete opening of basal floret.

3.6.4.2 Days to 50% floret wither

The number of days to 50% floret wither was counted for total number of florets in per spike count and first basal floret open to half number of open florets whither then five tagged plants averaged.

$$\textbf{50\% floret whither (\%)} = \frac{\text{Half number of florets wither per spike}}{\text{Total number of floret per spike}} \times 100$$

3.6.4.3 Vase life of gladiolus in ambient condition

The duration between the opening of the first basal floret and wilting of the 6^{th} floret from the basal of spike was taken as actual vase life and presented in days as suggested by Suneetha and Kumar (1998).

3.7 Statistical analysis

The statical analysis was done for Randomized Complete Block Design according to the method given by Panse and Sukhatme (1985). The calculated 'F' value is compared with table F values at 5% level of significance. If the calculated 'F' value was greater than the table value the difference was said to be significant and critical difference was calculated for further comparison. The data collected from various observations recorded in the field as well as laboratory were subjected to statistical analysis to know the degree of variation amongst all the treatments. The analysis of variance was carried out for each character separately as per method of Panse and Sukhatme (1985). Significance of differences among treatments was tested using the following skeleton.

Table 3.1: Analysis of variance for randomize block design

Source of variation	Degree of freedom	Sum of Square	Mean sum of square	'F'calculated	'F'tabulated
Replication	(r-1)	RSS	RMSS	RMSS/ErMSS	
Treatment	(t-1)	TrSS	TrMSS	TrMSS/ErMSS	
Error	(r-1)(t-1)	ErSS	ErMSS		
Total	(rt-1)	TSS			

Where,

r = Replication

t = Treatment

RSS = Sum of square for Replication

TrSS = Sum of square for Treatment

ErSS = Error sum of square

RMSS = Mean sum of square for replication

TrMSS = Mean sujm of square for treatment

ErMSS = Mean sum of square for error In order to compare the mean value of treatment, standard error and critical values were calculated as follows:

a. Standard Error of mean

$$\text{S Em} \pm = \sqrt{\frac{\text{EMS}}{\text{r}}}$$

Where,

S Em = Standard error of mean

EMS = Error Mean of square

r = Number of replications

b. Critical Difference

CD = SEd x t Value at 5% at error degree of freedom

$$S\ Ed = \sqrt{\frac{2EMS}{r}}$$

Where,

S Ed = Standard error of difference between two treatment means

EMS = Error Mean of square

r = Number of replications

CHAPTER- IV

RESULTS AND DISCUSSION

The present chapter deals with the results obtained for various characters of vegetative growth, flowering and corm yield by different cultivars taken as treatments. Further, the result has also been discussed in the available literature. The data has been presented in tabular form as well as supported by graphical representation, wherever necessary. Data recorded on various aspects during the course of investigation revealed interesting facts, which are briefly described in this chapter under the following heads:

4.1 Growth parameter

4.1.1 Days to 50% sprouting of mothers corms

4.1.2 Plant height (cm) at 20, 40, 60 days after planting

4.1.3 Number of leaves per plant at 20, 40, 60 days after planting

4.1.4 Length of leaves (cm) at 20, 40, 60 days after planting

4.1.5 Width of leaves (cm) at 20, 40, 60 days after planting

4.2 Flower yield and quality parameter

4.2.1 Days taken to spike emergence

4.2.2 Days taken to first floret colour show

4.2.3 Days taken to first floret open/bloom

4.2.4 Length of spike (cm)

4.2.5 Rachis length (cm)

4.2.6 Internodal length (cm)

4.2.7 Number of florets per spike

4.2.8 Diameter of florets (cm)

4.2.9 Duration of flowering (Days)

4.3 Corms and cormels yield

4.3.1 Number of corms per plant

4.3.2 Weight of corms per plant (g)

4.3.3 Diameter of corms (cm)

4.3.4 Number of cormels per plant

4.3.5 Weight of cormels per plant (g)

4.4 To evaluate vase life of different cultivars

4.4.1 Days to basal floret open

4.4.2 Days to 50% floret wither

4.4.3 Vase life of gladiolus in ambient condition

4.1 Growth parameter

4.1.1 Days to 50% sprouting of mothers corms

The data on 50% sprouting influenced by different cultivars of gladiolus are presented in Table 4.1 and Fig.4.1.

The perusal of data reveals that cultivar Punjab Dawn (8.67) taken minimum number of days to 50% sprouting which was at par with cultivar Candyman (9.33), Summer Sunshine (9.67), Saffron (9.67), American Beauty (9.67) and White Prosperity (9.67). Cultivar Punjab Dawn was significantly minimum days taken to 50% sprouting over others. The maximum number days (13.33) to taken 50% sprouting was recorded in cultivar Gunjan during investigation.

The above result indicates that different varieties have different dormancy periods and it may also be influence by climatic factors as well as soil temperature. Bose and Yadav (1989) reported that the natural dormancy period lasted from 17-27 weeks. Early cultivars tended to have short dormancy period and late cultivars have long ones.

Table 4.1: Days to 50% sprouting of mother corms of gladiolus

Notation	Treatment	Days to 50% sprouting
T_1	Candyman	9.33
T_2	Nova Lux	10.33
T_3	Gunjan	13.33
T_4	Advantage	11.00
T_5	Punjab Dawn	8.67
T_6	Summer Sunshine	9.67
T_7	Her Majesty	11.00
T_8	Dull Queen	10.33
T_9	Saffron	9.67
T_{10}	GS-2	11.67
T_{11}	American Beauty	9.67
T_{12}	White Prosperity	9.67
T_{13}	Red Majesty	11.33
T_{14}	Fancy Pink	11.67
S.Em±		**0.81**
C.D at 5%		**2.36**

4.1.2 Plant height (cm)

The observation on plant height was recorded at 20, 40, 60 days after planting and presented in Table 4.2 and Fig. 4.2.

The maximum (49.11 cm) plant height was recorded in cultivar Candyman at 20 DAP which was at par with cultivar White Prosperity (47.94 cm), Nova Lux (47.57 cm) and Advantage (47.31 cm). The minimum plant height was recorded in cultivar Dull Queen (30.34 cm).

During the course of growth the maximum (72.31 cm) plant height was recorded in cultivar Summer Sunshine at 40 DAP which was statistically at par with cultivar Candyman (71.42 cm), Nova Lux (69.12 cm), Red Majesty (69.00 cm), Advantage (68.81 cm) and GS-2 (67.07 cm) and minimum was observed in cultivar Dull Queen (43.37 cm).

At 60 DAP maximum plant height (100.21 cm) was recorded in cultivar Candyman. Which was significantly superior to rest of the other cultivars. The minimum plant height was recorded in cultivar Dull Queen (53.70 cm) and was significantly shorter than rest of the cultivars. The variation in plant height may be due to genetic makeup of the cultivar, which might differ variety to variety.Kumari and kumar (2015) reported that variation in final plant height among all the

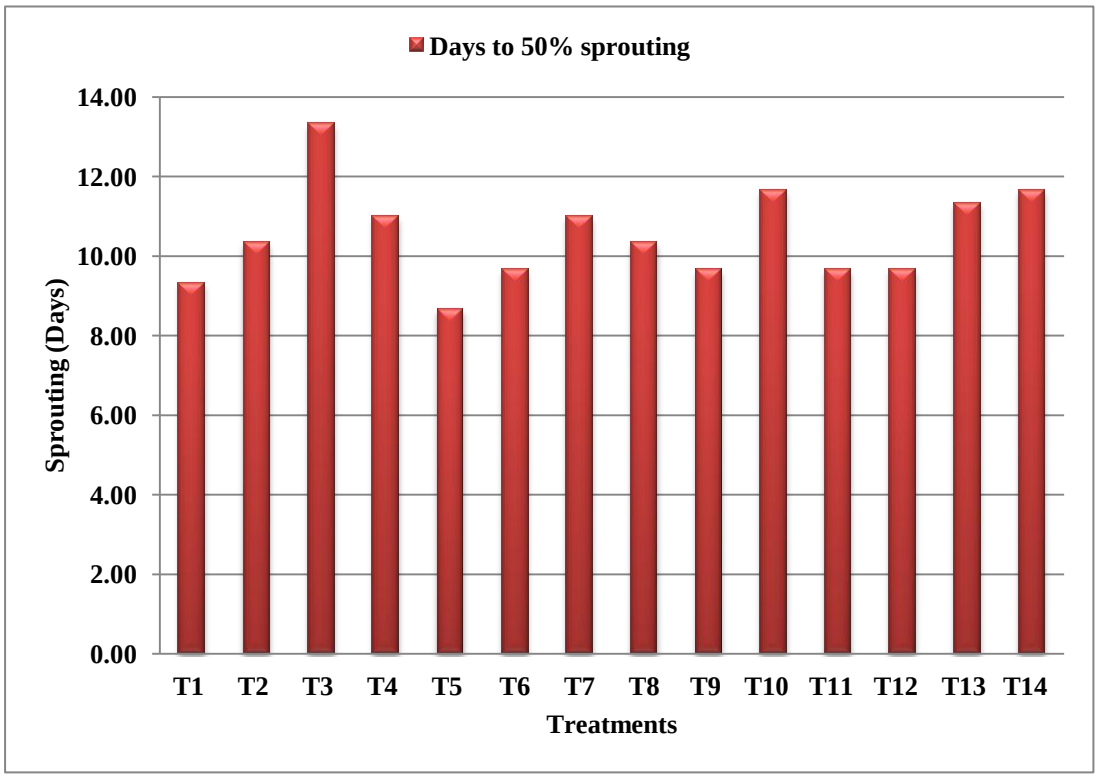


Fig.4.1: Days to 50% sprouting mother corms of different gladiolus varieties

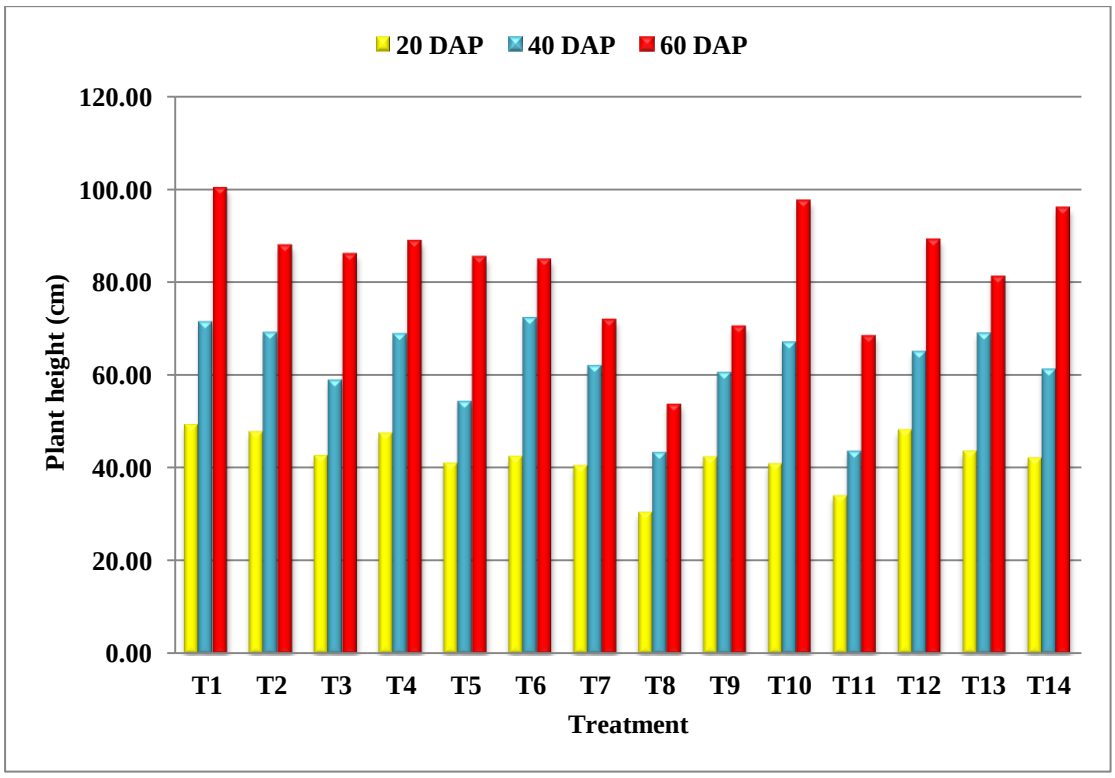


Fig.4.2: Plant height (cm) at different stage of growth

cultivars may be due to the hereditary traits or prevailing environmental conditionsof the growing location.

Table 4.2: Plant height (cm) at different stage of growth

Notation	Treatment	Plant height (cm)		
		20 DAP	40 DAP	60 DAP
T_1	Candyman	49.11	71.42	100.21
T_2	Nova Lux	47.57	69.12	87.91
T_3	Gunjan	42.45	58.91	86.02
T_4	Advantage	47.31	68.81	88.83
T_5	Punjab Dawn	40.89	54.31	85.43
T_6	Summer Sunshine	42.31	72.31	84.83
T_7	Her Majesty	40.33	62.00	71.97
T_8	Dull Queen	30.34	43.37	53.70
T_9	Saffron	42.14	60.52	70.47
T_{10}	GS-2	40.69	67.07	97.47
T_{11}	American Beauty	33.88	43.60	68.41
T_{12}	White Prosperity	47.94	65.04	89.17
T_{13}	Red Majesty	43.44	69.00	81.21
T_{14}	Fancy Pink	41.98	61.23	95.97
S.Em±		**1.88**	**2.00**	**0.57**
C.D at 5%		**5.48**	**5.83**	**1.68**

4.1.3 Number of leaves per plant

The data recorded on number of leaves per plant at different growth stages are presented in the Table 4.3 and Fig 4.3.

Number of leaves is significantly influenced at different growth stages. The maximum (3.57) number of leaves was recorded in cultivar GS-2 which was at par with cultivar Candyman (3.43), White Prosperity (3.07), Gunjan (3.03), Punjab Dawn (3.00), Red Majesty (3.00) and Summer Sunshine (2.97) and significantly higher than rest of the other cultivars. Minimum (2.40) number of leaves was observed in cultivar Her Majesty at 20 DAP.

At 40 DAP highest number of leaves was recorded in cultivar Gujan (6.07) which was at par with cultivar GS-2 (5.83) and Advantage (5.77) and it was found superior over other cultivars at 40 DAP. The lower number of leaves was observed in cultivar Nova Lux (4.17).

In case of 60 DAP the higher (8.03) number of leaves was recorded in cultivar Candyman which was at par with cultivar White Prosperity (7.87), GS-2

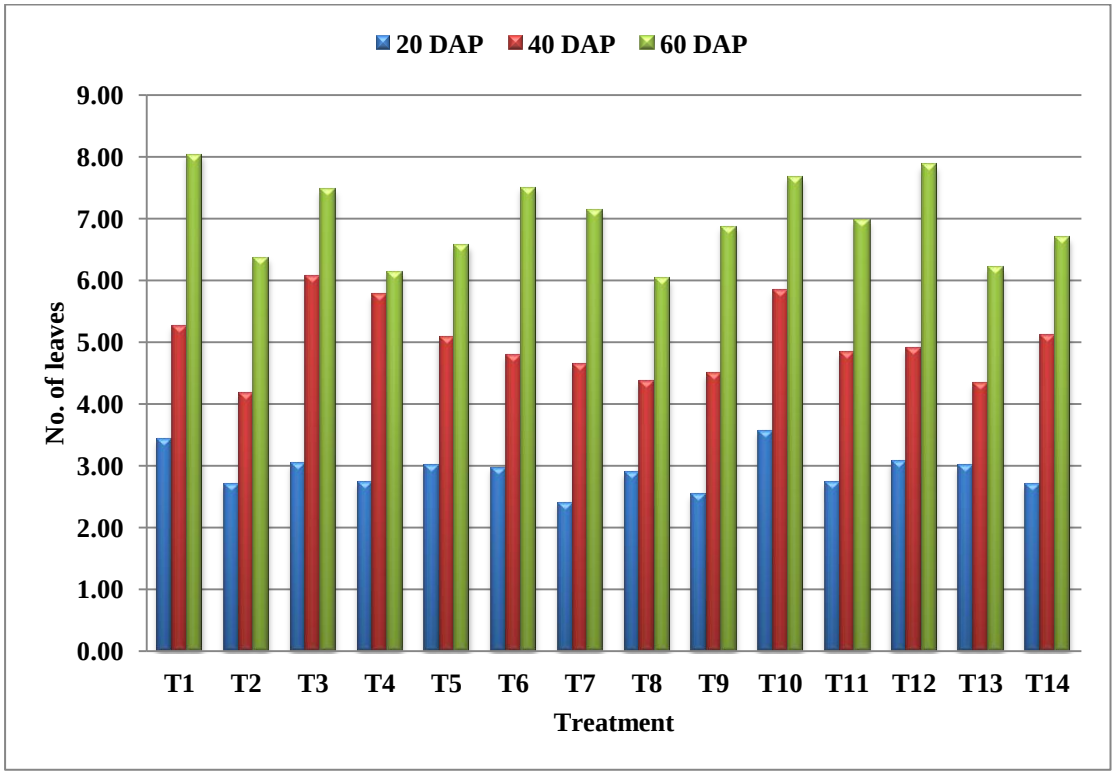


Fig.4.3: Number of leaves per plant at different stage of growth

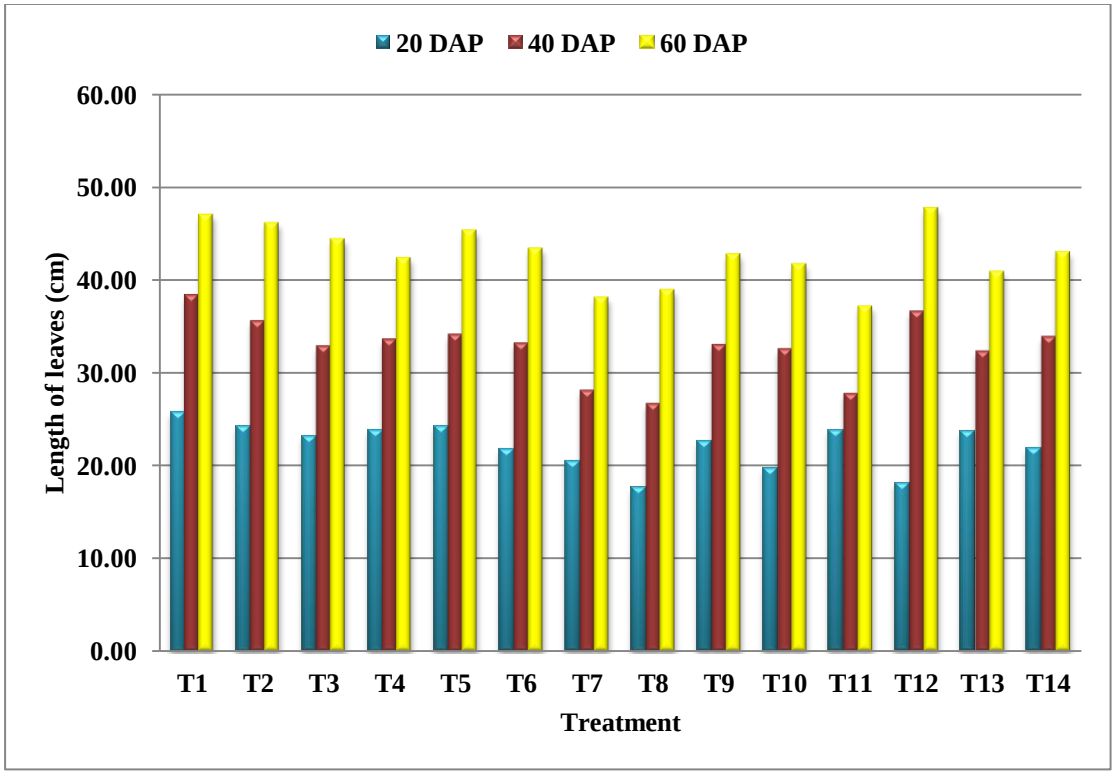


Fig.4.4: Length of leaves (cm) at different stage of growth

(7.67), Summer Sunshine (7.50), Gunjan (7.47), American Beauty (6.97) and Her Majesty (7.13). However, it was significantly superior then rest of the cultivars. The lowest number of leaves was recorded in cultivar Dull Queen (6.03).

Significant variation was observed as to the number of leaves amongst the cultivars. The variation in number of leaves might be due to genotype as well as some known or unknown environmental factors. Similar results were also reported by Hossain *et al.* (2011).

Table 4.3: Number of leaves per plant at different stage of growth

Notation	Treatment	Number of leaves		
		20 DAP	**40 DAP**	**60 DAP**
T_1	Candyman	3.43	5.27	8.03
T_2	Nova Lux	2.70	4.17	6.37
T_3	Gunjan	3.03	6.07	7.47
T_4	Advantage	2.73	5.77	6.13
T_5	Punjab Dawn	3.00	5.07	6.57
T_6	Summer Sunshine	2.97	4.80	7.50
T_7	Her Majesty	2.40	4.63	7.13
T_8	Dull Queen	2.90	4.37	6.03
T_9	Saffron	2.53	4.50	6.87
T_{10}	GS-2	3.57	5.83	7.67
T_{11}	American Beauty	2.73	4.83	6.97
T_{12}	White Prosperity	3.07	4.90	7.87
T_{13}	Red Majesty	3.00	4.33	6.20
T_{14}	Fancy Pink	2.70	5.10	6.70
S.Em±		**0.21**	**0.23**	**0.37**
C.D at 5%		**0.62**	**0.67**	**1.08**

4.1.4 Length of leaves (cm)

The data on length of leaves at 20, 40, 60 DAP were recorded and are presented in the Table 4.4 and depicted in Fig 4.4.

The data on length of leaves was recorded at 20, 40 and 60 DAP. Significantly the maximum length of leaves (25.67) was recorded in cultivar Candyman which was at par with cultivar Punjab Dawn (24.26 cm), Nova Lux (24.20 cm), American Beauty (23.81 cm), Advantage (23.79 cm), Red Majesty (23.70 cm), Gunjan (23.23 cm), Saffron (22.57), Fancy Pink (21.80 cm) and Summer Sunshine (21.71 cm). The lower length of leaves (17.63 cm) was noted in cultivar Dull Queen during the first growth stage.

Different cultivars shows significant impacts on length of leaves during 40 DAP. Higher leaves length (38.29 cm) was observed in cultivar Candyman which was at par with cultivar White Prosperity (36.52 cm), Nova Lux (35.48 cm) and significantly higher than rest of the other cultivars. The minimum length of leaves (26.61 cm) was noted in cultivar Dull Queen.

At 60 DAP significantly maximum length of leaves (47.70 cm) was recorded in cultivar White Prosperity which was at par with cultivar Candyman (47.00 cm), Nova Lux (46.10 cm) and Punjab Dawn (45.29 cm) and significantly differ with rest of the other cultivars. The lowest length of leaves was recorded (37.14 cm) in cultivar American Beauty. Differences in length of leaves might be due to genetic makeup of the cultivars, which is governed by the genotypic constituent of the plant. Similar results were also found by Kumar and Yadav (2005) and Swaroop *et al.* (2011).

Table 4.4: Length of leaves (cm) at different stage of growth

Notation	Treatment	Length of leaves (cm)		
		20 DAP	**40 DAP**	**60 DAP**
T_1	Candyman	25.67	38.29	47.00
T_2	Nova Lux	24.20	35.48	46.10
T_3	Gunjan	23.23	32.78	44.36
T_4	Advantage	23.79	33.51	42.33
T_5	Punjab Dawn	24.26	34.04	45.29
T_6	Summer Sunshine	21.71	33.12	43.37
T_7	Her Majesty	20.48	28.02	38.07
T_8	Dull Queen	17.63	26.61	38.90
T_9	Saffron	22.57	32.95	42.74
T_{10}	GS-2	19.66	32.49	41.66
T_{11}	American Beauty	23.81	27.69	37.14
T_{12}	White Prosperity	18.12	36.52	47.70
T_{13}	Red Majesty	23.70	32.23	40.86
T_{14}	Fancy Pink	21.80	33.80	42.97
S.Em±		**1.57**	**1.09**	**0.96**
C.D at 5%		**4.58**	**3.16**	**2.78**

4.1.5 Width of leaves (cm)

The data on width of leaves at 20, 40, 60 DAP were recorded and are presented in the Table 4.5 and depicted in Fig 4.5.

The data in respect to gladiolus width of leaves was recorded at 20, 40 and 60 DAP. Significantly higher width of leaves (1.92 cm) was observed in cultivar

Candyman which was at par with cultivar Advantage (1.80 cm), Fancy Pink (1.76 cm), White Prosperity (1.75 cm) and Red Majesty (1.74 cm) and it was found significantly differ with rest of the other cultivars. The lower width of leaves was recorded in cultivar Her Majesty (1.09 cm) at 20 DAP.

At 40 DAP maximum width of leaves (2.38 cm) was observed in cultivar Candyman which was at par with cultivar White Prosperity (2.36 cm), Summer Sunshine (2.20 cm), Fancy Pink (2.19 cm), Red Majesty (2.13 cm) and Advantage (2.07 cm). The lowest width of leaves (1.22 cm) was noted under cultivar Her Majesty.

During 60 DAP the cultivar White Prosperity gave maximum width of leaves (2.81 cm) which was at par with cultivar GS-2 (2.77 cm), Summer Sunshine (2.74 cm), Gunjan (2.71 cm), Fancy Pink (2.61 cm) and Punjab Dawn (2.50 cm) and it was noted significantly differ with rest of the other cultivars. The minimum width of leaves was noted from cultivar Dull Queen (1.74 cm).

The variation in leaf width among the cultivars might be due to variation in their genetic constitution that could have lead to differential rates of photosynthesis and ultimately influence to vegetative growth and development of the plants. Variation in leaf width amongst gladiolus varieties has also been reported by Kumar and Yadav (2005).

Table 4.5: Width of leaves (cm) at different stage of growth

Notation	Treatment	Width of leaves (cm)		
		20 DAP	40 DAP	60 DAP
T_1	Candyman	1.92	2.38	2.46
T_2	Nova Lux	1.35	1.60	1.81
T_3	Gunjan	1.35	1.72	2.71
T_4	Advantage	1.80	2.07	2.17
T_5	Punjab Dawn	1.24	1.53	2.50
T_6	Summer Sunshine	1.74	2.20	2.74
T_7	Her Majesty	1.09	1.22	1.95
T_8	Dull Queen	1.11	1.31	1.74
T_9	Saffron	1.17	1.64	2.20
T_{10}	GS-2	1.29	1.83	2.77
T_{11}	American Beauty	1.35	1.75	2.14
T_{12}	White Prosperity	1.75	2.36	2.81
T_{13}	Red Majesty	1.74	2.13	2.19
T_{14}	Fancy Pink	1.76	2.19	2.61
S.Em±		**0.06**	**0.11**	**0.14**
C.D at 5%		**0.19**	**0.32**	**0.40**

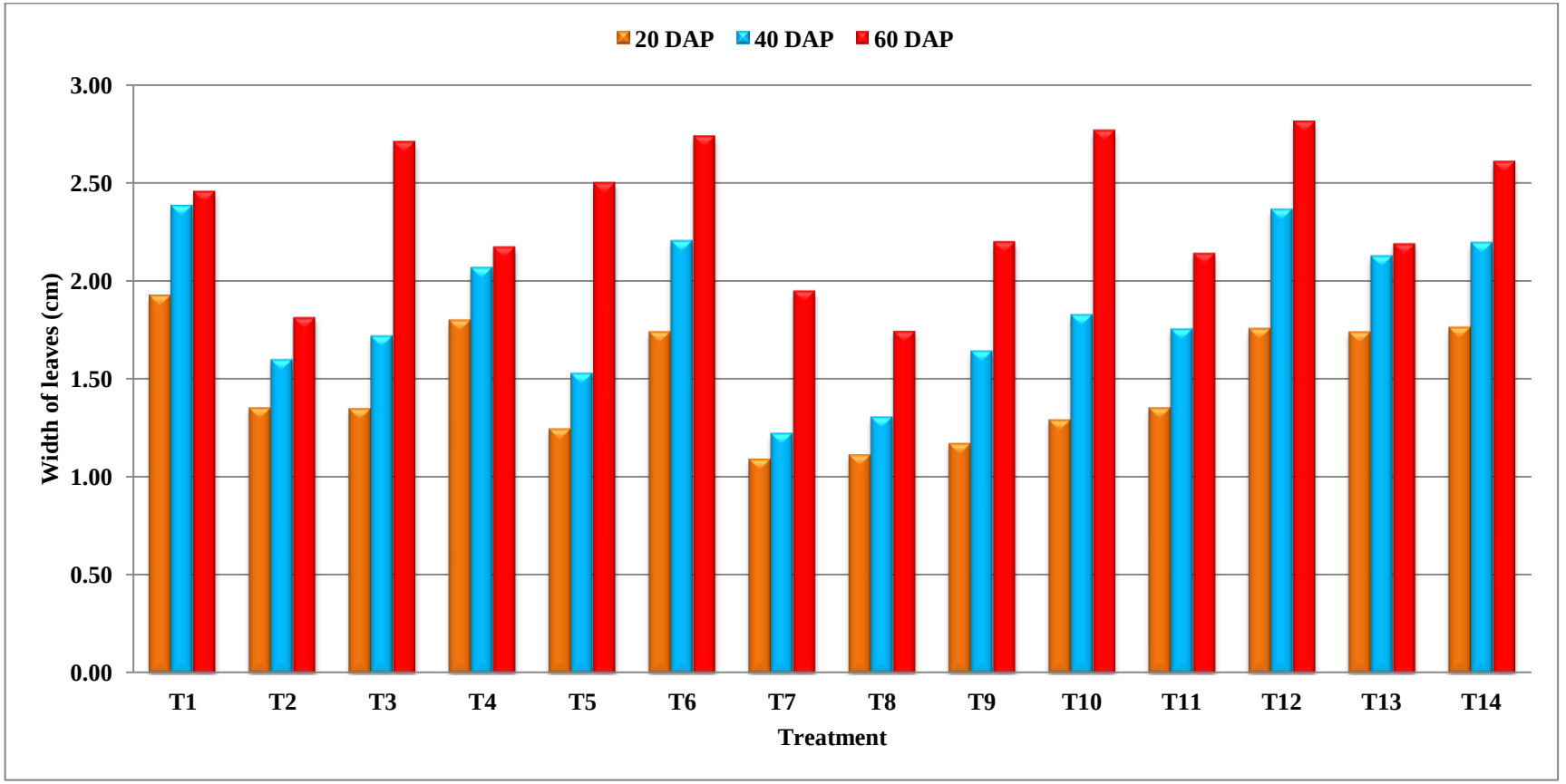


Fig.4.5: Width of leaves (cm) at different stage of growth

4.2 Flower yield and quality parameter

4.2.1 Days taken to spike emergence

The data on number of days to spike emergence were recorded and are presented in the Table 4.6 and Fig.4.6.

The cultivar Nova Lux was taken minimum number of days to spike emergence (60.49) which was showed at par with cultivar American Beauty (60.83), Fancy Pink (60.86), Punjab Dawn (61.63), White Prosperity (61.73), Dull Queen (61.82), Her Majesty (62.71) and GS-2 (63.12). However, it was significantly earlier then other cultivars. Candyman (72.26) took maximum number of days to spike emergence.

Time required for spike emergence is an important varietal character in gladiolus that might be primarily governed by the genetic makeup of the varieties. Spike emergence might have been primarily dependent on food reserves in plant that could be related to growth rate of plants regulating accumulation of the requisite level of carbohydrates for slipping. Similar results on varietal differences for spike emergence have reported by Nagaraju and Parthasarthy (2001) and Kumar and Yadav (2005).

4.2.2 Days taken to first floret colour show

The data on number of days to first floret colour show were recorded and are presented in the Table 4.6 and Fig 4.6.

The cultivar American Beauty (67.09) was taken minimum number of days to first floret colour show which was at par with cultivar GS-2 (69.01), Punjab Dawn (69.12), White Prosperity (69.92), Dull Queen (70.38) and Fancy Pink (70.71). However, it was significantly earlier then other cultivars. The cultivar Candyman (83.50) took maximum number of days to first floret colour show.

The Variation in days to first floret colour show might be attributed to genetic makeup of the cultivars, which is governed by the genotypic constituent of the plant and it may also be influence with growing environment of the plants. These results are in line with the result of Arora and Khanna (1985) and Rani *et al* (2007) who reported superiority of some genotypes over other genotypes arisen due to variation of genotypes used.

4.2.3 Days taken to first floret open

The data on number of days to first floret open were recorded and are presented in the Table 4.6 and Fig 4.6.

The data reveals that the minimum days to full bloom of first floret was taken by cultivar American Beauty (68.25) which was at par with cultivar White Prosperity (69.90) and Punjab Dawn (71.15). However, it was found significantly differ with rest of the other cultivars. The maximum number of days to first floret open (86.20) was recorded in cultivar Candyman.

The Variation in days to first floret open might be attributed to differences in genetic makeup of the cultivars and might also be influenced by their growing envoirnmental conditions. Similar results were obtained by Arora and Sandhu (1987), Kem *et al*, (2003) and Swaroop *et al.* (2011).

Table 4.6: Days taken to spike emergence, first floret color show and first floret open

Notation	Treatment	Days taken to spike emergence	Days taken to first floret color show	Days taken to first floret open
T_1	Candyman	72.26	83.50	86.20
T_2	Nova Lux	60.49	71.06	74.37
T_3	Gunjan	65.38	74.07	78.07
T_4	Advantage	67.53	76.14	79.43
T_5	Punjab Dawn	61.63	69.12	71.15
T_6	Summer Sunshine	65.51	73.16	75.07
T_7	Her Majesty	62.71	71.78	74.47
T_8	Dull Queen	61.82	70.38	72.27
T_9	Saffron	67.17	77.80	79.08
T_{10}	GS-2	63.12	69.01	71.33
T_{11}	American Beauty	60.83	67.09	68.25
T_{12}	White Prosperity	61.73	69.92	69.90
T_{13}	Red Majesty	66.93	76.29	79.98
T_{14}	Fancy Pink	60.86	70.71	74.12
S.Em±		**1.01**	**1.26**	**1.01**
C.D at 5%		**2.94**	**3.67**	**2.95**

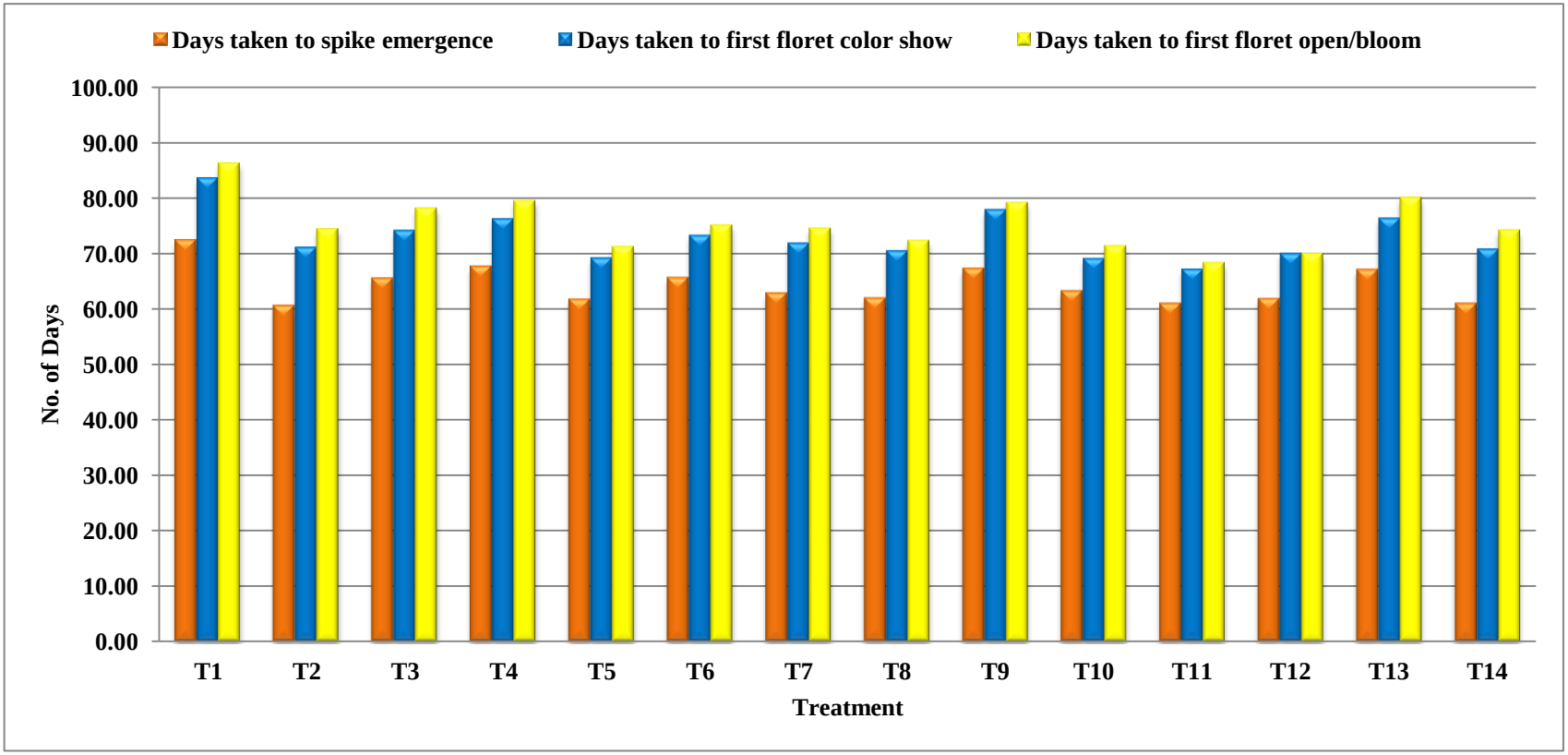
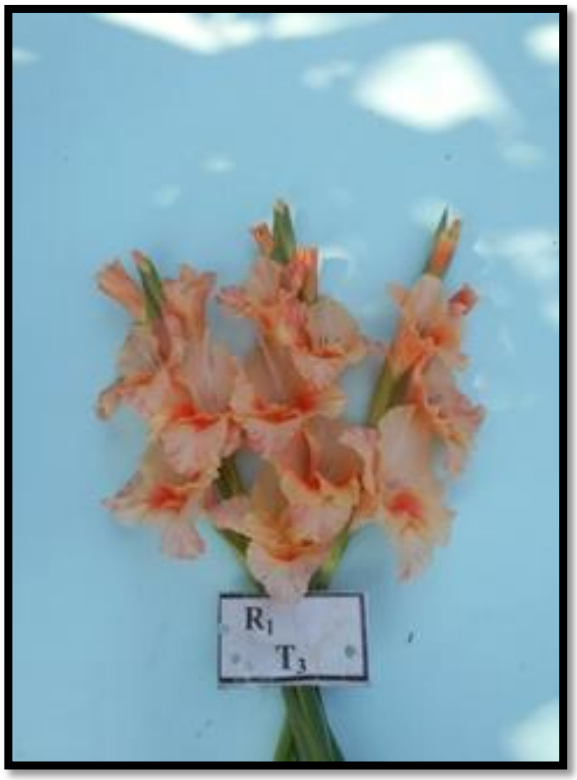


Fig.4.6: Days taken to spike emergence, first floret color show and first floret open

Candyman

Nova Lux



Gunjan

Advantage

Fig 4.7: Harvested spike of cultivars Candyman, Nova Lux, Gunjan, Advantage

4.2.4 Length of spike (cm)

The data on length of spike was recorded and are presented Table 4.7 and Fig 4.8.

The length of spike was significantly higher in cultivar Saffron (78.13 cm) which was at par with cultivar Candyman (76.16 cm), White Prosperity (75.33 cm) and Fancy Pink (75.30 cm). However, it was showed significant difference with other cultivars. The minimum length of spike was recorded under cultivar Gunjan (51.11 cm).

The variation in length of spike might be due to differences in genetic constitution of genotypes which show their character in one generation to next generation. Similar results were also reported by Arora *et al.* (2002), Rani *et al.* (2007) and Sindhu *et al*, (2014).

4.2.5 Rachis length (cm)

The data on rachis length was recorded and presented in Table 4.7 and Fig 4.8.

The length of rachis was recorded maximum in cultivar White Prosperity (69.81 cm) which was at par with cultivar Candyman (68.22 cm) and it was significantly variation with other cultivars. The minimum length of rachis was noted in cultivar Dull Queen (45.46 cm).

The results indicated that, rachis length was closely associated with other morphological characters like number of florets per spike, intermodal length of florets, spike length and plant height in the varieties. Similar results were reported by Baweja and Brahma (2003), Kumar and Yadav (2005) and Swain *et al*. (2008).

4.2.6 Internodal length (cm)

The data recorded on iternodal length and presented Table 4.7 and Fig 4.8. Significantly maximum intermodal length was pointed in cultivar White Prosperity (3.02 cm) which was significantly greater then rest of other cultivars. The lower intermodal length founds in cultivar GS-2 (1.06).

The variation in internodal length might be due to genetic makeup of the cultivars, which is governed by the genotypic constituent of the plant.

Table 4.7: Variation in length of spike (cm), rachis length (cm) and intermodal length (cm)

Notation	Treatment	Length of spike (cm)	Rachis length (cm)	Internodal length (cm)
T_1	Candyman	76.16	68.22	2.74
T_2	Nova Lux	74.78	66.41	2.08
T_3	Gunjan	51.11	46.49	1.89
T_4	Advantage	69.98	57.77	2.73
T_5	Punjab Dawn	69.19	65.26	1.74
T_6	Summer Sunshine	72.68	55.07	2.70
T_7	Her Majesty	71.01	58.03	1.69
T_8	Dull Queen	58.91	45.46	1.67
T_9	Saffron	78.13	54.73	1.83
T_{10}	GS-2	68.58	48.69	1.60
T_{11}	American Beauty	63.06	48.92	1.77
T_{12}	White Prosperity	75.33	69.81	3.02
T_{13}	Red Majesty	71.73	64.30	1.70
T_{14}	Fancy Pink	75.30	60.76	2.06
S.Em±		**0.98**	**0.73**	**0.06**
C.D at 5%		**2.85**	**2.12**	**0.17**

4.2.7 Number of florets per spike

The data recorded on number of florets per spikes of observation for each treatment is presented in the Table 4.8 and Fig 4.10.

The data reveals that the maximum number of florets per spike was recorded in cultivar Candyman (15.03) which was at par with cultivar White Prosperity (14.80), Red Majesty (14.37), Punjab Dawn (14.33) and Nova Lux (14.27) whereas it was exhibited significant differences with other cultivars. The minimum number of florets per spike recorded in cultivar Dull Queen (11.33).

The number of florets differs as different cultivar to cultivars might be due to hereditary traits of the cultivar of the gladiolus,which is governed by genetic makeup of the plants. Similar results on number of florets per spike have been reported by Rani and Singh (2005) and Ram *et al*. (2005).

4.2.8 Diameter of florets (cm)

It is evident from the data Table 4.8 and Fig 4.10. That the diameter of florets was significantly higher in the cultivar Fancy Pink (10.73 cm) and lower diameter of florets was found in the cultivar Punjab Dawn (8.33 cm).

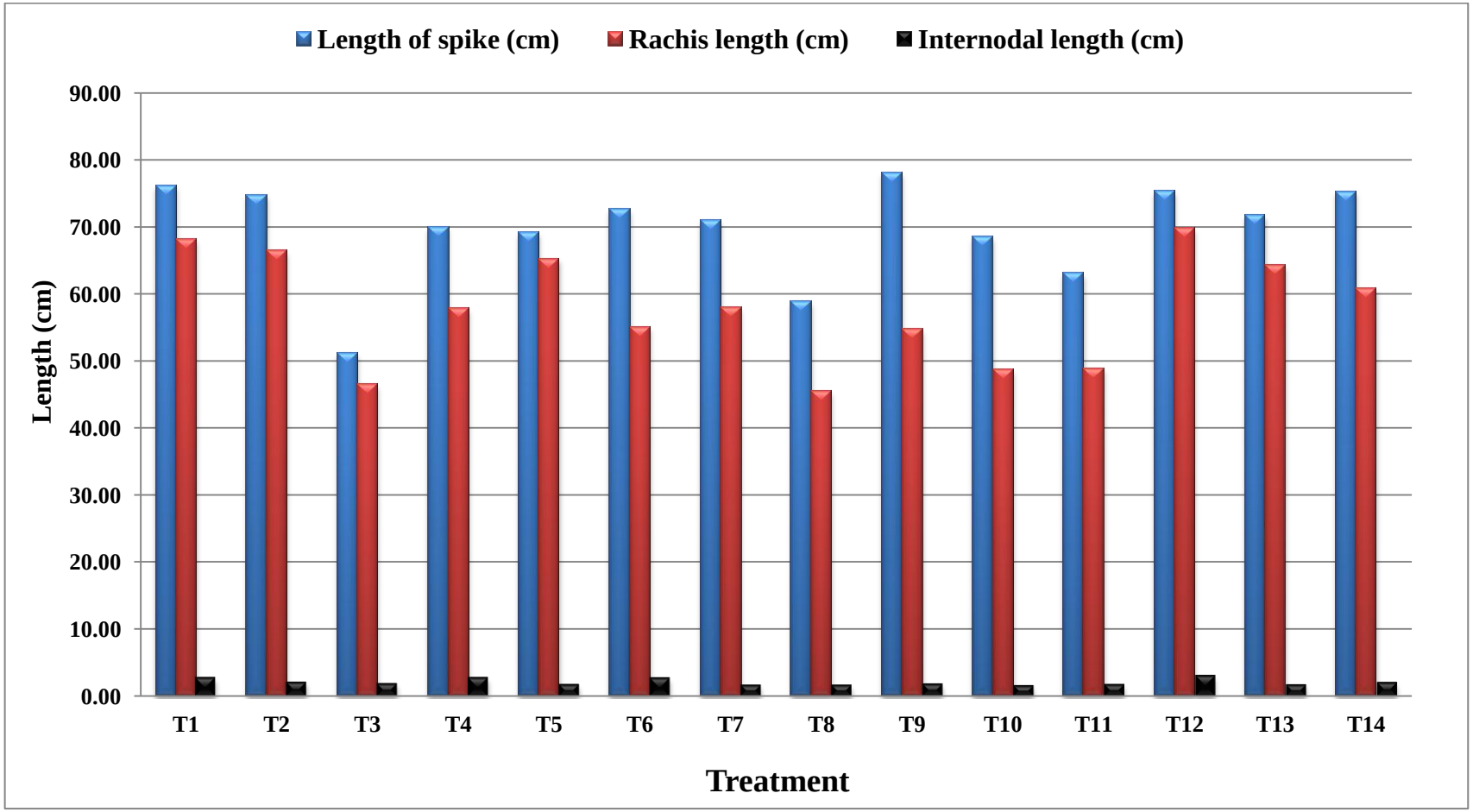


Fig.4.8: Variation in length of spike (cm), rachis length of spike (cm), internodal length (cm)

Punjab Dawn

Summer Sunshine

Her Majesty

Dull Queen

Fig 4.9: Harvested spike of cultivars Punjab Dawn, Summer Sunshine, Her Majesty, Dull Queen

The variation in diameter of florets might be due to hereditary traits of the varieties. Similar results on number of florets per spike have been reported by Rani and Singh (2005) and Ram *et al*. (2005).

4.2.9 Duration of flowering (Days)

The data for this attribute, i.e. days taken to flowering duration showed significant difference among various cultivars of gladiolus evaluated and ranged from 32.22 days to 21.14 days Table 4.8 and Fig 4.10.

The cultivar Gunjan has recorded highest flowering duration (32.22 days) which was at par with cultivar GS-2 (30.76 days) and White Prosperity (30.68) and it was showed significantly greater than other cultivars of the gladiolus. The lowest was in cultivar Candyman (21.14 days). Flowering duration differ might be due to genetic makeup of the cultivars as well as environmental factors, which is governed by the genotypic constituent of the plant.

Table 4.8: Number of florets per spike, diameter of florets (cm) and days taken to flowering duration

Notation	Treatment	Number of florets per spike	Diameter of florets (cm)	Duration of flowering (Days)
T_1	Candyman	15.03	9.74	21.14
T_2	Nova Lux	14.27	9.51	24.69
T_3	Gunjan	11.63	8.55	32.22
T_4	Advantage	13.13	9.69	21.53
T_5	Punjab Dawn	14.33	8.33	25.58
T_6	Summer Sunshine	12.03	9.64	25.20
T_7	Her Majesty	13.33	8.45	22.65
T_8	Dull Queen	11.33	8.41	25.27
T_9	Saffron	13.43	9.54	23.41
T_{10}	GS-2	12.23	9.19	30.76
T_{11}	American Beauty	12.47	9.71	28.25
T_{12}	White Prosperity	14.80	9.49	30.68
T_{13}	Red Majesty	14.37	9.62	22.48
T_{14}	Fancy Pink	13.33	10.73	26.52
S.Em±		**0.33**	**0.14**	**0.54**
C.D at 5%		**0.97**	**0.41**	**1.57**

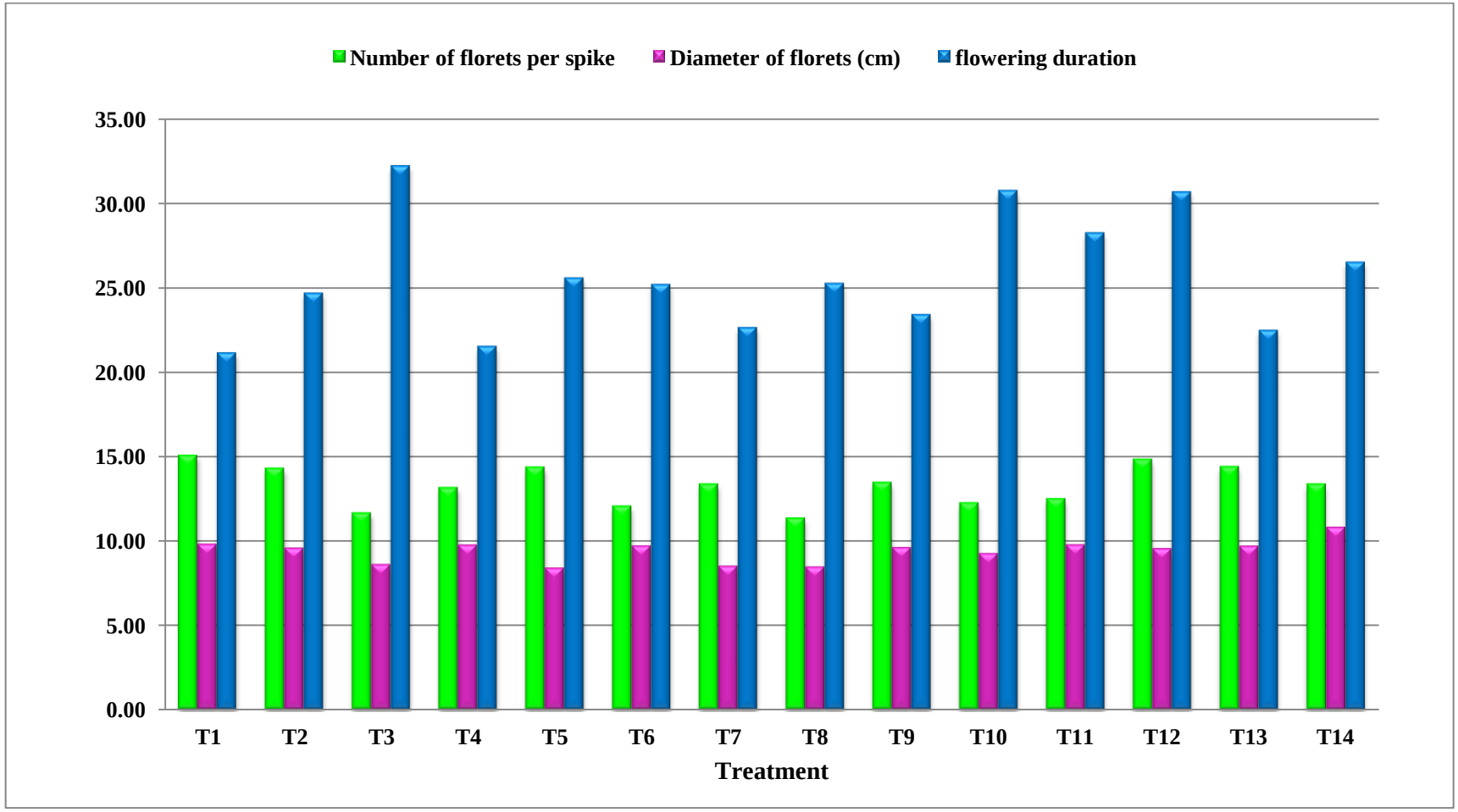
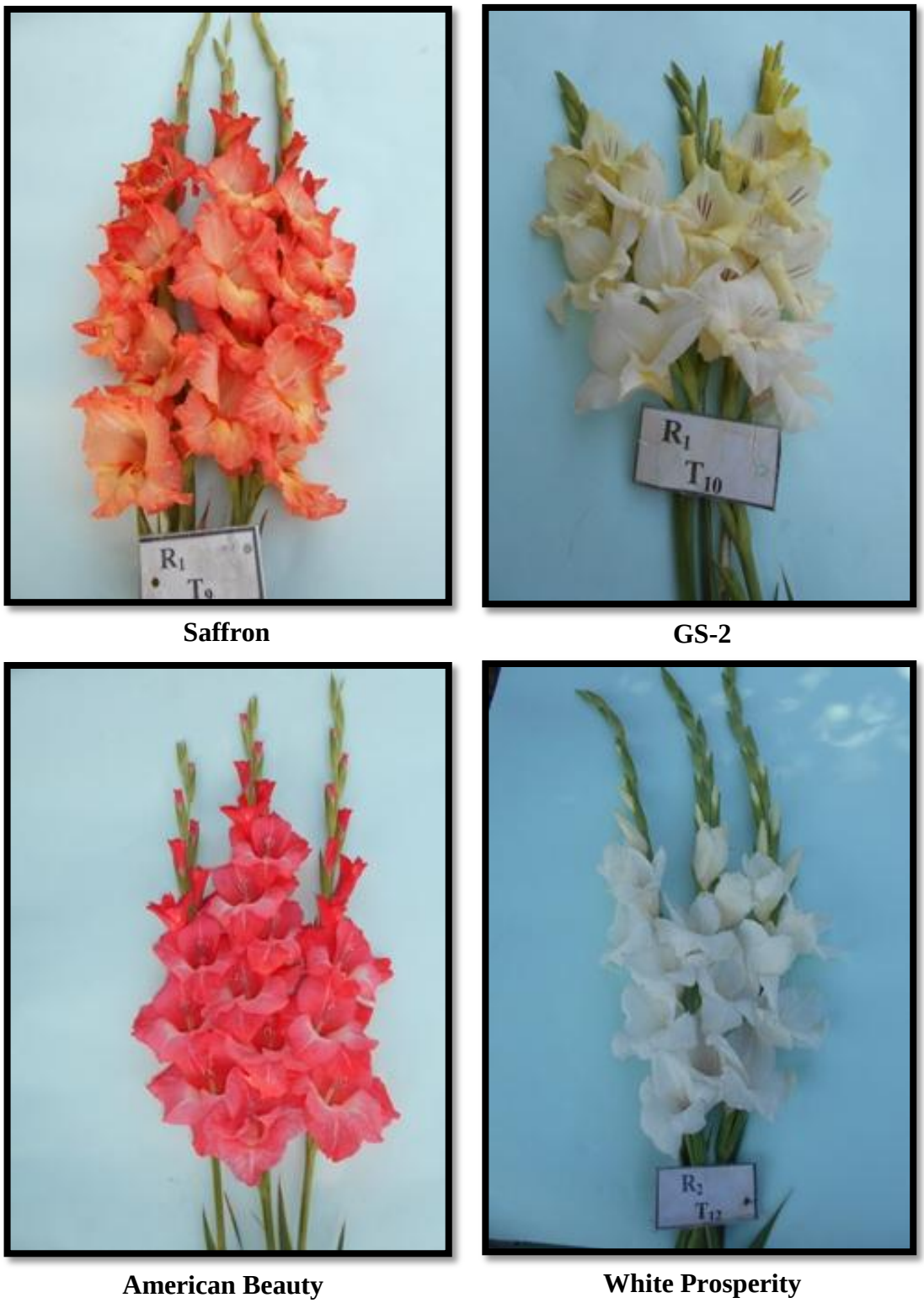


Fig.4.10: Number of florets per spike, diameter of florets (cm), duration of flowering (days)



Saffron **GS-2**

American Beauty **White Prosperity**

Fig 4.11: Harvested spike of cultivars Saffron, GS-2, American Beauty, White Prosperity

Red Majesty

Fancy Pink

A view of field duration flowering

Fig 4.12: Harvested spike of cultivars Red Majesty, Fancy Pink and a view of field in duration flowering

4.3 Corms and cormels yield

4.3.1 Number of corms per plant

Significant differences were observed among the cultivars for number of corms per plant and the values ranged from (4.69 to 2.14) Table 4.9 and Fig 4.13.

The maximum number of corms (4.69) per plant was recorded in cultivar Advantage followed by Saffron (3.82), Fancy Pink (3.73) and Nova Lux (3.48). However, it was found significantly differed to rest of the other cultivars of the gladiolus. Minimum number of corms (2.14) per plant was recorded in cultivar Summer Sunshine.

In gladiolus corm production directly depends on number of shoots produced per mother corm as reported by Ramachandrudu and Thangam (2008). The cultivars American Beauty, Arka Amar and Arka Naveen produced more number of shoots per mother corm. Kishan (2010) also reported that American Beauty recorded maximum number of tillers plant^{-1} and corms plant^{-1} (3.44 and 3.33, respectively). Similar variation for number of corms plant^{-1} in gladiolus was also observed by Saini *et al.* (1991), Ravidas (1993), Shiramagond and Hanamashetti (1999), Neeraj *et al.* (2000), Rajiv and Yadav (2005), and Neha *et al.* (2012).

4.3.2 Weight of corms per plant (g)

The data for weight of corms per plant in different cultivars of gladiolus are presented in Table 4.9 and Fig. 4.13. Significant differences were observed among the cultivars with respect to weight of corms per plant and ranged from 80.56 (g) to 21.15 (g). The maximum weight of corms per plant was recorded in cultivar Candyman 80.56 (g) and minimum weight of corms plant was recorded in cultivar Dull Queen 21.15 (g).

The production of daughter corms of more weight may be attributed to the good vegetative growth of plants in the initial stages, which supplies higher amounts of photosynthates for storage in the corms which are also the storage organs. This is clearly evident from the results obtained as cultivar Bindya recorded maximum plant height and more number of leaves. Number of corms produced per corm may also influence the weight of corms per plant. It may also

due to highest corm weight and corm size at the time of planting. Sharma and Sharma (1984), Saini *et al.* (1991), Das (1998), Dimri (2002), Rajiv and Yadav (2005) and Rahul *et al.* (2011) also reported similar variations in weight of corms.

4.3.3 Diameter of corms (cm)

Significant differences were observed among the cultivars with respect to diameter of the corm ranged from 6.46 cm to 3.27 cm and the data is presented in Table 4.9 and Fig. 4.13.

The maximum diameter of corm was recorded in cultivar Candyman (6.46 cm) and minimum was recorded in Dull Queen (3.27 cm). This was significantly greater than other cultivars of the gladiolus. Corm diameter and corm weight are important parameters for producing quality spikes along with more number of florets of larger size. Sharma and Gupta (2003) reported that availability of more food materials stored in bigger sized mother corms helps in better plant growth might be associated with cormels production.

Superiority of the cultivar Candyman with respect to diameter and weight of corms per plant over others might be due to utilization of available food material for the development of corms. Neeraj *et al.* (2001), Ram *et al.* (2005), Naik *et al.* (2011) and Sankari *et al.* (2012) also observed similar variations for diameter of corm.

Table 4.9: Number of corms per plant, weight of corms per plant (g) and diameter of corms (cm)

Notation	Treatment	Number of corms per plant	Weight of corms per plant (g)	Diameter of corms (cm)
T_1	Candyman	2.33	80.56	6.46
T_2	Nova Lux	3.48	32.09	4.14
T_3	Gunjan	2.48	31.69	4.19
T_4	Advantage	4.69	42.33	4.74
T_5	Punjab Dawn	2.99	39.12	4.28
T_6	Summer Sunshine	2.14	58.71	5.36
T_7	Her Majesty	3.31	33.01	4.43
T_8	Dull Queen	3.32	21.15	3.27
T_9	Saffron	3.82	33.41	4.17
T_{10}	GS-2	2.66	25.42	4.19
T_{11}	American Beauty	2.16	33.42	4.28
T_{12}	White Prosperity	2.55	46.73	5.55
T_{13}	Red Majesty	2.40	53.79	4.92
T_{14}	Fancy Pink	3.73	49.61	4.81
S.Em±		**0.24**	**1.26**	**0.24**
C.D at 5%		**0.71**	**3.67**	**0.69**

4.3.4 Number of cormels per plant

The data presented in Table 4.10 and fig 4.14. Significant variation was observed among cultivars of gladiolus with respect to number of cormels per plant. The cultivar White Prosperity (132.46) was significantly superior over all other cultivars under study, followed by Dull Queen (120.79) and lowest number of cormels (25.67) per plant was noted in the cultivar GS-2.

In gladiolus, the ability to produce corms and cormels plant^{-1} determines its rate of multiplication. Production of number of cormels plant^{-1} may be attributed to the genetic makeup of a cultivar. The results for number of cormels plant^{-1} confirm with the findings of Mishra and Saini (1990), Jhon *et al.* (1996), Rani *et al.* (2007), Ranpise *et al.* (2007) and Hossain *et al.* (2011) in gladiolus.

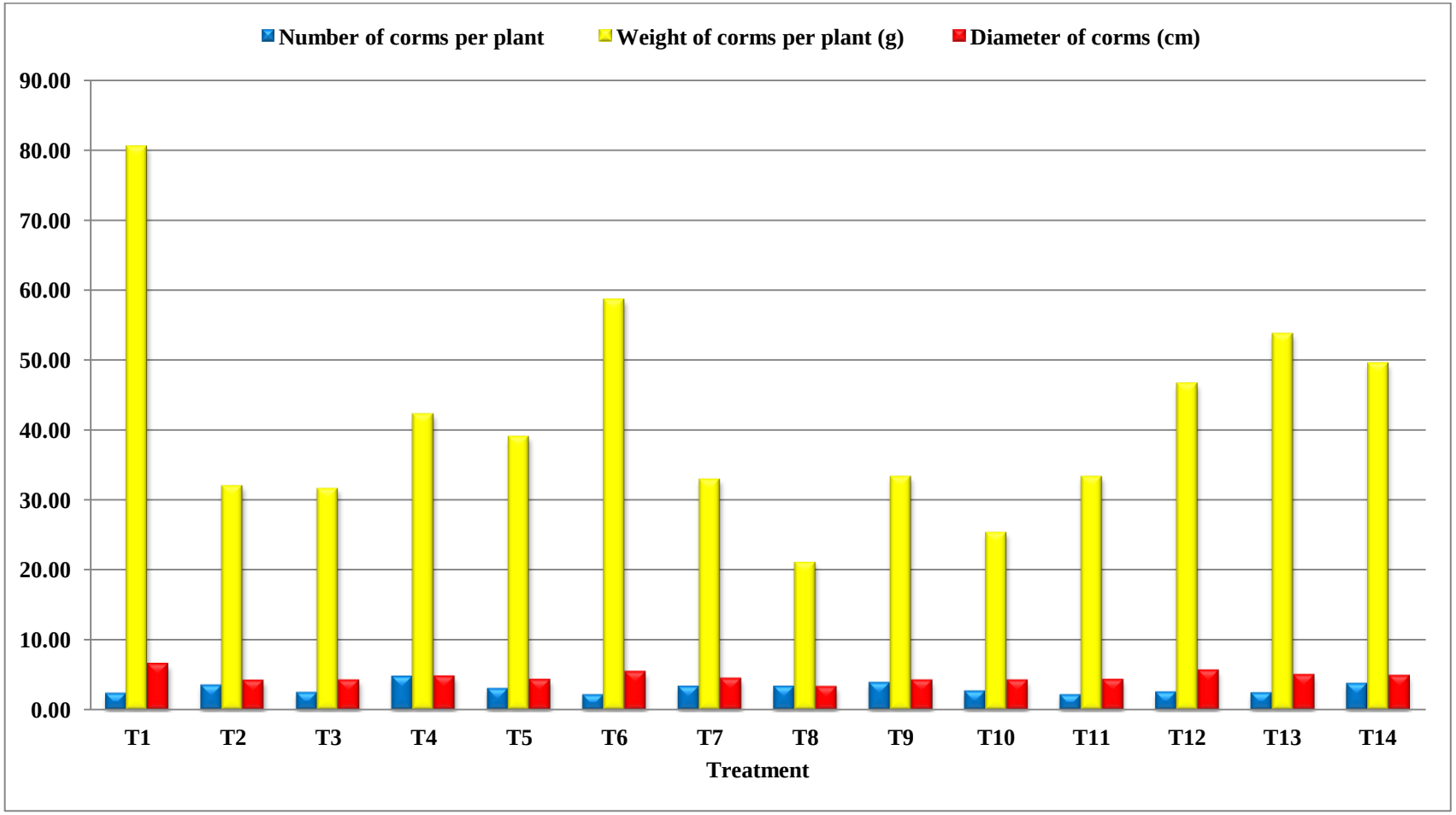


Fig.4.13: Number of corms per plant, weight of corms per plant (g), diameter of corms (cm)

4.3.5 Weight of cormels per plant (g)

Significant differences were observed among the cultivars for weight of cormels. The data collected for weight of cormels per plant ranged from 45.14 g to 10.67 g and is presented in Table 4.10 and Fig. 4.15.

The weight of cormels was highest in cultivar White Prosperity (45.14 g) followed by Gunjan (32.49 g) and lowest cormel weight per plant was recorded Advantage (10.67 g). The number, size and weight of cormels produced per plant in various cultivars may be closely associated with the genetic variation are the cultivars. Similar variations for weight of cormels per plant were also recorded by Nair and Shiva (2003), Nimbalkar (2007) and Kishan (2010).

Table 4.10: Number of cormels per plant and weight of cormels per plant (g)

Notation	Treatment	Number of cormels per plant	Weight of cormels per plant (g)
T_1	Candyman	54.95	17.47
T_2	Nova Lux	53.27	12.53
T_3	Gunjan	72.92	32.49
T_4	Advantage	49.18	10.67
T_5	Punjab Dawn	35.35	13.53
T_6	Summer Sunshine	42.82	11.43
T_7	Her Majesty	52.75	16.15
T_8	Dull Queen	120.79	30.89
T_9	Saffron	83.49	18.27
T_{10}	GS-2	25.67	13.12
T_{11}	American Beauty	42.74	12.69
T_{12}	White Prosperity	132.46	45.14
T_{13}	Red Majesty	43.40	18.68
T_{14}	Fancy Pink	44.83	21.61
S.Em±		**1.75**	**1.16**
C.D at 5%		**5.10**	**3.36**

4.4 To evaluate vase life of different cultivars

4.4.1 Days to basal floret open

Perusal of data on days to basal floret open is depicted in Table 4.11 and Fig.4.17. Results revealed that significant difference was found in different cultivars. However, the minimum number of days to basal floret open was recorded in cultivar Saffron (2.21) which was found at par with cultivar Red

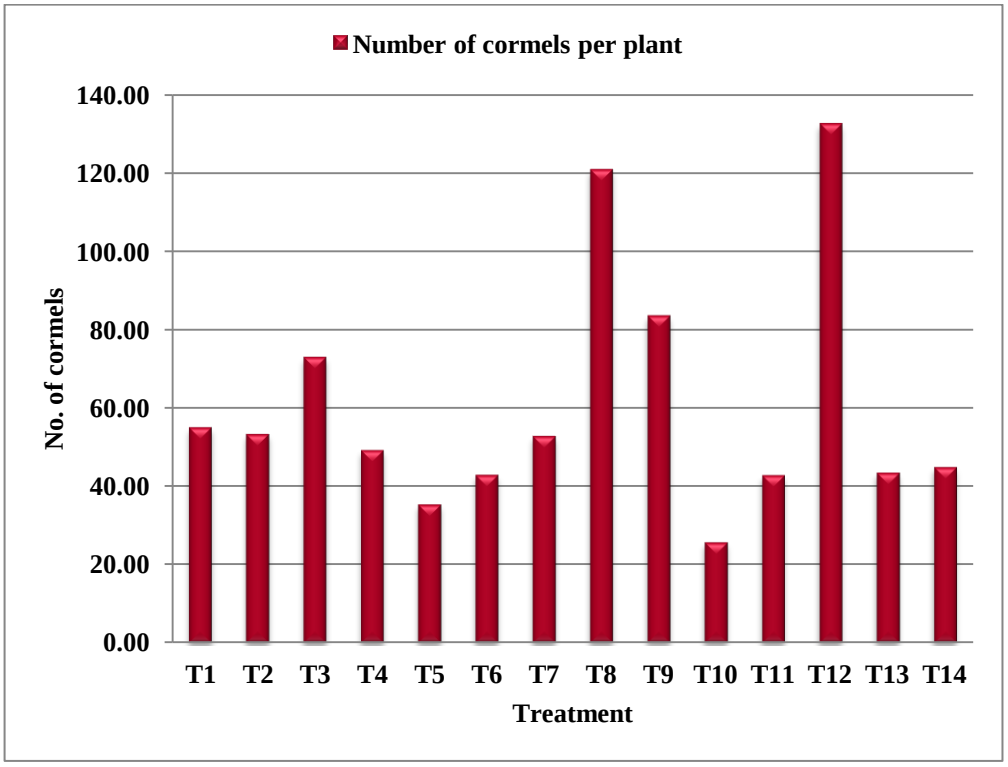


Fig.4.14: Number of cormels per plant

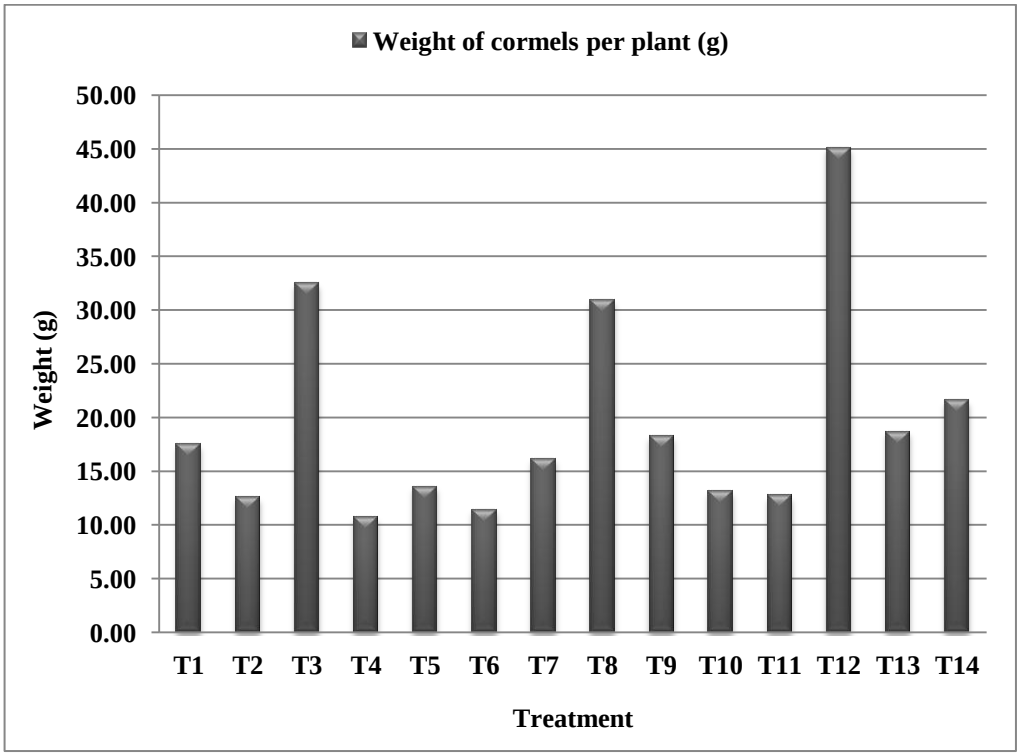


Fig.4.15: Weight of cormels per plant (g)

Majesty (2.41) and Her Majesty (2.57). The maximum was noted under cultivar Punjab Dawn (3.67). The early basal florets open might be due to ambient condition of the room and hereditary traits of the cultivar correlate with ambient temperature. Similar result were also by Rupa Rani *et al* (2007).

4.4.2 Days to 50% floret wither

The data with respect to days to 50% floret are wither is presented in Table 4.11 and Fig.4.17.

The cultivar Advantage took maximum days to 50% withers (9.86) followed by Nova Lux (9.20) and minimum (6.32) was noted in the cultivar Summer Sunshine. The maximum days to 100 % florets withering were found in the cultivar American Beauty (13.45 days) Joshi *et al.*, (2011).

The variation in the post harvest life of cut flower of the gladiolus may be affected by the accumulation of the carbohydrate, as well as weight of spike which may be favourable to increases the post harvest life of cut flowers. Similar variation in the postharvest life has been reported on gladiolus cut flower due to genetic and varietal factors (Bhattacharjee & Saxena 1998). These variations have been attributed to variation on cell wall thickening, levels of peroxidase and lignification, as well as the genetic makeup of the cultivars (Gelder 1998).

4.4.3 Vase life of gladiolus in ambient condition

The data on vase life of gladiolus in ambient condition is presented Table 4.11 and Fig.4.16.

The experimental flowers were held in the laboratory at about 22 ± 2ºC ambient room temperature. The maximum days to vase life of gladiolus in ambient condition was recorded in the cultivar Candyman (8.26) which was at par with cultivar White Prosperity (7.56) and Fancy Pink (7.45). The minimum days to vase life was noted in the cultivar American Beauty (5.94). Variation in vase-life may be attributed to differential accumulation of carbohydrates from varied leaf production, sensitivity of cultivars to ethylene and genetically framework of the plant. It may also be differ due to hereditary character of the cultivars. Vase life of the spike in water under ambient conditions was found to be best in cultivars ‘Priscilla’ and ‘Legend’ (14 days) followed by cultivar Tropic Sea was reported by

Sankari *et al.,* (2012). Rupa Rani *et al* (2007) observed that cv. American Beauty was the best in terms of duration of flowering under natural condition. Vase-life of cut gladiolus flowers under tap water (11.73 days) was observed in cultivar Charm Glow (Baggio *et. al.,* 2015).

Table 4.11: Days to basal floret open, days to 50% floret wither and vase life of gladiolus in ambient condition

Notation	Treatment	Days to basal floret open	Days to 50% floret wither	Vase life of gladiolus in ambient condition
T_1	Candyman	3.02	7.86	8.26
T_2	Nova Lux	3.04	9.20	7.30
T_3	Gunjan	3.31	6.95	6.57
T_4	Advantage	3.12	9.86	7.29
T_5	Punjab Dawn	3.67	8.18	6.15
T_6	Summer Sunshine	3.28	6.32	6.86
T_7	Her Majesty	2.57	6.87	6.53
T_8	Dull Queen	3.47	7.49	5.95
T_9	Saffron	2.21	6.81	6.64
T_{10}	GS-2	3.17	7.54	7.16
T_{11}	American Beauty	3.03	8.06	5.94
T_{12}	White Prosperity	2.95	7.95	7.56
T_{13}	Red Majesty	2.41	7.54	6.94
T_{14}	Fancy Pink	3.21	8.25	7.45
S.Em±		**0.21**	**0.35**	**0.31**
C.D at 5%		**0.60**	**1.03**	**0.89**

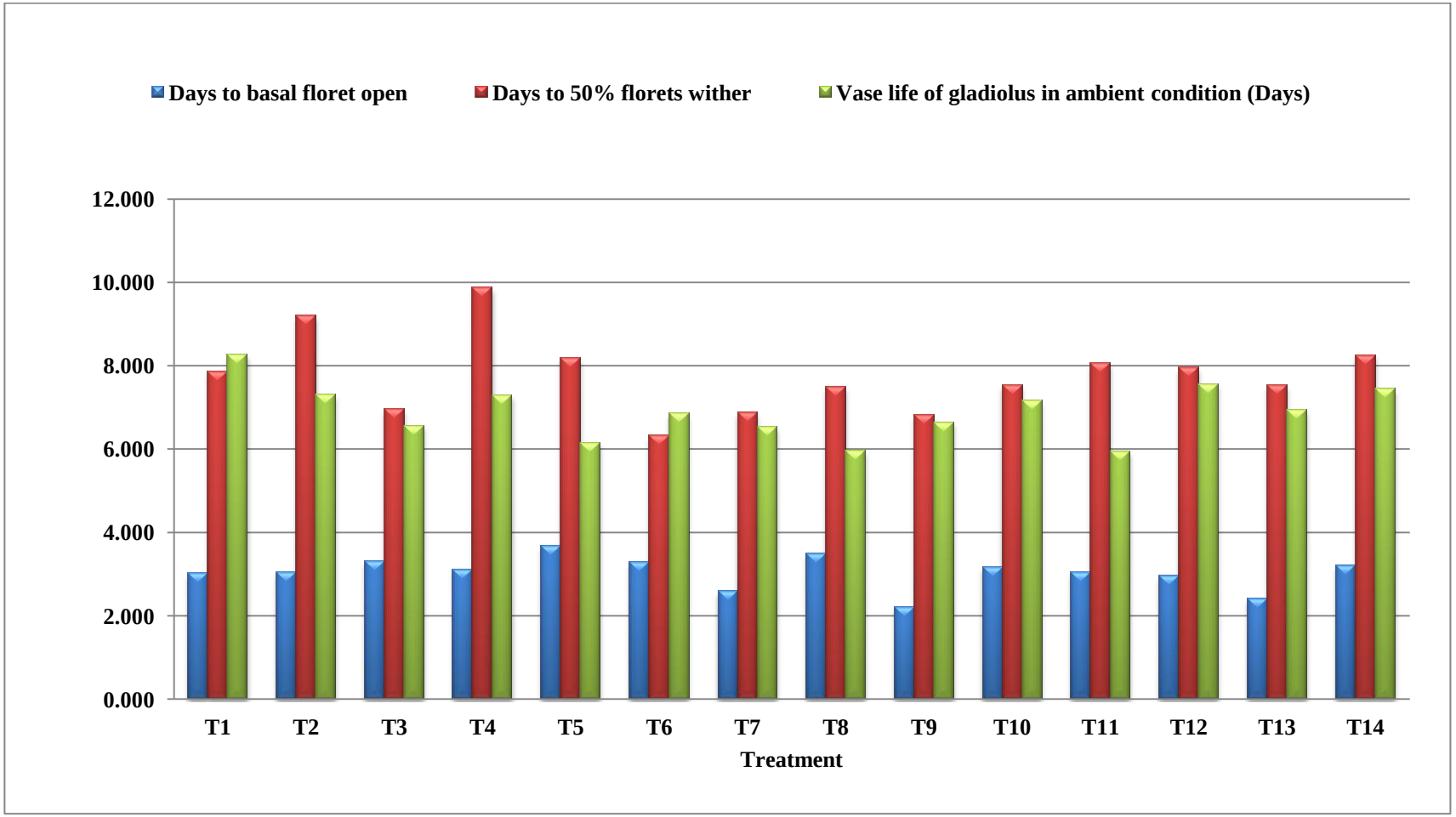


Fig.4.16: Days to basal floret open, days to 50% florets wither, vase life of gladiolus in ambient condition

Fig 4.17: A view of study of vase life of different cultivars

CHAPTER-V
SUMMARY AND CONCLUSIONS

The present investigation entitled- **"Performance of different gladiolus cultivars on growth, flowering and corm production under Chhattisgarh plains condition"** was undertaken at Horticulture Research cum Instructional Farm, College of Agriculture, IGKV, Raipur (C.G.) with the following objectives:

1. To find out the performance of different cultivars of gladiolus.
2. To find out the suitable cultivars for cut flower under Chhattisgarh plains.
3. To evaluate vase life of different cultivars under ambient condition.

The experiment was conducted during *Rabi* season of 2016 (October 2016-April 2017) and the corms were harvested in April 2017. The experiment was laid out in Randomized Block Design (RBD) with 14 treatments (cultivars) and three replications, with net plot size of 1.80 m x 1.20 m and spacing of 30 cm × 20 cm. The different varieties evaluated were cultivar Candyman, White Prosperity, Dull Queen, Saffron, Summer Sunshine, Red Majesty, American Beauty, Fancy Pink, Her Majesty, Punjab Dawn, Gunjan, GS-2, Nova Lux and Advantage.

The observations on vegetative, flowering, flower quality, corm and cormels yield characters like number of days to 50 percent sprouting, plant height (cm), length of leaves (cm), number of leaves per plant, width of leaf (cm), days taken to spike emergence, days taken to first floret color show, days taken to first floret open, length of spike (cm), length of rachis (cm), number of florets per spike, diameter of florets (cm), Inter nodal length (cm), flowering duration, number of corms per plant, diameter of corm (cm), weight of corms per plant (g), number of cormels per plant, weight of cormels per plant (g), days to basal floret open, days to 50% floret wither and vase life of gladiolus in ambient condition were recorded. The summary and conclusions drawn from the experiment are given below.

The results of the investigation are summarized as follows:

Growth parameter

- Cultivar Punjab Dawn (8.67) taken minimum number of days to 50% sprouting which was at par with cultivar Candyman (9.33), Summer

Sunshine (9.67), Saffron (9.67), American Beauty (9.67) and White Prosperity (9.67). However, maximum number days (13.33) to taken 50 % sprouting were recorded in cultivar Gunjan during investigation.

- Highest plant height (100.21 cm) was recorded in cultivar Candyman and lower (53.70 cm) in cultivar Dull Queen.
- The higher number of leaves (8.03) was recorded in cultivar Candyman which was at par with cultivar White Prosperity (7.87), GS-2 (7.67), Summer Sunshine (7.50), Gunjan (7.47), American Beauty (6.97) and Her Majesty (7.13). The lower number of leaves was recorded in cultivar Dull Queen (6.03).
- Longest leave length (47.70 cm) was recorded in cultivar White Prosperity which was at par with cultivar Candyman (47.00 cm), Nova Lux (46.10 cm), Punjab Dawn (45.29 cm) and lower (37.14 cm) in cultivar American Beauty.
- The cultivar White Prosperity gave maximum width of leaves (2.81 cm) which was at par with cultivar GS-2 (2.77 cm), Summer Sunshine (2.74 cm), Gunjan (2.71 cm), Fancy Pink (2.61 cm) and Punjab Dawn (2.50 cm). The minimum width of leaves was noted from cultivar Dull Queen (1.74 cm)

Flower yield and quality parameter

- The cultivar Nova Lux taken minimum number of days to spike emergence (60.49) which was showed at par with cultivar American Beauty (60.83), Fancy Pink (60.86), Punjab Dawn (61.63), White Prosperity (61.73), Dull Queen (61.82), Her Majesty (62.71), GS-2 (63.12) and cultivar Candyman (72.26) took maximum number of days to spike emergence.
- The cultivar American Beauty (67.09) taken minimum number of days to first floret colour show which was at par with cultivar GS-2 (69.01), Punjab Dawn (69.12), White Prosperity (69.92), Dull Queen (70.38), Fancy Pink (70.71) and maximum number of days (83.50) to first floret colour show was recorded with cultivar candyman.
- The minimum days to full opening of first floret noted with cultivar American Beauty (68.25) which was at par with cultivar White Prosperity

(69.90), Punjab Dawn (71.15) and maximum number of days to first floret open (86.20) was recorded in cultivar Candyman.

- Significantly longest spike length was recorded with cultivar Saffron (78.13 cm) which was at par with cultivar Candyman (76.16 cm), White Prosperity (75.33 cm) and Fancy Pink (75.30 cm). The minimum length of spike was recorded under cultivar Gunjan (51.11 cm).
- The length of rachis was recorded maximum in cultivar White Prosperity (69.81 cm) which was at par with cultivar Candyman (68.22 cm) and minimum length of rachis was noted in cultivar Dull Queen (45.46 cm).
- Significantly maximum intermodal length was pointed in cultivar White Prosperity (3.02 cm) and lower intermodal length was found in cultivar GS-2 (1.06).
- The maximum number of florets per spike was recorded in cultivar Candyman (15.03) which was at par with cultivar White Prosperity (14.80), Red Majesty (14.37), Punjab Dawn (14.33), Nova Lux (14.27) and minimum number of florets per spike was recorded in cultivar Dull Queen (11.33).
- The diameter of florets was significantly higher in the cultivar Fancy Pink (10.73 cm) and lower diameter of florets was found in the cultivar Punjab Dawn (8.33 cm).
- The cultivar Gunjan have highest flowering duration (32.22 days) which was at par with cultivar GS-2 (30.76 days), White Prosperity (30.68) and lowest was in cultivar Candyman (21.14 days).

Corms and cormels yield

- The maximum number of corms per plant was recorded in cultivar Advantage (4.69) followed by Saffron (3.82), Fancy Pink (3.73) and Nova Lux (3.48). The minimum number of corms per plant was recorded in cultivar Summer Sunshine (2.14).
- The maximum weight of corms per plant was recorded in cultivar Candyman 80.56 (g) and minimum weight of corms plant was recorded in cultivar Dull Queen 21.15 (g).

- The maximum diameter of corm was recorded in cultivar Candyman (6.46 cm) and minimum was recorded in cultivar Dull Queen (3.27 cm).
- The cultivar White Prosperity (132.46) was significantly superior over all other cultivars under study, followed by cultivar Dull Queen (120.79) and lowest number of cormels per plant was noted in the cultivar GS-2 (25.67).
- The weight of cormels was highest in cultivar White Prosperity (45.14 g) followed by Gunjan (32.49 g) and lowest cormel weight per plant was recorded cultivar Advantage (10.67 g).

To evaluate vase life of different cultivars

- The minimum number of days to basal floret open was recorded in Saffron (2.21) which was found at par with cultivar Red Majesty (2.41) and Her Majesty (2.57) and maximum was noted under Punjab Dawn (3.67).
- The cultivar advantage gave maximum days to 50% wither (9.86) followed by Nova Lux (9.20) and minimum was noted in the cultivar Summer Sunshine (6.30).
- The maximum days to vase life of gladiolus in ambient condition was recorded in the cultivar Candyman (8.26) which was at par with White Prosperity (7.56) and Fancy Pink (7.45). The minimum days to vase life was noted in the cultivar American Beauty (5.94).

Conclusions

The following conclusions can be drawn from the experiment.

For commercial production of spikes the cultivars Candyman, Novalux, Advantage, Punjab Dawn, Summer Sunshine, White Prosperity are highly suitable. Cultivars Candyman, Novalux, Advantage, Her Majesty and Fancy Pink responded well for corm production. For production of cormels the cultivars Advantage, Novalux, Candyman, GS-2, White Prosperity and Fancy Pink were the best. Cultivars Advantage, Novalux, Candyman, GS-2, White Prosperity and Fancy Pink are the best for vase life.

Suggestions for future work

1. Studies with new and exotic promising cultivars should be done in order to find out the best suitable cultivars of gladiolus for different agroclimatic regions of Chhattisgarh.
2. Similar study can be conducted at different locations of Chhattisgarh.
3. Economics of cultivation should be worked out in order to assess the feasibility of gladiolus cultivation for the growers.
4. The vase life study of cut flower of gladiolus should be standardized for increasing vase life.

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Appendix-A: Weekly meteorological data during the crop growth period 2016-17

Wk No.	Date	Max. Temp. (^{0}C)	Mini. Temp. (^{0}C)	Rain fall (mm)	Relative Humidity (%)		Vapour Pressure (mm of Hg)		Wind Velocity (Km/ ph)	Evapo-ration (mm)	Sun Shine (hours)
					I	II	I	II			
41	Oct.10- 16	32.16	21.43	0.00	91.14	37.43	18.91	13.50	1.37	3.89	7.94
42	17-23	31.29	18.61	0.00	91.57	35.86	16.20	12.11	1.20	3.81	10.04
43	24-30	31.41	18.46	0.00	85.33	39.14	14.83	13.33	1.60	3.65	9.26
44	31- 06	30.50	19.87	0.00	85.33	49.14	15.67	15.47	2.27	3.40	8.11
45	Nov.07-13	29.99	14.46	0.00	89.00	26.71	11.91	8.10	1.61	3.49	8.44
46	14-20	29.07	14.10	0.00	88.43	33.57	11.90	10.23	1.59	3.03	7.99
47	21-27	30.26	11.67	0.00	88.71	24.57	9.81	7.70	0.81	3.01	8.53
48	28-04	30.43	13.36	0.00	87.71	31.29	11.04	9.50	1.30	3.26	8.37
49	Dec.05-11	28.66	13.54	0.00	88.86	37.86	10.87	10.56	1.39	2.83	7.27
50	12-18	28.91	11.71	0.00	84.29	26.86	9.46	7.79	2.07	3.53	8.43
51	19-25	27.37	8.49	0.00	85.43	24.57	7.69	6.41	1.43	2.94	8.47
52	26-01	28.36	10.00	0.00	85.86	26.14	8.37	7.36	1.13	2.76	7.19
1	Jan.02-08	28.63	12.17	0.00	90.43	33.33	9.73	8.79	1.54	2.84	6.39
2	09-15	27.17	11.89	0.93	85.71	34.86	9.50	8.53	1.96	3.01	7.00
3	16-22	28.89	11.80	0.00	84.57	27.00	9.30	8.03	1.16	3.07	8.01
4	23-29	29.87	14.29	0.00	83.43	29.43	10.90	16.90	1.91	3.61	7.71
5	30-05	30.34	12.02	0.00	79.86	26.14	9.87	8.16	1.60	3.69	9.45
6	Feb.06-12	32.17	14.11	0.80	81.00	26.17	10.30	8.87	1.80	4.29	9.34
7	13-19	31.01	15.61	0.00	70.86	30.86	11.31	9.19	2.59	4.41	6.84
8	20-26	34.06	15.50	0.00	68.43	17.29	9.94	6.46	2.60	5.96	10.10
9	27-05	34.14	15.55	0.00	72.92	15.13	10.58	6.11	2.22	5.83	9.82
10	Mar.06-12	32.99	19.43	0.79	68.57	36.00	12.49	12.30	3.30	5.21	6.73
11	13-19	32.86	16.97	0.00	58.29	17.57	9.71	6.70	3.31	6.21	8.87
12	20-26	36.54	19.66	0.00	63.14	15.29	12.20	6.99	2.91	7.14	9.17
13	27-02	41.06	23.00	0.00	57.57	12.86	13.33	7.37	2.74	8.36	8.89
14	03-09	41.43	26.63	0.00	44.86	17.00	14.44	9.56	5.06	9.53	8.33
15	10-16	40.70	21.96	0.00	35.86	8.71	9.13	5.19	3.20	9.91	9.44
16	17-23	42.63	26.67	0.00	40.86	9.86	12.87	6.06	4.64	9.51	9.51
17	24-30	42.27	24.93	0.00	37.29	8.14	10.54	4.94	5.43	25.33	10.34

Resume

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B.Sc. (Ag.)	2015	IGKV, Raipur
M.Sc. (Ag.)	2017	IGKV, Raipur

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Membership of Professional Societies (If any): No

Awards / Recognitions (If any): No

Publications (If any): No

Signature

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TITLE - EVALUATION OF VASE LIFE OF DIFFERENT GLADIOLUS CULTIVARS UNDER AMBIENT CONDITION

Shravan Kumar, T. Tirkey, Gaurav Sharma and Rakesh Kumar Ratre

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