

Annual Report 2015-16
AICRP on Floriculture, IIHR Hesaraghatta Centre

1. GERMPLASM CONSERVATION AND EVALUATION

GLADIOLUS

Project No. 1.2.1: Collection, evaluation and maintenance of gladiolus germplasm

A total of 69 genotypes having different colour and floral traits are maintained.

CARNATION

Project No. 1.3.1: Collection, evaluation and maintenance of germplasm of carnation

All the accessions were multiplied vegetatively and established in pots. Due to the problem of Fusarium wilt, 15 accessions were cultured *in vitro* and maintained. No new collections were added as to the existing 82 accessions, as the agencies involved in introduction and multiplication of varieties have refused to share the material for carrying out research.

Project No. 1.4.1: Collection, evaluation and maintenance of germplasm of chrysanthemum

A total of 77 genotypes were multiplied and maintained (Table 1.4.1).

Table 1.4.1: Chrysanthemum genotypes maintained at ICAR-IIHR Hesaraghatta Centre (2015-16)

Sl. No.	Genotype	Sl. No.	Genotype	Sl. No.	Genotype	Sl. No.	Genotype	Sl. No.	Genotype	Sl. No.	Genotype
1.	Arka Ravi	14.	Aparajita	27.	Coffee	40.	Anmol	53.	NBRI Little Kusum	66.	Kajal
2.	Chandrika	15.	Jubilee	28.	Kargil	41.	Pink Cloud	54.	Chandini	67.	Magie White
3.	Kirti	16.	Anmol PAU	29.	Jayanti	42.	Ajay	55.	Vasanthika	68.	Lalpari
4.	Indira	17.	Sunil	30.	Sweta Singar	43.	Star Pink	56.	Magie Yellow	69.	Garden Beauty
5.	Nilima	18.	White Andaman	31.	Appu	44.	Mayur	57.	Cherabu	70.	Flirt
6.	Pankaj	19.	Punjab Anuradha	32.	NBRI Little Orange	45.	Kalpana	58.	Co-1	71.	Sadbhavana
7.	Ravikiran	20.	Apoorva Singar	33.	Mother Teresa	46.	Geetanjali	59.	Heritage	72.	CoSD
8.	Red Gold	21.	Winter Queen	34.	Punjab Gold	47.	Birbal Sahni	60.	Himanshu	73.	Asha
9.	Yellow Gold	22.	Yellow Delight	35.	Nayantara	48.	NBRI Little Darling	61.	Sharadmala	74.	Autumn Joy
10.	Yellow Star	23.	Pusa Anmol	36.	White Prolific	49.	NBRI Little Hemant	62.	Basanti	75.	White Dolley
11.	Usha Kiran	24.	Jaya	37.	Shukla	50.	Fitonia	63.	Red Stone	76.	Thai Chin Queen
12.	Arka Pink Star	25.	Ratlam Selection	38.	NBRI Little Pink	51.	Shyamal	64.	Statesman	77.	Gulmohar
13.	Chandrakant	26.	Vijay Kiran	39.	Rekha	52.	Pusa Centenary	65.	Talhatzol	-	-

ANTHURIUM

Project No. 1.6.1: Collection, evaluation and maintenance of germplasm of anthurium

Collections which were made from the farmers field during the year 2012 are mostly seed derived and not performed well like commercial varieties. Among the flowered accessions, the colour ranged from Greenish pink, pink, white, red etc. (Table 1.6.1).

Table 1.6.1: Performance of anthurium accessions at CHES, Chettalli at ICAR-IIHR Hesaraghatta Centre (2015-16)

Accession No.	Length of spike (cm)	Spathe length (cm)	Spathe diameter (cm)	Spadix length (cm)	Spadix diameter (cm)	No. of spike /plants
1	45.5	12.75	8.23	6.71	0.88	2
2	46.5	10.45	13.13	6.78	0.73	3
3	31.5	14.75	8.23	10.83	0.83	2
4	54.5	10.45	12.13	8.03	0.98	3
5	56.5	14.75	6.13	9.28	0.98	2
6	13.5	10.45	8.33	9.30	0.78	2
7	51.5	12.75	6.38	7.50	0.73	3
8	50.5	10.45	6.43	4.75	1.60	3
9	20.5	14.75	7.28	11.68	0.8	2
11	53.5	12.86	5.90	13.50	0.85	4
12	17.5	14.75	4.78	12.00	1.20	1
13	48.5	10.45	8.23	10.40	1.33	2
14	50.5	13.00	13.13	6.98	0.90	1
16	45.5	11.03	7.78	13.50	1.13	1
17	33.0	14.25	8.60	10.83	1.10	2
18	60.0	13.30	6.98	8.03	0.87	2
19	48.5	14.83	11.38	9.28	0.92	8
20	41.3	13.68	9.28	10.83	0.83	3
21	41.5	13.03	9.45	8.03	0.98	2
22	63.5	13.60	10.56	9.28	0.98	2
24	23.5	12.98	9.34	7.50	0.98	2
25	35.2	16.43	8.23	4.75	0.98	3
26	33.5	14.75	11.13	8.03	0.78	3
27	51.5	10.45	6.13	9.28	0.73	2
29	57.6	15.75	6.38	8.03	-	-
30	53.5	12.45	6.43	10.83	0.83	4
31	40.5	-	-	8.03	0.98	4
32	55.5	15.75	7.13	10.83	0.98	2
33	45.0	10.45	7.87	8.03	0.83	2
35	35.5	14.75	12.13	10.83	0.98	1
36	43.5	10.45	6.13	8.03	0.78	2
37	47.0	10.45	8.33	9.28	0.73	2
38	43.5	10.33	6.38	9.30	1.60	3

The commercial varieties at ICAR-IIHR, Bangalore has been evaluated for 6 economical characters. Each variety performed differently with respect to 6 economical characters evaluated.

However, in the market the variety will be judged on large spathe (both length and diameter), small spadix and bright colour. In view of grower point along with these characters, number of flowers is another important character to evaluate. Taking into consideration all these characters Tropical performs better followed by Eternity.

Table 1.6.1: Performance of anthurium varieties at ICAR-IIHR Hesaraghatta Centre (2015-16)

Genotypes	Days taken to attain marketable flower	Spike length (cm)	Spathe length (cm)	Spathe width (cm)	Spadix length (cm)	Spadix diameter (cm)	Number of flowers/plant/year	Vase life (days)
Acropolis	21.75	39.85	10.55	8.53	6.13	0.88	6.75	15.3
Chaco	28.00	27.27	16.86	14.03	8.33	0.73	5.4	14.4
Deep Pink	15.50	38.60	15.75	10.83	6.38	0.83	6.75	15.2
Eternity	38.75	36.75	10.45	8.03	6.43	0.98	6.75	13.7
Fantasia	19.25	33.47	13.00	9.28	7.28	0.98	6.50	14.2
Fla Orange	43.50	32.88	11.23	9.30	5.95	0.78	4.50	13.4
Hondurus Red	16.00	38.80	9.03	7.50	5.90	0.73	6.25	12.9
IIHR selection A1	35.00	33.33	14.25	4.75	7.78	1.60	5.8	13.3
Lambda	29.50	36.90	16.30	11.68	8.23	0.8	6.00	12.6
Meringue White	44.00	44.27	14.83	10.85	13.13	1.08	6.50	15.3
Pistache	30.00	45.60	17.68	13.50	7.98	0.85	6.25	14.3
Regina	33.75	42.75	17.03	12.00	7.78	1.20	6.25	13.5
Simba	39.25	56.70	16.60	10.40	8.60	1.33	6.25	14.6
Singapore Red	35.25	50.47	9.93	6.98	6.98	0.90	7.25	14.2
Sunglow	31.50	40.80	12.98	9.33	11.38	0.85	6.25	14.3
Tropical	41.50	48.05	18.43	13.50	7.98	0.98	7.00	17.7
SEM	1.87	2.27	1.34	1.56	1.67	0.21	0.59	0.76
CD@5%	5.66	6.67	3.78	4.78	4.98	0.65	1.78	2.34

TUBEROSE

Project No. 1.7.1: Collection, evaluation and maintenance of tuberose germplasm

The tuberose varieties viz., Bidhan Rajani-1, Bidhan Rajani-2 and Bidhan Rajani-3 were collected from BCKV, Kalyani were multiplied.

Evaluation of single tuberose cultivars

Twelve single tuberose cultivars were evaluated for growth and yield parameters (Table 1 and 2). Plant height was noticed highest in Prajwal (53.65 cm) and lowest in GK-T-C4 (36.20 cm) and Mexican Single (36.29 cm). Number of leaves per plant was highest in Bidhan Rajani -2 (170.40 no's) and lowest in Variegated (45.50 no's) and Arka Sugandhi (46.00 no's). Early spike emergence was noticed in Arka Nirantara (97.20 days) and delayed spike emergence was recorded in Variegated (187.90 days). Spike length was highest in Prajwal (109.92 cm) and lowest in Arka Sugandhi (57.13 cm). Bidhan Rajani-1 recorded highest rachis length of 28.43 cm followed by Prajwal (22.69 cm) and Calcutta Single recorded the lowest rachis length of 9.30 cm. Number of florets per spike was highest in Bidhan Rajani -2 (60.50 no's) followed by Bidhan Rajani -1 (57.50 no's) and lowest in Variegated (35.60 no's). Bidhan Rajani -1 noticed highest floret length of 7.76 cm followed by Mexican Single (7.45 cm) and Arka Nirantara (7.44

cm), and lowest in variegated (5.29 cm). Diameter of the floret was highest in Bidhan Rajani-1 (6.17 cm) and lowest in Calcutta Single (4.01 cm). Prajwal recorded highest diameter of cut spikes (12.53 mm) and Calcutta Single recorded lowest value of 7.19 mm.

Weight of individual floret was highest in Prajwal (2.15g) followed by Bidhan Rajani-1 (2.01g) and lowest in Calcutta Single (0.75 g). Bidhan Rajani-1 (115.54g) and Prajwal (114.19g) recorded highest weight of floret per spike and Calcutta Single recorded lowest weight of floret per spike (24.11g). Number of spikes per clump was noticed highest in Arka Nirantara (3.7 spikes/clump) followed by Prajwal (3.0 spikes /clump) and lowest in Variegated (1.1 spikes/clump). Arka Nirantara recorded highest number of spikes per plot and hectare (122.10 and 407000.00 no's) and Variegated recorded lowest number of spikes per plot and hectare (36.30 and 121000.00 no's). Weight of flowers per plot and ha was highest in Arka Nirantara (11704.6 kg and 39.0154 t/ha) followed by Prajwal (11,346.3 kg and 37.8209 t/ha) and lowest weight of flowers per plot and ha was recorded in Variegated (1011.09 kg and 3.37029 t/ha) (Table 1.7.1a and b).

Table 1.7.1a. Performance of tuberose cultivars (single type) at IIHR Hessaraghatta Centre (2015-16)

Genotype	Plant height (cm)	No. of leaves/plant	Days to spike emergence	Spike length (cm)	Rachis length (cm)	Number of florets / spike	Length of floret (cm)	Diameter of floret (cm)	Diameter of cut spike (mm)
Mexican Single	36.29	91.00	110.90	102.29	18.25	46.9	7.45	4.38	9.29
Shringar	44.33	78.40	122.10	80.73	19.22	48.8	5.75	4.22	9.87
Prajwal	53.65	57.50	100.00	109.92	22.69	53.3	7.36	4.64	12.53
Arka Nirantara	44.99	133.6	97.20	90.33	18.92	52.5	7.44	4.68	10.94
Arka Sugandhi	44.65	46.00	122.90	57.13	16.40	52.4	5.74	4.18	10.99
Variegated	42.39	45.50	187.90	108.35	17.79	35.6	5.29	4.22	8.56
Hyderabad Single	41.58	125.40	153.50	77.14	18.99	51.1	6.65	4.57	10.05
Calcutta Single	40.90	69.70	122.90	104.41	9.30	32.1	6.12	4.01	7.19
Phule Rajani	38.63	123.50	151.60	66.02	19.52	46.6	6.51	4.96	16.07
GK-T-C4	36.20	73.60	177.10	61.17	18.54	46.8	6.40	4.51	8.93
Bidhan Rajani-1	46.05	83.80	100.90	100.84	28.43	57.5	7.76	6.17	11.43
Bidhan Rajani -2	39.67	170.40	111.90	63.31	15.27	60.5	6.07	4.13	9.14
CD at 5%	2.501	8.239	5.488	4.959	1.399	2.879	0.173	0.142	2.641

Table 1.7.1b. Performance of tuberose cultivars (single type) at IIHR Hesaraghatta Centre (2015-16)

Genotype	Weight of individual floret (g)	Weight of florets per spike (g)	Number of spikes per clump	Number of spikes/plot	Number of spikes/ha	Weight of florets/plot (kg)	Weight of florets/ha (tones)
Mexican Single	1.15	53.51	2.1	69.30	231000.00	3760.02	12.5334
Shringar	1.29	63.14	2.5	82.50	275000.00	5115.33	17.0511
Prajwal	2.15	114.19	3.0	99.00	330000.00	11346.3	37.8209
Arka Nirantara	1.83	95.91	3.7	122.1	407000.00	11704.6	39.0154
Arka Sugandhi	0.90	47.52	1.9	62.70	209000.00	2838.59	9.46198
Variegated	0.86	29.79	1.1	36.30	121000.00	1011.09	3.37029
Hyderabad Single	1.43	73.40	2.1	69.30	231000.00	4938.22	16.4607
Calcutta Single	0.75	24.11	1.3	42.90	143000.00	1035.8	3.45268
Phule Rajani	1.21	56.23	1.9	62.70	209000.00	3602.08	12.0069
GK-T-C4	1.03	48.27	1.3	42.90	143000.00	2118.53	7.06178
Bidhan Rajani-1	2.01	115.54	1.8	59.40	198000.00	6568.62	21.8954
Bidhan Rajani -2	1.198	72.189	1.9	62.70	209000.00	4270.07	14.2336
CD at 5%	0.233	11.56	0.272	8.98	29933.545	1034.655	3.449

Evaluation of Double tuberose cultivars

Six double tuberose cultivars were evaluated for growth and yield parameters (Table 3 and 4). Among the cultivars studied plant height (46.84 cm), number of leaves per plant (116.67 no's) was noticed highest in Suvasini and lowest in Calcutta Double (31.37 cm and 91.60 no's respectively). Days to spike emergence was noticed early in Vaibhav (138.11 days) and late in Suarna Rekha (184.00 days). Hyderabad Double recorded highest spike length (105.51 cm) and lowest in Suarna Rekha (97.94 cm). Highest Rachis length of 31.90 cm was recorded in Suvasini and lowest in Suarna Rekha (22.47 cm). Number of florets per spike was highest in Suvasini (62.97 no's) and lowest in Pearl Double and Hyderabad Double (44.39 no's). Length of the floret was highest in Hyderabad Double (6.59 cm) and lowest in Calcutta Double (5.31 cm).

Diameter of floret was highest in Suvasini (4.75 cm) and lowest in Suarna Rekha (3.78 cm). Calcutta Double recorded highest diameter of cut spike (10.94 mm) and Suarna Rekha recorded lowest (8.79 mm). Weight of the individual floret was highest in Suarna Rekha (3.05 g) and lowest in Calcutta Double (2.17g). Vaibhav recorded highest number of spikes per clump (3.50 no's), number of spikes per plot (115.50 no's) and number of spikes per ha (38,5000.00 no's) and lowest number of spikes per clump (0.50 spikes / clump), number of spikes per plot (16.50 spikes/plot) and number of spikes per hectare (55000.00 spikes/ha) in Suarna Rekha (Table 1.7.1c and d).

Table 1.7.1c. Performance of tuberose cultivars (Double type) at IIHR Hesaraghatta Centre (2015-16)

Genotype	Plant height (cm)	No. of leaves/plant	Days to spike emergence	Spike length (cm)	Rachis length (cm)	Number of florets/ spike	Length of floret (cm)
Pearl Double	38.63	93.00	142.44	104.33	30.98	44.39	5.79
Suvasini	46.84	116.67	140.33	104.41	31.90	62.97	6.20
Vaibhav	40.17	109.40	180.78	92.60	26.41	47.47	6.59
Hyderabad Double	45.21	103.73	138.11	105.51	23.51	44.39	6.13
Calcutta Double	31.37	91.60	161.11	98.81	28.31	45.67	5.31
Suarna Rekha	34.57	79.60	184.00	97.94	22.47	44.78	5.78
CD at 5%	5.192	21.002	8.972	11.608	5.038	5.874	0.44

Table 1.7.1d. Performance of tuberose cultivars (Double type) at IIHR Hesaraghatta Centre (2015-16)

Genotype	Diameter of floret (cm)	Diameter of cut spike (mm)	Weight of individual floret (g)	Number of spikes per clump	Number of spikes/plot	Number of spikes/ha
Pearl Double	3.90	10.49	2.94	1.14	37.58	125277.78
Suvasini	4.75	9.86	2.78	1.83	60.50	201666.67
Vaibhav	4.52	10.13	2.63	3.50	115.50	385000.00
Hyderabad Double	4.46	10.13	2.26	1.94	64.17	213888.89
Calcutta Double	3.83	10.94	2.17	1.06	34.83	116111.11
Suarna Rekha	3.78	8.79	3.05	0.50	16.50	55000.00
CD at 5%	0.386	0.785	0.505	0.496	16.366	54554.745

GERBERA

Project No. 1.8.1: Collection, evaluation and maintenance of gerbera germplasm

Genotypes *viz.*, Natan, Solange, Susan, GJ 0248, Beverly and Levi Dana Ellen, Rosalin, Balance, Goliath, Stanza, Basics, Alcatraz, Terra Kalina, Faith were collected, planted and evaluated under naturally ventilated polyhouse (Table 1.8.1).

Table 1.8.1a: Evaluation of gerbera genotypes for vegetative characters under polyhouse (pooled data of two years) at IIHR Hesaraghatta Centre (2015-16)

Genotypes	No. of leaves/plant	Leaf length (cm)	Leaf breadth (cm)	Plant spread (cm)		No. of Suckers/plant	Reaction to pests
				E-W	N-W		
Natan	14.09	41.05	18.02	69.56	72.93	2.36	susceptible
Solange	11.37	33.50	15.68	65.72	66.00	2.41	susceptible
Susan	11.08	34.07	13.46	58.03	57.57	2.60	susceptible
GJ 0248	13.82	37.32	13.82	61.51	62.24	3.00	Highly susceptible
Beverly	13.33	42.58	19.33	73.85	73.20	2.63	susceptible
Levi	18.14	36.92	16.54	66.91	67.46	3.33	susceptible
Danaellen	13.00	36.57	15.47	61.99	59.90	2.86	susceptible

Rosalin	14.79	40.05	19.02	69.56	73.93	2.36	susceptible
Balance	12.69	37.12	14.11	66.18	65.76	2.36	Highly susceptible
Goliath	14.46	33.99	11.95	61.15	58.02	2.22	susceptible
Stanza	14.84	37.64	19.80	63.27	64.36	2.60	susceptible
Basics	13.56	37.89	12.98	67.34	63.45	2.19	Highly susceptible
Faith	13.44	42.32	13.44	65.43	67.54	2.00	susceptible
Kalina	13.78	42.27	14.56	65.67	64.33	1.58	susceptible
Alcatraz	12.67	43.34	13.20	63.20	63.45	1.65	susceptible
Terra	14.56	41.24	13.44	67.2	65.33	1.92	susceptible
SEm±	0.67	1.01	0.80	1.56	1.69	0.12	
C.D. at 5%	1.66	2.48	2.48	3.83	4.16	0.28	

Table 1.8.1b: Evaluation of gerbera genotypes for flowering characters under polyhouse (pooled data of two years) at IIHR Hessaraghatta Centre (2015-16)

Genotypes	Days to bud burst	Days to first flower opening	Flower diameter (cm)	Disc diameter (cm)	Flower stalk length (cm)	Flower stalk diameter (mm)	Number of flowers/ plant/ month	Vase life (days)
Natan,	81.2	85.78	9.45	3.10	54.11	5.89	2.87	7.1
Solange	72.33	78.45	9.98	2.98	53.26	5.63	3.11	7.1
Susan	63.27	69.60	10.60	2.93	50.08	5.40	2.38	6.2
GJ 0248	70.11	75.85	10.05	2.07	51.19	5.86	2.88	6.4
Beverly	75.99	81.49	11.17	3.12	65.22	5.88	3.45	7.6
Levi	74.21	80.55	10.11	2.58	63.80	6.17	3.46	7.1
Danaellen	68.94	68.50	10.41	3.03	55.84	5.75	3.02	7.2
Rosalin	64.82	70.41	10.18	2.53	61.11	6.73	3.07	8.1
Balance	65.22	72.05	10.21	2.91	56.88	6.43	2.86	7.9
Goliath	76.88	82.28	9.62	1.96	48.09	5.55	3.63	7.5
Stanza	61.88	67.14	9.73	2.63	51.02	4.82	2.73	6.9
Basics	67.94	73.88	10.80	2.12	66.39	5.83	3.34	6.4
Faith	71.34	77.34	10.11	2.65	61.45	5.89	3.56	6.7
Kalina	73.22	79.34	10.34	2.78	55.23	5.65	3.24	7.2
Alcatraz	71.45	78.45	10.45	2.98	56.34	5.34	3.67	6.3
Terra	73.44	78.93	10.56	2.56	55.18	5.67	3.57	8.2
SEm±	1.77	3.95	0.08	0.04	0.77	0.14	1.33	0.78
C.D. at 5%	3.72	8.30	0.21	0.10	1.90	0.34	2.72	2.42

SPECIALITY FLOWERS

Project No. 1.13.1: Collection and evaluation of underexploited ornamentals (Heliconias, Ginger lily, Bird of Paradise etc.)

Of the twenty two collections maintained in germplasm, 16 varieties being evaluated after purification. Two sets of 16 accessions were established in cement pots to avoid further mixing of varieties during experimentation due to differential growth and multiplication habit.

Project No. 1.15.2: Collection and evaluation of turf grasses

Six grass species namely Kentucky blue grass (*Poa pratensis*), *Lolium perene* and *Agrostis palustris* *Eragrostis curvula*, *Paspalum notatum* and *Argentine bahia* were evaluated for five morphological and five quality traits for four consecutive years (2011-12 to 2014-15).

Significant variation was recorded among the traits. On the basis of pooled analysis, *Poa pratensis* recorded maximum depth of root (8.28 cm), maximum shoot length (14.12 cm) and fresh weight of shoot (0.14 g) was recorded in *Eragrostis curvula*. However, significantly maximum dry weight of shoot (0.03g each) was recorded in *Poa Pratensis* and *Eragrostis curvula*. Highest root density (11.31/10 cm²) was recorded in *Argentine bahia* followed by *Lolium perene* (9.33/10 cm²) and *Paspalum notatum* (8.5/10 cm²). In conclusion, considering the morphological and quality traits, turf grass species namely *Eragrostis curvula*, *Paspalum notatum* and *Argentine bahia* were found most suitable for lawn making and recommended for Bengaluru conditions (Table 1.15.2a and b).

Table 1.15.2a Mean performance of turf grass species for morphological traits at IIHR Hessaraghatta Centre (2015-16) (pooled data of four years from 2011-12 to 2014 -15)

Turfgrass species	Depth of root (cm)	Shoot Length (cm)	Fresh weight (g)	Dry weight (g)	Root density /10cm ²
<i>Paspalum notatum</i> Flugge	6.15	2.04	0.08	0.02	8.51
<i>Poa pratensis</i> L.	8.28	7.28	0.05	0.03	7.33
<i>Eragrostis curvula</i>	7.19	14.12	0.14	0.03	2.35
<i>Agrostis palustris</i> L.	6.36	6.60	0.04	0.01	3.45
<i>Argentine bahia</i>	6.30	3.08	0.07	0.01	11.31
<i>Lolium perene</i> L.	5.20	12.41	0.13	0.04	9.33
SEd	0.06	0.04	0.06	0.005	0.05
C D @ 5%	0.13	0.100	0.01	0.01	0.10

Table 1.15.2b. Evaluation of turf quality traits at IIHR Hessaraghatta Centre (2015-16)

Turfgrass species	Leaf blade colour	Leaf texture	Growth habit on visual observation	Weed intensity (scores*)	Growth rate (scores**)	Suitable for mowing
<i>Paspalum notatum</i> Flugge	Yellow green (146 B)	Smooth	Medium	4.3	2.9	Suitable
<i>Poa pratensis</i> L.	Green (138B)	Smooth	Medium	1.4	8.5	Suitable
<i>Eragrostis curvula</i>	Green 137B	Smooth	Fast	6.7	8.1	Not Suitable
<i>Agrostis palustris</i> L.	Yellow green (147B)	Rough	Fast	1.6	6.2	Suitable
<i>Argentine bahia</i>	Green (137C)	Smooth	Slow	7.9	5.6	Suitable
<i>Lolium perene</i> L.	Yellow green (147B)	Smooth	Slow	2.2	3.2	Not Suitable

*Scores: 1: Low weed intensity; 9: High weed intensity, ** Scores: 1: Slow growth rate 9: Fast growth rate

2. CROP IMPROVEMENT

GLADIOLUS

Project No. 2.2.2: Testing of new genotypes of gladiolus for cut flower, garden decoration and disease resistance

A total of seven genotypes from different testing centers were evaluated for vegetative and floral traits (Table 2.2.2). There was significant difference among the varieties for different traits. Among the genotypes tested, 'Pink Friendship' was early to flower followed by 'IIHRG-12'. Rachis length was maximum in 'Arka Naveen' followed by 'IIHRG -11' and Punjab Glad-1. Number of florets per spike was maximum in IIHRG-11 followed by 'Arka Naveen' and Punjab Glad -1. Flowering duration was maximum in 'Arka Naveen' and it was on par with 'IIHRG-11 and 'IIHRG-12'. The genotypes 'Arka Naveen' and IIHRG-11 were found to be promising for cut flower purpose (Table 2.2.2).

Table 2.2.2: Performance of different genotypes along with Pink Friendship at IIHR Hesaraghatta Centre (2015-16)

Cultivar/Hybrid	Days to spike emergence	Days to flower	Plant height (cm)	Spike length (cm)	Rachis length (cm)	Floret size (cm)	No. of florets/spike	Florets remain open	Flowering duration (days)
Arka Naveen	61.33	71.33	112.66	84.86	60.86	9.60	15.66	4.76	15.50
IIHRG -11	58.66	65.33	100.66	81.53	53.86	8.23	16.00	5.00	15.00
IIHRG -12	56.33	65.33	113.00	95.90	46.93	8.23	14.66	5.00	15.00
Punjab Glad-1	60.66	66.66	105.66	90.46	47.53	8.33	14.66	5.66	15.00
Pusa Shubham	60.00	68.00	106.66	92.10	47.40	8.03	14.70	5.33	13.66
Pusa Kiran	65.00	66.00	110.00	90.60	45.93	8.46	14.66	6.00	14.00
Pink Friendship	51.33	61.66	80.66	75.83	45.80	8.06	10.00	6.00	10.33
SEm ±	0.87	1.73	1.34	1.14	0.94	0.07	0.47	0.29	0.42
C.D. at 5%	2.70	5.33	4.13	3.51	2.91	0.24	1.46	0.89	1.30
CV (%)	2.57	4.51	2.23	2.26	3.29	1.60	5.78	9.37	5.22

CHRYSANTHEMUM

Project No. 2.3.2: Testing of newly evolved genotypes of chrysanthemum for loose flowers, cut flowers and pot culture

Eight genotypes and local check were evaluated. Maximum plant height was recorded in Local Yellow Semi Double (63.63 cm). Earliest days to bud appearance (60.40 days) and flower bud opening (74.36 days) was recorded in genotypes E 89, while it was late in Arka Yellow Gold (96.10 days and 136.40 days, respectively). Maximum flower diameter (5.60 cm) and weight of 100 flower (219.10 g) was recorded from Arka Arka Yellow Gold, however, maximum number of flowers per plant was recorded in Arka Chandrika (112.16). The genotypes Rajat and Arka Chandrika recorded maximum flowering duration (46.47 days and 16.40 days, respectively) (Table 2.3.2).

Table 2.3.2: Testing of new genotypes for cut flower and loose flower at ICAR-IIHR Hesaraghatta Centre (2015-16)

Genotypes	Plant height (cm)	Number of days taken for flower bud appearance	Number of days taken for flower bud opening	Flower diameter (cm)	Number of flowers/plant	Weight of flowers/plant (g)	Duration of flowering (days)	Shelf life (day)
PAU-D-1	39.02	65.06	79.60	4.60	58.36	183.42	43.20	3.00
E 82	44.30	63.48	76.20	4.00	83.00	163.28	37.56	2.80
E 87	53.60	60.40	74.36	3.49	68.58	153.40	33.00	3.00
E 85	55.60	63.60	82.61	4.40	73.00	169.58	39.50	3.00
Rajat	43.35	78.00	93.60	5.60	106.00	210.00	46.47	2.90
Roopanjali	51.20	70.16	88.15	4.62	82.68	189.40	31.03	2.50
B 47/101	46.10	68.12	83.15	4.68	83.16	183.44	37.40	3.30
C 6/11	50.10	72.06	86.06	4.30	69.40	172.16	41.63	3.00
B 32/20	46.05	76.63	92.40	3.96	88.25	166.18	36.10	2.60
Arka Yellow Gold	50.62	96.10	136.40	5.60	90.60	219.10	43.43	3.25
Arka Chandrika	46.30	76.40	94.13	4.86	112.16	183.00	46.40	3.00
Local Yellow Double	63.63	79.60	96.05	4.30	48.60	139.0	29.30	2.90
SEm±	2.30	1.43	1.14	0.68	3.48	2.16	1.52	0.50
C.D. at 5%	6.36	4.86	3.51	2.18	9.98	6.63	4.93	1.53

TUBEROSE

Project No. 2.6.2: Testing of genotypes in tuberose for higher flower yield (loose/cut flowers), concrete yield and resistance to nematode

The planting material received from BCKV, Kalyani for Bidhan Rajani- 1 (65 nos) and Bidhan Rajani-2 (60 no's) were not sufficient to set up an experiment and the bulbs of the above tuberose varieties were multiplied during the year 2015-2016 to take up trial in the next year (2016-2017).

CROSSANDRA

Project No. 2.8.1: Testing of new genotypes for loose flower, cut flower and for pot culture

Plants of four varieties viz., Arka Ambara, Arka Kanaka, Arka Shreya and Arka Shravya were multiplied and supplied to TNAU, Coimbatore, YSHRU, Hyderabad and NARP, Pune. AT ICAR-IIHR, all the four varieties are performing significantly superior over control for all the characters evaluated. Eventhough Arka Shravya recorded highest number of flowers. The variety Arka Ambara recorded highest yield followed by Arka Kanaka (Table 2.8.1).

Table 2.8.1 Evaluation of new varieties of Crossandra at IIHR Hesaraghatta Centre (2015-16)

Genotypes	Plant height (cm)	Plant spread (cm)	Number of branches per plant	Days to flower	Rachis length (cm)	Spike length (cm)	Floret length (cm)	Flower width (cm)	Shelf life (days)	Number of flowers/spike	Yield/plant/year (g)	Susceptibility to insect and disease, if any
Local	62.60	54.89	21.45	95.34	2.12	5.56	2.63	2.46	3.0	7.3	179.3	HS
Arka Ambara	72.30	52.78	25.78	66.34	4.56	8.67	2.78	4.11	4.0	7.2	426.3	MR
Arka Kanaka	65.30	51.89	25.34	67.43	4.56	7.12	2.98	4.23	4.1	8.7	367.6	MR
ArkaShreeya	48.9	49.90	29.87	65.45	4.45	9.56	2.78	4.34	3.8	8.9	427.1	MR
Arka Shravya	62.98	77.3	33.56	66.23	7.23	13.56	2.67	2.98	4.2	12.6	377.3	MR
SEm±	2.5	1.4	1.2	3.2	0.277	1.2	0.56	0.05	0.43	0.8	15.8	
C.D. @ 5%	7.3	3.9	3.67	9.4	0.797	3.6	NS	0.15	1.25	2.4	45.78	

CHINA ASTER

Project No. 2.9.1: Testing of new genotypes for cut flower and loose flower

Three varieties and two local checks were evaluated. Significant differences were observed among the genotypes for different vegetative and flower quality traits. The maximum plant height was recorded in Local Pink followed by Arka Kamini and Local White. The genotypes Arka Aadya and Arka Archana recorded early flowering, while Arka Kamini was late in flowering. Maximum flower diameter was recorded in Arka Kamini followed by Arka Aadya. Maximum 100 flower weight was recorded in Arka Archana followed by Arka Aadya and Arka Kamini (Table 2.9.1).

Table 2.9.1: Testing of new genotypes of China aster for cut flower and loose flower

Genotypes	Plant height (cm)	Plant spread (cm)	Stalk length (cm)	Days to 50% flowering	Flower head diameter (cm)	Number of flowers/plant	Weight of 100 flowers (g)	Flowering duration (day)	Vase life in days (days)	Shelf life of loose flower (day)	Flower colour (RHS)	Reaction to insect and disease
Arka Aadya	46.20	44.25	37.90	57.26	5.50	65.83	236.0	16.52	-	3.86	62.A	-
Arka Archana	49.60	46.32	45.67	64.10	4.82	79.35	246.8	18.34	-	-	NN155.C	-
Arka Kamini	58.64	32.18	30.85	80.26	5.60	59.62	206.2	15.63	8.00	3.00	73.A	-
Local White	55.80	35.36	33.68	65.92	5.40	75.68	176.2	11.28	6.86	2.68	NN155.C	-
Local Pink	58.63	34.52	38.60	75.83	5.10	63.87	179.3	12.30	6.42	3.02	N57.C	-
SEm±	1.24	1.35	1.12	1.09	0.08	3.26	2.26	1.48	0.10	0.16	-	-
C.D. at 5%	3.09	4.76	3.58	3.38	0.21	9.83	6.67	2.36	0.38	0.43	-	-

3. CROP MANAGEMENT

Project No. 3.3.1: Drip irrigation and fertigation studies in marigold

An experiment was conducted to study the effect of drip irrigation and fertigation in marigold cv. Arka Agni. The trial comprised of seven fertigation treatments replicated thrice in randomized block design. Rooted terminal cuttings of marigold cv. Arka Agni were planted in February 2016. Observations on vegetative characters, bud initiation, blooming period, floral traits and yield were recorded. Significant differences among the treatments were observed for plant spread (EW), individual flower weight, yield of flowers/plant, yield of flowers/plot (4m²) and estimated yield/ha.

Plant spread (EW) was maximum (Table 3.3.1.1) in T₁- 75 % of RDF using WSF (30.0 cm) and was on par with the other treatments except T₅-50% WSF + 50% SF which recorded the minimum spread (24.93 cm). The individual flower weight (Table 3.3.1.2) was the highest in T₆-25% WSF + 75% SF (0.70g) which was on par with T₇-100 % Straight Fertilizer (0.68g) and T₄-75 % WSF + 25% SF (0.67 g). Lowest individual flower weight was recorded in the T₁ and T₂ treatments (0.65 g). The yield of flowers/plant (Table 3.3.1.2) was the highest in T₅-50% WSF + 50% SF (203.5 g) and the lowest in T₁ - 75 % of RDF using WSF (152.58 g). The yield of flowers/plot (Table 3.3.1.2) was highest in T₅-50% WSF + 50% SF (14.65 kg/4m²) and the lowest in T₁- 75 % of RDF using WSF (10.99 kg/4m²). The estimated yield/ha (Table 3.3.1.2) was the highest in T₅-50% WSF + 50% SF (84.66 qt) and the lowest in T₁ - 75 % of RDF using WSF (63.47qt) (Table 3.3.1.1 and 2).

Table 3.3.1.1: Effect of drip irrigation and fertigation on vegetative and floral traits in marigold cv. Arka Agni

Treatments	Plant height at first flower bud appearance stage (cm)	Number of primary branches	Plant spread (cm)		Days taken for first flower bud appearance	Days taken for full bloom (harvest stage)	Stem girth (cm) 1cm from the ground
			NS	EW			
75 % of RDF- WSF	47.8	6.33	34.00	30.00	50.47	13.53	4.51
100% of RDF- WSF	48.73	6.27	32.20	29.47	50.47	13.33	4.63
125 % of RDF- WSF	47.87	5.53	30.60	27.60	50.33	13.93	4.33
75 % WSF + 25% SF	47.13	5.60	29.00	27.60	50.20	13.47	4.26
50% WSF + 50% SF	47.4	5.87	29.80	24.93	50.27	13.67	4.28
T ₆ T ₆ -25% WSF + 75% SF	48.13	6.13	30.87	28.13	50.27	13.33	4.28
100 % Straight Fertilizer (Control)	51.13	6.13	33.27	29.60	50.07	13.47	4.55
CV (%)	6.33	10.01	8.36	5.54	1.10	3.35	6.04
CD (p=0.05)	NS	NS	NS	2.78	NS	NS	NS

Table 3.3.1.2: Effect of drip irrigation and fertigation on floral traits and yield in marigold cv. Arka Agni

Treatments	Flowering duration	Diameter of flower (cm)	Pedicle length (cm)	Individual flower weight (g)	Estimated yield/ha (qt)	Yield of flowers/plant (g)	Yield of flowers/plot kg Plot size 4 x1 m bed
75 % of RDF- WSF	41.93	4.21	4.03	0.65	63.47	152.58	10.99
100% of RDF- WSF	42.53	4.21	3.93	0.65	71.77	172.52	12.42
125 % of RDF- WSF	41.73	4.36	4.03	0.66	77.31	185.84	13.38
75 % WSF + 25% SF	42.53	4.38	4.16	0.67	77.28	185.78	13.38
50% WSF + 50% SF	42.13	4.30	4.26	0.66	84.66	203.50	14.65
T ₆ T ₆ -25% WSF + 75% SF	42.13	4.28	4.36	0.70	83.59	200.94	14.47
100 % Straight Fertilizer (Control)	43.20	4.46	4.15	0.68	81.93	196.94	14.18
CV (%)	1.59	2.49	5.02	2.52	13.08	13.08	13.08
CD (p=0.05)	NS	NS	NS	0.03	7.95	23.16	2.01

4. CROP PROTECTION

Project No. 4.1.1: Disease diagnostics in major ornamental crops of the region.

Table. 1.1.1. List of fungal diseases of ornamental crops identified.

Sl. No.	Crop	Place	Disease	Symptoms	Tentative identification
1	Tuberose	Kahikuchi	Leaf blight	Brownish patches on the leaf	<i>Phoma</i> species
2	<i>Jasminum auriculatum</i>	Kahikuchi	Leaf blight	Gray coloured spots on leaf	<i>Cercospora</i>
3	Alpine galanga Ginger lilly	Kahikuchi	Leaf spot	Brown spots on leaf	<i>Cercospora</i>
4	Gerbera	Shillong	Leaf spot	Marginal leaf drying	<i>Alternaria</i>
5	<i>Heliconia bahai</i>	Shillong	Leaf spot	Brown spots on leaf	<i>Alternaria</i>
6	Rhapis palm	Kahikuchi	Leaf spot	Yellowish spots on leaf	<i>Pestalotiopsis</i>
7	Spathogotis orchid	Kahikuchi	Root rot	Drying of roots	<i>Phytophthora nicotianae</i>
8	Spiderlilly	Kahikuchi	Leaf spot	red to light brown coloured spots / patches on leaf	<i>Phoma</i> species
9	Plumaria	Kahikuchi	Leaf spot	Oblong shaped brownish patches on leaf	<i>Cercospora</i>
10	Dendrobium	Kahikuchi	Leaf blight	Blight on leaf lamina and midribs	<i>Colletotrichum</i>
11	Spathogotis orchid	Kahikuchi	Black leaf spot	Bacterial leaf spots	<i>Xanthomonas</i>

* Species identification using ITS/tef1 for fungal and 16S rDNA work is in progress. All the work carried out in collaborating with Dr. Mazumdar and Dr. S. K. Bora.

ROSE

Project No. 4.2.1: Control of black spot of rose under open field condition.

Evaluation of selected fungicides for the management of black spot in rose caused by *Diplocarpon rosae*

For the second year, field trial for the management of rose black spot caused by *Diplocarpon rosae* was carried out for field grown rose. Among the fungicides tested trifloxystrobin + tebuconazole available as a combination product with 50 and 25% ai as 0.1% spray at 15 days interval was very effective against black spot with 2-19 PDI while in control it reached 88 PDI. Propiconazole was the next best fungicide with with PDI 10 – 48 during the crop season. The defoliation due to black spot could be avoided in trifloxystrobin + tebuconazole treated plants by 95% in which the disease severity was 4.22 in September while in control complete defoliation was observed with disease severity of 88.0. As a result of defoliation there were only 156 leaves in control plants while in trifloxystrobin + tebuconazole treated plants there were 3417 leaves which was reflected in the reduction in flower production by 90% in control.

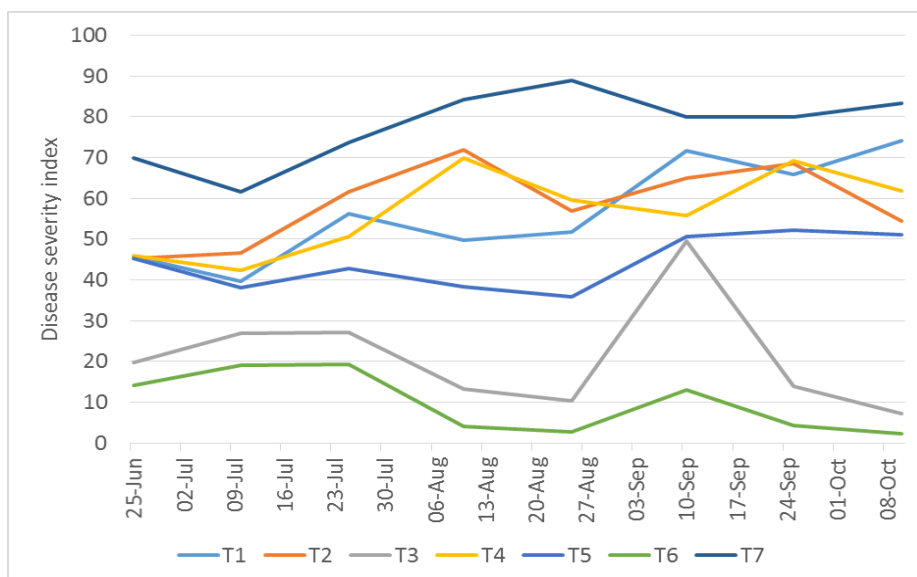


Fig. 1. Evaluation of fungicides for the management of black spot of rose (Disease severity index)

Table 4.2.1. Evaluation of fungicides for the management of black spot of rose

Treatments	Disease severity @	No of leaves per plant *	Flower yield in g \$
Mancozeb (0.1%)	66.00d	304b	458a
Carbendazim (0.1%)	68.67d	394b	560b
Propiconazole (0.1%)	14.00b	2573c	2817e
Azoxystrobin (0.1%)	69.33d	642c	780c
Kresoxim Methyl (0.1%)	52.22c	1275d	2235d
Trifloxystrobin (0.1%)	4.22a	3417e	5233f
Control	80.00e	156a	483a

@ In Sept, * On 23rd Sept, \$ cumulative of 3 harvests per plot each with 10 plants, Average of 3 Replications. Values followed by same letters in a column do not differ significantly

GLADIOLUS

Project No. 4.3.1: Management of *Fusarium* wilt in gladiolus

Carbendazim tolerant *Trichoderma harzianum* culture was supplied by ICAR-IIHR to other centers. Field trail conducted to check the efficacy of *Trichoderma harzianum* (carbendazim tolerant isolate GJ16B from NBAIR), Carbendazim and Captan for the management of *Fusarium* wilt in Gladiolus. The experiment consists of 7 treatments with 4 replications. Each replication contains 90 plants and the treatment details are given below. Observations made for germination percentage, number of flowers and wilt percentage. The germination percentage was good and 96% -100% of germination was observed in all the treatments. Wilt percentage recorded throughout the field trial. wilt incidence was 20.5% in 4 replication of T7 (Control) wilt incidence was 5.6% in T3 (T1 - CAPTON +CARBENDAZIM

+T2 -TH) and in T6 (T2- TH+SOIL CAPT+CARB) it was 8.3%. *Trichoderma* treatments and fungicide treatments were on par with their effect in wilt management. The combined treatment of *Trichoderma* and fungicides were found to be more effective (5.6% to 8.7% wilt incidence) than single application of chemicals alone (12.3%).



Fig. 2a. Field trial for the management of gladiolus wilt (variety: white prosperity)



Fig. 2b. Wilting of gladiolus plants in control plot

Table 4.3.1. Evaluation of *Trichoderma harzianum* and carbendazim for the management of wilt in gladiolus under field conditions

Treatment	Germ. %	No. of wilted plants/plot	Wilt incidence in %*
Captan + Carbendazim	97.18	5.75	12.8b
<i>T. harzianum</i>	98.00	3.50	7.8a
T1+T2	98.28	2.50	5.6a
T2+ application of <i>T. harzianum</i>	98.30	3.00	6.7a
T1+soil application of Captan + Carbendazim	97.75	5.50	12.2b
T2+ Captan + Carbendazim	99.43	3.75	8.3a
CONTROL	98.58	9.25	20.6c

Values followed by same letters do not differ significantly in a column.

Project No. 4.5.2: Evaluation of Bio-efficacy of *Bacillus subtilis*– 1 % W.P. in the management of root knot nematode, *M. incognita* infesting tuberose.

Dipping of tuberose bulbs in *Bacillus subtilis* – 1 % W.P. suspension at 10 g/lit of water followed by soil application of 5 tons/ ha of FYM enriched with *B. subtilis* (5 kg) recorded the minimum nematode population in soil (88.75) and roots (12.75). This treatment also recorded the maximum increase in flower (38.3%) and bulb yield (35.5%) (Table 4.5.2). It was comparable with chemical carbofuran which also recorded 59.0% decrease in nematode population in soil and 64.9% decrease in roots (Fig 1.)

Table 4.5.2. Effect of *B. subtilis* 1% W.P. for management of *M. incognita* in tuberose (Initial nematode population per 100 c.c soil– 104 ± 3.2)

Treatment	Final Nematode population per 100 c.c soil	Nematode population in roots per 10 g	Spike yield (Kg)/plot	Bulb yield(Kg) /plot	Gall index	%increase in spike yield	%increase in bulb yield
Bulb treatment with <i>Bacillus subtilis</i> – 1 % W.P. at 10g/lit.	118.75	18.25	2.23	6.97	2.02	14.1	28.4
T1+ Application of 5 tons of FYM enriched with 2.5kg of <i>Bacillus subtilis</i> / ha	98.00	15.50	2.53	8.18	1.67	29.5	32.2
T1+ Application of 5 tons of FYM enriched with 5 kg of <i>Bacillus subtilis</i> / ha	88.75	12.75	2.70	9.36	1.53	38.3	35.5
Application of 5 tons of FYM	145.25	26.25	2.10	5.94	3.40	7.8	9.4
T5: Chemical Treatment (carbofuran at 1 kg a.i./ ha)	100.50	13.00	2.40	7.58	1.88	23.2	31.1
Untreated Control	245.25	37.00	1.95	3.61	4.80	--	--
CD-5%	9.75	5.56	0.26	0.24	0.23	--	--
SEd	4.57	2.61	0.12	0.11	0.10	--	--



Fig. 1. Effect of *B. subtilis* 1% W.P. on *M. incognita* population in tuberose

5. POSTHARVEST TECHNOLOGY

Project No.5.2 Standardization of post harvest technology of marigold flowers

Experiment 5.2.1 Standardization of packaging techniques for flower strings of marigold

Experiment was carried out as per the technical programme with African marigold var. Orange. Observations on physiological loss in weight,% fresh weight, shelf life and acceptability were recorded. Also observations on room temperature, relative humidity and temperature inside the package were recorded. Data is represented in tables 5.2.1a,b& c. Temperature and relative humidity during the experiment were 26-28°C and Relative humidity was 48-56%. Results revealed that maximum shelf life of 5 days was obtained with flowers stored for three days in thermocol, followed by 4 days of shelf life with flowers stored for three days in CFB. Flowers stored in bamboo basket had minimum shelf life of 3 days. Xanthophyll content of marigold petals was estimated and was 9264mg/kg dry wt. but its content did not vary among the treatments.

Table 5.2.1a. Effect of packaging and storage techniques on shelf life and % fresh flower strings of marigold at Hesarahatta (2015-16)

Treatments	Shelf life (days)				% fresh flower			
	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboo basket	5.6	5.5	4.5	3.8	100	95	90	70
C ₂ Thermocol	5.6	6.8	5.5	5.0	100	99	98	95
C ₃ CFB	5.6	6.5	5.2	4.0	100	97	95	90
	CD@5%				CD@5%			
C	NS				4.36			
S	1.60				1.80			
CXS	NS				1.26			

Table 5.2.1b. Effect of packaging and storage techniques on % PLW and fresh weight of flower strings of marigold at Hesarahatta (2015-16).

Treatments	% PLW				Fresh weight (g)			
	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboo basket	100	5.6	18.2	39.8	100	94.4	89.8	69.2
C ₂ Thermocol	100	1.2	2.8	5.5	100	98.8	97.2	94.5
C ₃ CFB	100	3.4	5.7	10.6	100	96.6	94.3	89.4
	CD@5%				CD@5%			
C	0.38				3.18			
S	5.5				0.72			
CXS	0.42				0.56			

Table 5.2.1c. Effect of packaging and storage techniques on acceptability of flower strings of marigold at Hesaraghatta (2015-16).

Treatments	Acceptability			
	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboobasket	9	8	7	6
C ₂ Thermocol	9	8	7	7
C ₃ CFB	9	8	7	6
	CD@5%			
C	0.38			
S	NS			
CXS	NS			

Experiment 5.3.2 Standardization of packaging techniques for flower strings of tuberose

Experiment was carried out as per the technical programme with tuberose single var. Prajwal. Observations on physiological loss in weight, % fresh weight, shelf life and acceptability were recorded. Also observations on room temperature, relative humidity and temperature inside the package were recorded. Data is represented in tables 5.3.2a, b & c. Temperature and relative humidity during the experiment were 26-28°C and Relative humidity was 48-56%. Results revealed that maximum shelf life of 3.5 days was obtained with flowers stored for three days in thermocol, followed by 3 days of shelf life with flowers stored for three days in CFB. Flowers stored in bamboo basket had minimum shelf life of 2 days. Acceptability of flowers in varied packages at different intervals of storage did not show any variations.

Table 5.3.2a. Effect of packaging and storage techniques on shelf life and % fresh flower strings of tuberose single var. Prajwal at Hesaraghatta (2015-16).

Treatments	Shelf life (days)				% fresh flower			
	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboo basket	4.6	4.5	3.5	2.0	100	90	85	65
C ₂ Thermocol	4.6	5.5	4.5	3.5	100	86	82	80
C ₃ CFB	4.6	5.2	4.2	3.0	100	92	90	85
	CD@5%				CD@5%			
C	NS				3.58			
S	1.60				2.16			
CXS	NS				1.50			

Table 5.3.2b. Effect of packaging and storage techniques on % PLW and fresh weight of flower strings of tuberose single var. Prajwal at Hesaraghatta (2015-16).

Treatments	%PLW				Fresh weight(g)			
	No storage (S ₀)	1day storage (S ₁)	2day of storage (S ₂)	3day of storage (S ₃)	No storage (S ₀)	1day storage(S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboo basket	0	10.0	15	35	100	90.0	85.0	65.0
C ₂ Thermocol	0	2.4	3.8	5.0	100	97.6	96.2	95.0
C ₃ CFB	0	4.8	6.0	8.5	100	95.2	94.0	91.5
	CD@5%				CD@5%			
C	2.58				4.62			
S	1.86				1.96			
CXS	1.52				1.54			

Table 5.3.2c. Effect of packaging and storage techniques on acceptability of flower strings of tuberose single var. Prajwal at Hesaraghatta (2015-16).

Treatments	Acceptability			
	No storage (S ₀)	1day storage(S ₁)	2day of storage (S ₂)	3day of storage (S ₃)
C ₁ Bamboobasket	9	8	7	6
C ₂ Thermocol	9	8	7	7
C ₃ CFB	9	8	7	6
	CD@5%			
C	0.06			
S	0.42			
CXS	0.16			

Experiment 5.3.3 Studies on use of food dyes for tinting in tuberose stems

Experiment was carried out as per the technical programme with tuberose Double var. Suvasini. Observations on physiological loss in weight, % fresh weight & floret opened, vase life and acceptability were recorded. Also observations on room temperature, relative humidity and temperature inside the package were recorded. Data is represented in tables 5.3.3a, b & c. Temperature and relative humidity during the experiment were 26-28°C and Relative humidity was 48-56%. Results revealed that maximum vase life of 8.5 days was obtained with control flowers. As the food colour concentration and duration of tinting increased the vase life, % floret opened and floret diameter reduced. Whereas % PLW increased with increased concentration of colour evaluated.

Table 5.3.3a Effect of tinting on vase life and % PLW of tuberose Double var. Suvasini cut flower at Hesaraghatta (2015-16)

Treatments	Vase life(days)			% PLW		
	1hr	2 hrs.	3 hrs.	1hr	2 hrs.	3 hrs.
T ₀ Control	8.5	8.3	8.2	22	28	32
T ₁ Lemon yellow 4%	8.0	7.2	6.8	23	27	34
T ₂ Lemon yellow 8%	7.5	6.7	6.4	26	30	36
T ₃ Kesar Yellow 4%	8.0	6.9	6.5	22	26	33
T ₄ Kesar Yellow 8%	7.6	6.5	6.3	25	28	32
T ₅ Orange red 4%	7.9	7.0	6.8	21	29	35
T ₆ Orange red 8%	7.4	6.6	6.4	24	30	36
T ₇ Rose pink 4%	7.9	7.5	6.9	22	27	33
T ₈ Rose pink 8%	7.5	7.3	6.5	26	30	38
T ₉ Raspberry pink 4%	8.0	8.0	6.8	23	27	35
T ₁₀ Raspberry pink 8%	7.8	7.2	6.5	25	28	38
	CD@5%			CD@5%		
T	0.28			0.46		
D	0.02			1.54		
TXD	NS			1.30		

Table 5.3.3b Effect of tinting on uptake of colour and % florets opened in tuberose Double var. Suvasini cut flower at Hesaraghatta (2015-16)

Treatments	Colour uptake (ml)			% florets opened		
	1hr	2 hr	3 hr	1hr	2 hr	3 hr
T ₀ Control	36	50	64	92	92	92
T ₁ Lemon yellow 4%	30	48	54	86	84	82
T ₂ Lemon yellow 8%	22	39	48	82	80	78
T ₃ Kesar Yellow 4%	32	46	54.5	84	82	80
T ₄ Kesar Yellow 8%	21	38	48.5	80	78	76
T ₅ Orange red 4%	30	47	54.6	82	80	78
T ₆ Orange red 8%	23	39	47.5	79	76	74
T ₇ Rose pink 4%	31	48	54.2	80	78	76
T ₈ Rose pink 8%	23.6	38.2	48.3	78	76	74
T ₉ Raspberry pink 4%	21.4	47.2	52.9	81	78	75
T ₁₀ Raspberry pink 8%	24.8	40.6	46.8	79	76	73
	CD@5%			CD@5%		
T	7.2			0.52		
D	9.5			0.88		
TXD	4.8			0.45		

Table 5.3.3c. Effect of tinting on floret diameter of tuberose Double var. Suvasini cut flower at Hesaraghatta (2015-16)

Treatments	Floret diameter (cm)		
	1hr	2 hrs.	3 hrs.
T ₀ Control	3.2	3	2.8
T ₁ Lemon yellow 4%	3.1	2.9	2.8
T ₂ Lemon yellow 8%	2.8	2.7	2.6
T ₃ Kesar Yellow 4%	3.0	2.9	2.8
T ₄ Kesar Yellow 8%	2.8	2.7	2.6
T ₅ Orange red 4%	3.1	3.0	2.9
T ₆ Orange red 8%	2.9	2.8	2.7
T ₇ Rose pink 4%	3.0	2.9	2.8
T ₈ Rose pink 8%	2.8	2.7	2.6
T ₉ Raspberry pink 4%	3.0	2.9	2.8
T ₁₀ Raspberry pink 8%	2.9	2.7	2.6
	CD@5%		
T	0.24		
D	0.34		
TXD	0.22		