

**TAMIL NADU AGRICULTURAL UNIVERSITY**



**ANNUAL REPORT 2015– 2016  
ALL INDIA CO-ORDINATED RESEARCH PROJECT (FLORICULTURE)  
(VOLUNTARY CENTRE)**

**HORTICULTURAL COLLEGE AND RESEARCH INSTITUTE  
PERIYAKULAM EAST – 625 604**

## TAMIL NADU AGRICULTURAL UNIVERSITY

Horticultural College and Research Institute, Periyakulam East - 625 604.  
Annual Report – 2015 – 2016

All India Co-ordinated Research Project (Floriculture) – Voluntary Center

### 1. Background Information :

Horticultural College and Research Institute, Periyakulam is located at Eastern part of Western Ghats, Theni District, Tamil Nadu. This institute has the locational advantage of taking up research in commercial floriculture crops viz., rose, jasmine, tuberose, crossandra, marigold, chrysanthemum (loose), nerium, gomphrena and cockscomb and tropical foliage crops.

The Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam Centre has been included as voluntary centre, under ICAR - AICRP on Floriculture, Directorate of Floriculture, ICAR, New Delhi during October, 2010. Under this programme, eleven projects have been completed earlier and nine have been initiated during this reporting year, 2015-16.

The mandatory crops assigned to this centre are crossandra, tuberose, marigold, under exploited ornamentals and native ornamentals.

2.	Staff position	:	Nil - Voluntary Centre (Floriculture)
3.	Budget Details (2015-16)	:	

Opening Balance Rs.	Receipts Rs.	Expenditure (Rs.)		
		TA	Recurring	Total
(-208) *	1,00,000/- as Recurring contingencies	28,250	71,750	1,00,000
* Extra amount spent in 2014-15 and not adjusted in 2015-16				

4.	Salient Achievements during 2015-16	:	
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- Under the experiment on native ornamentals, IC Number 598296 has been obtained from NBPGR, New Delhi for *Chlorophytum tuberosum*.
- The fertigation trials on marigold and crossandra indicated that the plants which received 125 % of RD of fertilizers using WSF through fertigation recorded best performance for growth, earliness in flowering and yield.

- Post harvest packaging and storage studies on marigold and tuberose flower strings revealed that thermocol box with ice pack was the best container for packing.
- Treating loose flowers of tuberose with 2% boric acid extended the post harvest life and quality.
- Under value addition, drying of flowers, foliage and pods by embedding in silica gel and oven drying at 50°C can be recommended for adaptation.

## **5. Experiment wise results :**

### **1. Germplasm conservation**

#### **Project No. 1.14.2: Survey, collection and evaluation of native ornamentals for commercial cultivation.**

**Duration :** 2011 onwards

#### **Technical Programme:**

- Explorative survey and data collection in liaison with ICAR-NBPGR, New Delhi.
- Evaluating native ornamentals for commercial potential such as cut flower, cut green, loose flower, pot plant and other landscape use.
- The concerned scientists are advised to maintain passport data of newly collected species/varieties and obtain the IC/EC number from ICAR-NBPGR, New Delhi for record.
- Recommendation of a variety for commercial cultivation in respective region based on extensive evaluation should be submitted to the Director, ICAR-DFR, Pune every year along with the proposal for testing in the other centres, if any.
- Areas to be covered: Western Ghats, Western Himalayas and NEH region.

#### **Progress Made:**

- At Horticultural College & Research Institute, Periyakulam, two native ornamental species *viz.*, has been collected in Usilankaradu area of Periyakulam, Tamil Nadu.
- The collected species were identified at Botanical Survey of India, Coimbatore-3, Tamil Nadu and IC Number 598296 has been obtained for *Chlorophytum tuberosum* from NBPGR, New Delhi.

- For *Crossandra infundibuliformis* (L.) Nees – Acanthaceae, planting material has been sent for obtaining IC Number.
- Apart from that the following eight native ornamental species viz., wild jasmine - *Jasminum sp.*, *Holmskioldia sp.*, *Pterospermum sp.*, *Leucas sp.*, *Aristolochia sp.*, *Barlaria sp.*, *Crossandra sp.*, (Maruthamalai) and *Symphorema sp.*, were found in the foothills of western ghats in an around Theni district of Tamil Nadu during 2015 – 2016 and species confirmation is in progress.
- Multiplication of the identified species is being carried out for commercial exploitation of the species.
- Cytological studies were carried out and found that *Chlorophytum tuberosum* (Roxb.) is a diploid plant species with  $2n=14$  chromosomes with 7 bivalents. Abnormal meiosis with multivalent formation and univalent were also observed.

**Salient findings :**

IC Number 598296 has been obtained from NBPGR, New Delhi for *Chlorophytum tuberosum*.

**2. Crop Improvement : NIL**

**3. Crop management**

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

**Duration :** 3 years (2015-16 onwards)

**Technical Programme**

Design: Randomized Block Design

No. of treatments: Seven

**Treatment details:**

- T1 -75 % of RD of fertilizers using WSF
- T2 -100% of RD of fertilizer s using WSF
- T3 -125 % of RD of fertilizer s using WSF
- T4 -75 % WSF + 25% Straight Fertilizer
- T5 -50% WSF + 50% Straight Fertilizer
- T6-25% WSF + 75% Straight Fertilizer
- T7-100 % Straight Fertilizer (Control)

Recommended dose of fertilizers: 90:90: 75 kg/ha NPK/ha.

## Progress Made:

Experiment on fertigation in marigold was laid out with seven treatments. Observation on growth and yield parameters were recorded. The results of the study revealed that 125 % of RD of fertilizers using WSF (T<sub>3</sub>) recorded best performance with regard to growth and yield. The treatment T<sub>3</sub> recorded the highest plant height of 37.86 cm, highest stem girth of 3.40cm, highest number of primary branches per plant (9.8) and the maximum plant spread (N x S) & (E x W) of 19.2 cm and 18.2 cm respectively.

Earliness in flowering (15 days), flower duration (54 days) and flower characters like flower diameter (5.6 cm) and pedicel length (3.5 cm) was observed to be best in T<sub>3</sub>. Regarding the yield parameters the same treatment registered maximum values for Individual flower weight (7.85g), Number of flowers per plant (35.94 nos.), Yield of flowers / plant (243.32g) and Estimated yield (14.55 t/ha).

**Table 1. Effect of drip fertigation on morphological characters of Marigold cv. Maxima Yellow**

Treatments	Plant Height (cm) (1 <sup>st</sup> flower bud appearance stage)	Stem Girth (cm) (1 <sup>st</sup> from ground level)	Number of primary branches	Plant spread (cm)	
				N X S	EXW
T1 -75 % of RD of fertilizers using WSF	36.95	3.0	8.3	18.1	17.3
T2 -100 % of RD of fertilizers using WSF	36.48	2.5	8.0	17.3	16.0
<b>T3 -125 % of RD of fertilizers using WSF</b>	<b>37.86</b>	<b>3.7</b>	<b>9.8</b>	<b>19.2</b>	<b>18.2</b>
T4 -75 % WSF + 25% Straight Fertilizer	35.50	2.0	7.0	16.1	15.2
T5 -50% WSF + 50% Straight Fertilizer	34.30	1.5	6.2	15.0	14.2
T6-25% WSF + 75% Straight Fertilizer	33.40	1.0	6.0	14.2	13.8
T7-100 % Straight Fertilizer (Control)	32.45	1.0	5.0	13.6	12.0
<b>Mean</b>	<b>35.27</b>	<b>3.67</b>	<b>7.1</b>	<b>16.21</b>	<b>15.24</b>
<b>SEd</b>	<b>3.20</b>	<b>0.63</b>	<b>1.51</b>	<b>2.27</b>	<b>2.28</b>
<b>CD (0.05)</b>	<b>6.97</b>	<b>1.38</b>	<b>3.29</b>	<b>4.96</b>	<b>4.98</b>

**Table 2. Effect of drip fertigation on flower characters in Marigold cv. Maxima Yellow**

Treatments	Days taken for 1 <sup>st</sup> flower bud appearance	Days taken for full bloom	Flower duration (days)	Flower	
				Flower Diameter (cm)	Pedicle length (cm)
T1 -75 % of RD of fertilizers using WSF	18	25	50	4.9	3.2
T2 -100 % of RD of fertilizers using WSF	20	27	48	4.0	2.9
<b>T3 -125 % of RD of fertilizers using WSF</b>	<b>15</b>	<b>20</b>	<b>54</b>	<b>5.8</b>	<b>3.9</b>
T4 -75 % WSF + 25% Straight Fertilizer	25	28	45	3.0	2.0
T5 -50% WSF + 50% Straight Fertilizer	28	30	40	2.9	1.5
T6-25% WSF + 75% Straight Fertilizer	30	35	40	2.4	1.5
T7-100 % Straight Fertilizer (Control)	35	38	40	2.0	1.2
<b>Mean</b>	<b>24.42</b>	<b>29.0</b>	<b>45.28</b>	<b>6.25</b>	<b>4.05</b>
<b>SEd</b>	<b>7.32</b>	<b>6.37</b>	<b>6.53</b>	<b>1.15</b>	<b>0.63</b>
<b>CD (0.05)</b>	<b>15.96</b>	<b>13.89</b>	<b>14.23</b>	<b>2.51</b>	<b>1.38</b>

**Table 3. Effect of drip fertigation on yield characters in Marigold cv. Maxima Yellow**

Treatments	Individual flower weight (g)	Number of flowers per plant	Yield of flowers / plant (g)	Estimated yield (t/ha)
T1 -75 % of RD of fertilizers using WSF	6.03	33.09	199.50	13.47
T2 -100 % of RD of fertilizers using WSF	5.42	31.28	180.17	12.50
<b>T3 -125 % of RD of fertilizers using WSF</b>	<b>7.85</b>	<b>35.94</b>	<b>243.32</b>	<b>14.55</b>
T4 -75 % WSF + 25% Straight Fertilizer	5.00	28.03	147.15	11.24
T5 -50% WSF + 50% Straight Fertilizer	4.50	25.03	126.15	10.85
T6-25% WSF + 75% Straight Fertilizer	4.00	22.56	112.57	10.03
T7-100 % Straight Fertilizer	3.95	21.06	93.08	9.45

(Control)				
<b>Mean</b>	<b>9.18</b>	<b>28.14</b>	<b>157.42</b>	<b>11.72</b>
<b>SEd</b>	<b>1.16</b>	<b>5.92</b>	<b>5.46</b>	<b>1.89</b>
<b>CD (0.05)</b>	<b>2.55</b>	<b>12.91</b>	<b>11.90</b>	<b>4.12</b>

**Salient findings:** The treatment T3 which received 125 % of RD of fertilizers using WSF through fertigation found to be best treatment for better growth, earliness in flowering and higher yield.

### **Project No. 3.4.1: Drip irrigation and fertigation studies in Crossandra**

Duration : 3 years (2015-16 onwards)

Technical Programme:

Design: Randomized Block Design

No. of treatments: Seven

Treatment details:

T1 -75 % of RD of fertilizers using WSF

T2 -100% of RD of fertilizer s using WSF

T3 -125 % of RD of fertilizer s using WSF

T4 -75 % WSF + 25% Straight Fertilizer

T5 -50% WSF + 50% Straight Fertilizer

T6-25% WSF + 75% Straight Fertilizer

T7-100 % Straight Fertilizer (Control)

Recommended dose of fertilizers: 75:50:125 kg/ha

### **Progress made:**

Experiment on fertigation in crossandra was laid out with seven treatments. Observation on growth and yield parameters were recorded. The results of the study revealed that 125 % of RD of fertilizer s using WSF (T<sub>3</sub>) recorded best performance with regard to growth and yield. The treatment T3 recorded the highest plant height of 49.10 cm, highest number of branches per plant (5.99) and the maximum plant spread (N x S) & (E x W) of 26.54 cm and 29.23 cm respectively.

Earliness in flowering (71.79 days), blooming period (50 days) and flower characters like Spike length (16.00cm), Spike girth (4.2 cm) and No. of flowers / spike (22.00) was observed to be best in T<sub>3</sub>. Regarding the yield parameters the same treatment registered maximum values for Floret length (3.0 cm), Floret width (3.36 cm), Flower weight (6.64 g) (100 flowers) and Yield / plant (102.00 g). The highest shelf life of 3.5 days was also observed in the same treatment.

**Table 1: Effect of fertiligation on growth parameters of crossandra**

Treatment	Plant ht (cm)	Plant spread		Number of branches
		E x W	N x S	
T1	47.2	25.40	23.56	3.38
T2	48.3	27.34	25.64	4.62
<b>T3</b>	<b>49.1</b>	<b>29.23</b>	<b>26.54</b>	<b>5.99</b>
T4	45.2	24.38	24.43	4.33
T5	40.2	23.90	23.24	3.67
T6	38.2	22.25	20.64	3.0
T7	36.7	20.02	19.87	2.33
<b>SEd</b>	<b>2.93</b>	<b>2.42</b>	<b>2.56</b>	<b>0.96</b>
<b>CD (0.05)</b>	<b>5.74</b>	<b>5.17</b>	<b>5.03</b>	<b>1.36</b>

**Table 2. Effect of fertigation on flower characters of crossandra**

Treatments	Days to flower	Spike length (cm)	Spike girth (cm)	No. of flowers / spike
T1	73.41	11.26	3.00	19.34
T2	72.84	12.43	3.5	20.17
<b>T3</b>	<b>71.79</b>	<b>16.00</b>	<b>4.2</b>	<b>22.00</b>
T4	79.43	12.00	3.7	18.40
T5	84.39	10.43	3.2	16.53
T6	89.39	9.26	3.00	16.00
T7	92.46	9.00	2.82	14.33
<b>SEd</b>	<b>7.20</b>	<b>0.85</b>	<b>0.14</b>	<b>1.94</b>
<b>CD (0.05)</b>	<b>13.52</b>	<b>1.57</b>	<b>0.27</b>	<b>3.72</b>

**Table 3. Effect of fertigation on yield attributes and yield of crossandra**

Treatments	Floret length (cm)	Floret width (cm)	Flower weight (g) (100 flowers)	Yield / plant (g)
T1	2.5	3.0	4.84	63.00
T2	2.7	3.11	5.72	90.00
<b>T3</b>	<b>3.0</b>	<b>3.36</b>	<b>6.64</b>	<b>102.00</b>
T4	2.66	2.44	5.18	73.00
T5	2.49	2.86	4.98	66.00
T6	2.38	2.55	4.53	53.00
T7	2.20	2.35	4.50	48.00
<b>SEd</b>	<b>0.11</b>	<b>0.09</b>	<b>0.52</b>	<b>6.61</b>
<b>CD (0.05)</b>	<b>0.20</b>	<b>0.18</b>	<b>1.01</b>	<b>12.88</b>



**Table 4. Effect of fertigation on quality of crossandra**

<b>Treatments</b>	<b>Shelf life (days)</b>	<b>Flower colour as per RHS colour charts</b>	<b>Blooming period (days)</b>	<b>No. of pickings</b>
T1	3.00	N30B	43.56	6.00
T2	3.30	N30B	49.19	6.00
<b>T3</b>	<b>3.50</b>	<b>N30B</b>	<b>50.00</b>	<b>7.00</b>
T4	3.00	N30C	47.43	6.00
T5	3.00	N30C	42.61	6.00
T6	2.50	N30C	40.61	6.00
T7	2.50	N30C	37.11	6.00
<b>SEd</b>	0.51		3.6	
<b>CD (0.05)</b>	0.99		7.29	

**Salient findings:** The treatment T3 which received 125 % of RD of fertilizers using WSF through fertigation found to be best treatment for better growth, earliness in flowering and higher yield.

### **Post harvest Management**

#### **Project No. 5.2.: Standardization of postharvest technology of marigold flowers**

##### **Experiment 5.2.1: Standardization of packing techniques for flower strings of marigold**

Duration: Three years (2015-16 onwards)

#### **Technical Programme**

Crop and cultivar: Marigold strings of any popular commercial cultivar (String size 2-3 feet)

#### **Treatments**

##### **Factor 1- Containers:**

- C1-Bamboo basket with paper lining and icepack in the centre (two baskets upside down of about 1.5 feet diameter with 1 foot depth.
- C2-Thermocol box (2x1 feet) with ice pack
- C3-CFB Box–Std size (Icepacks of 100 gm wrapped in plastic film should be placed in the centre of the first two type of containers)

##### **Factor 2 - Storage duration:**

- S1-0 day
- S2-1 day
- S3-2 day
- S4-3 day

No. of containers / treatment: Five

No. of replications: Five

Design of experiment: Completely Randomized Design (Factorial)

### Progress made:

Experiment was carried out at Horticultural College and Research Institute, Periyakulam to standardize the packing techniques for flower strings of marigold. The flower strings of two feet length were packed in containers like news paper lined bamboo basket, thermocol box and ventilated CFB boxes with ice pack. The containers were placed at room temperature and the quality of the flowers were assessed at 0,1,2 and 3 days after packing. The results of the experiment indicated lowest physiological loss in weight (5.24 %), highest weight of flower string during storage period (336.25g), highest percentage of fresh flowers (98.03 %) and best overall acceptability. Rotting of flowers was not observed in any of the containers.

### Salient findings

Thermocol box with ice pack was found to be the best container for storage of marigold flower strings.

**Table 1: Effect of packaging and storage duration on physiological loss in weight (%) and Weight of flower (g) of marigold flower string**

Treatments	PLW (%)				Weight of flower (g)				
	S2	S3	S4	Mean	S1	S2	S3	S4	Mean
C1	5.01	12.00	21.00	12.67	350.00	332.46	308.00	276.50	316.74
C2	2.14	4.78	8.80	5.24	350.00	342.51	333.27	319.20	336.25
C3	3.67	7.89	11.40	7.65	350.00	337.15	322.38	310.10	329.91
<b>Mean</b>	<b>3.60</b>	<b>8.22</b>	<b>13.76</b>		<b>350.00</b>	<b>337.37</b>	<b>321.22</b>	<b>301.93</b>	

	PLW (%)		Weight of flower string (g)	
	SEd	CD (0.05)	SEd	CD (0.05)
T	1.75	2.71	2.21	4.56
S	1.24	1.62	2.32	4.63
T x S	2.47	3.24	4.95	10.20

**Table 2: Effect of packaging material and storage duration on fresh flowers (%) and rotting (%) of marigold flower string**

Treatments	Fresh flowers (%)				Mean	Rotting (%)			
	S1	S2	S3	S4		S1	S2	S3	S4
C1	100	92.00	88.64	80.53	90.29	Nil			
C2	100	99.20	98.53	94.37	98.03				
C3	100	97.40	96.71	93.26	96.84				
<b>Mean</b>	100	96.20	94.63	89.39					

	Fresh flowers (%)	
	SEd	CD (0.05)
T	18.00	21.04
S	16.51	19.76
T x S	21.22	28.00

**Table 3: Effect of packaging material and storage duration on overall acceptability (score values) of marigold flower string**

Treatments	Overall acceptability (score values)				Mean
	S1	S2	S3	S4	
C1	8.20	7.5	6.9	6.2	7.2
C2	8.30	7.9	7.2	7.0	7.6
C3	8.20	7.8	7.4	7.2	7.65
<b>Mean</b>	8.23	7.73	7.17	6.8	

### 9 – Point Hedonic Scale

Score card	Overall acceptability
0-1	Not acceptable
1-2	Moderately Not acceptable
2-3	Highly Not acceptable
3-4	Extremely Not acceptable
4-5	Neither acceptable nor Not acceptable
5-6	Acceptable
6-7	Moderately acceptable
7-8	Highly acceptable
8-9	Extremely acceptable

### Project No. 5.3.: Standardization of postharvest technology of tuberose flowers

Experiment 5.3.1: Standardization of postharvest treatment using boric acid and sodium benzoate for improving postharvest life of loose flowers of tuberose

Duration: Three years (2015-16 onwards)

Technical Programme

Cultivar: Any popular commercial cultivar (Mexican single was used)

Stage of harvest: Fully opening loose flowers of tuberose

Number of treatments: Eight

1. Control
2. Boric acid -2%
3. Boric acid -3%
4. Boric acid -4%
5. Boric acid-5%
6. Sodium benzoate -10 ppm
7. Sodium benzoate -25 ppm
8. Sodium benzoate -50 ppm

No. of flowers/ replication: 25

No. of replications: Four

Statistical design: Completely Randomized Design

**Progress made:**

Experiment was carried out at Horticultural College and Research Institute, Periyakulam to study the effect of different concentrations of chemicals like Boric acid and Sodium benzoate on post harvest life of tuberose loose flowers. The results indicated that boric acid (2%) recorded minimum change in flower weight after 3 days of treatment (16.25%), highest percentage of fresh flowers (65%) and highest overall acceptability. No rotting was observed.

**Salient findings:** Treating loose flowers of tuberose with 2% boric acid found to give the best post harvest life.

**Table 1: Effect of chemicals on post harvest life of loose tuberose flowers**

Treatment	Change in flower weight after 3 days of treatment (%)	Percentage of fresh flowers	Rotting (%)	Overall acceptability
T1	57.50	18	NIL	0.5
<b>T2</b>	<b>16.25</b>	<b>65</b>		<b>1.9</b>
T3	30.00	48		5.7
T4	28.75	52		5.4
T5	46.50	31		0.3
T6	51.70	27		0.5
T7	40.50	35		0.7
T8	36.25	42		5.4

<b>SEd</b>	3.02	2.87
<b>CD (0.05)</b>	5.43	4.92

## **Experiment 5.3.2: Standardization of packing techniques for flower strings of tuberose**

**Duration:** Three years (2015-16 onwards)

### **Technical Programme**

Crop and cultivar: Strings of tuberose flower of any popular commercial cultivar (String size 2ft)

### **Treatments**

**Factor 1:** Containers:

- C1-Bamboo basket with paper lining with ice pack (two baskets upside down of about approx. 1 feet diameter with 0.5 foot depth.
- C2-Thermocol box (1x0.5 feet) with ice pack
- C3-CFB Box–Std size (Icepacks of 100 gm shall be placed in the centre of the first two type of packs)

**Factor 2:** Storage duration:

S1-0 day  
S2-1 day  
S3-2 day  
S4-3 day

No. of containers / treatment: Five

No. of replications: Five

Design of experiment: Completely Randomized Design (Factorial)

### **Progress made:**

Experiment was carried out at Horticultural College and Research Institute, Periyakulam to standardize the packing techniques for flower strings of tuberose. The flower strings of two feet length were packed in containers like news paper lined bamboo basket, thermocol box and ventilated CFB boxes with ice pack. The containers were placed at room temperature and the quality of the flowers were assessed at 0,1,2 and 3 days after packing. The results of the experiment indicated lowest physiological loss in weight (39.5%), highest weight of flower string during storage period (89.63g), highest percentage of fresh flowers (78.00 %) and best overall acceptability. Rotting of flowers was not observed in any of the containers.

### **Salient findings**

Thermocol box with ice pack was found to be the best container for packing and storage of tuberose flower strings.

**Table 1: Effect of packaging material and storage duration on PLW (%) and flower weight (g) on tuberose flower string**

Treatments	PLW (%)				Weight of flower (g)				Mean
	S2	S3	S4	Mean	S1	S2	S3	S4	
C1	8.0	26.0	57.2	91.2	100	92.0	74.0	42.8	77.2
C2	3.8	14.3	21.4	<b>39.5</b>	100	96.2	85.7	76.6	<b>89.63</b>
C3	4.5	19.4	34.5	130.7	100	95.5	80.3	65.5	85.33
<b>Mean</b>	5.43	19.90	37.70		100	94.57	80.00	61.63	

	PLW (%)		weight of flower string (g)	
	SEd	CD (0.05)	SEd	CD (0.05)
C	1.25	2.27	19.00	28.03
S	0.95	1.60	16.00	22.10
C x S	2.27	3.21	32.10	44.20

**Table 2: Effect of packaging material and storage duration on fresh flowers (%) and rotting (%) of tuberose flower string**

Treatments	Fresh flowers (%)				Mean	Rotting (%)			
	S1	S2	S3	S4		S1	S2	S3	S4
C1	100	70.00	52.00	33.00	63.75	Nil			
C2	100	82.00	74.00	56.00	<b>78.00</b>				
C3	100	77.00	68.00	45.00	72.50				
<b>Mean</b>	100	76.33	64.67	44.67					

	Fresh flowers (%)	
	SEd	CD (0.05)
C	19.36	23.25
S	12.18	18.93
C x S	27.27	38.20

**Table 3: Effect of packaging material and storage duration on flowers opening (%) of tuberose flower string**

Treatments	Flower opening (%)				Mean
	S1	S2	S3	S4	
C1	25.17	44.84	58.20	73.50	50.43
C2	27.50	32.00	40.00	48.00	<b>36.88</b>
C3	30.00	38.00	41.00	59.00	42.00
<b>Mean</b>	27.56	38.28	46.40	60.17	

	Flower opening (%)	
	SEd	CD (0.05)
C	1.18	1.51
S	0.82	1.77
C x S	1.67	2.52

**Table 4: Effect of packaging material and storage duration on overall acceptability (score values) of tuberose flower string**

Treatments	Overall acceptability (score values)			
	S1	S2	S3	S4
C1	8.50	7.9	6.5	6.2
C2	8.00	7.6	6.9	6.0
C3	8.30	7.8	6.6	6.2

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

**Duration :** Three years (2014-15 onwards)- continuing

**Technical Programme**

**Cultivar :** Suvasini or any Double petalled Cultivars specific for the region.

Stages of harvest: Commercial stage.

No. of Treatments: Thirteen

**Food dyes:**

T1 – Control

T2 – Lemon Yellow – 4%

T3 – Lemon Yellow – 8%

T4 –Kesar Yellow – 4%

T5 –Kesar Yellow – 8%

T6 –Kalakatta– 4%

T7 – Kalakatta – 8%

T8 –Orange red – 4%

T9 – Orange red – 8%

T10 –Rose pink – 4%

T11 – Rose pink – 8%

T12–Raspberry red – 4%

T13 – Raspberry red – 8%

**Immersion time**

Control – No dipping.

1 hour

2 hour

3 hour

No. of replications: Three

No. of stems for replication: Three

Design: Completely Randomized Design (Factorial)

**Progress made:**

Tuberose spikes were immersed in various food dyes as per technical programme. The spikes responded well for immersion in Kalakatta– 4% and Orange red – 4%.

## Value addition

### Project No. 5.4.1: Identification of ornamental species for preparation of value added dried products

Duration : Three years (2015-16 onwards)

Treatments:

T1 : Air drying

T2 : Sun drying

T3 : Embedding in sand drying + oven drying at 50 °C( ±5)

T4 : Embedding in Silica gel + oven drying at 50 °C( ±5)

T5 : Embedding in Silica + sand (1:1) + oven drying at 50 °C( ±5)

Design : Completely Randomized Design

Replications : Four

No. of treatments : Five

No. of flowers / parts / replications: 10 or more

#### Progress Made:

Experiments were carried out at the Horticultural College and Research Institute, Periyakulam during 2016 to evaluate certain locally available plant species for their suitability in dry flower industry. The experiments were laid out in a completely randomized block design with three replications. The locally available plant species grouped hereunder were utilized for the study.

#### Grouping of identified species

- Plant parts evaluated : Flowers, foliage & pods
- Flowers evaluated : F1 – *Dendranthema grandiflorum*  
F2 – *Nerium oleander*  
F3 – *Cassia alata*
- Foliage evaluated : L1 – *Simarouba glauca*  
L2 – *Tabebuia rosea*  
L3 – *Achras sapota*
- Pods evaluated : P1 – *Achras sapota*  
P2 – *Bixa orellana*  
P3 – *Crescentia cujete*

Among flowers, *Chrysanthemum* dried by microwave oven drying at 50°C after embedding in silica gel was most suitable for dry flower production with highest dry weight and lowest moisture loss percentage. Quickest drying was achieved in the same treatment. Among



foliage, *Simarouba glauca* dried by microwave oven drying at 50°C after embedding in silica gel + sand (1:1) recorded highest dry weight, least moisture loss and highest overall acceptability. Among pods, *Bixa* dried by microwave oven drying at 50°C after embedding in silica gel recorded highest dry weight and least moisture loss.

#### Floral craft:

The materials used in the experiments were converted into floral crafts, in order to evaluate their suitability, appeal and also to study the economics of the technology. The following crafts were made.

- Dry flower arrangements
- Dry flower wall hangings
- Dry flower greetings cards

#### Salient findings:

Drying of flowers, foliage with silica gel + oven drying at 50°C can be recommended for adaptation.

**Table 1: Effect of drying on change in weight of pods, flowers and leaves**

Treatment	Change in weight in flowers, foliage and pods			Change in weight in various flowers			Change in weight in various leaves		
	Sapota	Bixa	Crescentia	Chrysanth-emum	Nerium	Cassia	Simar-ouba	Tabebuia	Sapota
T1	1.41	120.68	1.76	2.44	2.67	10.99	10.10	7.33	2.61
T2	1.20	69.22	2.54	1.75	3.14	11.17	8.27	5.04	3.26
T3	2.39	78.31	1.45	1.62	2.06	9.28	4.80	5.70	2.54
T4	<b>0.47</b>	<b>66.47</b>	<b>0.58</b>	0.34	0.64	7.46	4.89	2.38	1.81
T5	1.09	79.09	1.69	2.27	3.31	10.00	5.21	4.78	2.63
<b>SEd</b>	0.09	14.77	0.34	0.39	0.34	1.11	1.75	0.39	0.34
<b>CD(.05)</b>	<b>0.20</b>	<b>32.19</b>	<b>0.77</b>	0.87	0.76	2.48	3.91	0.87	0.75

**Table 2: Effect of drying on percentage moisture loss for pods, flowers and leaves**

Treatment	% Moisture loss in various pods			% Moisture loss in various flowers			% Moisture loss in various leaves		
	Sapota	Bixa	Crescentia	Chrysanthemum	Nerium	Cassia	Simarouba	Tabebuia	Sapota
T1	85.40	90.09	60.47	86.96	77.70	77.10	85.75	81.45	79.12
T2	88.42	87.39	54.84	86.16	79.95	77.52	81.54	82.10	77.45
T3	89.11	82.16	41.68	86.86	82.72	78.02	79.68	79.76	77.51
T4	81.52	71.12	32.51	85.69	79.73	66.05	78.14	77.90	77.40
T5	86.84	78.18	38.95	86.57	80.39	77.28	82.12	78.25	77.90
SEd	0.79	4.04	1.87	0.54	2.48	2.35	1.48	1.63	0.91
CD(.05)	1.77	9	4.16	1.21	5.53	5.23	3.30	3.64	2.03

**Table 3: Effect of drying on time taken for drying of pods, leaves and flowers**

S. No	Treatment	Sapota	Bixa	Crescentia	Simarouba	Tabebuia	Sapota	Chrysanthemum	Nerium	Cassia
1	T1 days	10	12	30	5	5	6	4	5	4
2	T2 days	5	5	20	2	2	2	1	1	1.5
3	T3 min	5.0	4.30	15	2.30	2.30	3	3	2.45	3
4	T4 min	4.15	4	13	2	2	2.30	2.30	2	2
5	T5 min	4	5	14	2.15	2	2.30	2.20	2.15	2.30

**Table 4: Scores on brittleness, shape retention, colour retention and overall acceptability under drying methods for pods**

Treatments	Brittleness	Shape retention	Colour retention	Overall acceptability
P <sub>1</sub> T <sub>1</sub>	1.4	0.7	1.2	2
P <sub>1</sub> T <sub>2</sub>	1.2	0.8	0.8	2
P <sub>1</sub> T <sub>3</sub>	0.9	1.3	1.3	3
P <sub>1</sub> T <sub>4</sub>	0.6	1.2	0.6	2
P <sub>1</sub> T <sub>5</sub>	0.8	1.1	0.9	3
P <sub>2</sub> T <sub>1</sub>	1.8	1.7	1.9	2
P <sub>2</sub> T <sub>2</sub>	1.9	1.9	1.7	1
P <sub>2</sub> T <sub>3</sub>	1.7	2.1	2.2	3
P <sub>2</sub> T <sub>4</sub>	2.2	2.3	2.4	2
P <sub>2</sub> T <sub>5</sub>	2.0	1.6	1.8	3
P <sub>3</sub> T <sub>1</sub>	0.1	3.6	0.26	3
P <sub>3</sub> T <sub>2</sub>	0.4	3.9	0.3	3
P <sub>3</sub> T <sub>3</sub>	0.2	3.5	0.18	3
P <sub>3</sub> T <sub>4</sub>	0.3	3.6	0.22	3
P <sub>3</sub> T <sub>5</sub>	0.4	3.7	0.34	3

**Table 6: Scores on brittleness, shape retention, colour retention and overall acceptability under drying methods for leaves**

Treatments	Brittleness	Shape retention	Colour retention	Overall acceptability
L <sub>1</sub> T <sub>1</sub>	3.8	0.2	0.2	2
L <sub>1</sub> T <sub>2</sub>	3.6	0.3	0.4	2
L <sub>1</sub> T <sub>3</sub>	3.7	0.23	0.1	3
L <sub>1</sub> T <sub>4</sub>	3.6	0.4	0.35	2
L <sub>1</sub> T <sub>5</sub>	3.5	0.1	0.1	3
L <sub>2</sub> T <sub>1</sub>	3.9	0.5	0.37	2
L <sub>2</sub> T <sub>2</sub>	3.6	1.3	0.26	1
L <sub>2</sub> T <sub>3</sub>	3.7	1.1	0.4	3
L <sub>2</sub> T <sub>4</sub>	4	0.8	0.1	2
L <sub>2</sub> T <sub>5</sub>	3.9	0.1	0.3	3
L <sub>3</sub> T <sub>1</sub>	2.8	0.2	0.6	2
L <sub>3</sub> T <sub>2</sub>	3.2	0.25	0.9	2
L <sub>3</sub> T <sub>3</sub>	3.4	0.38	0.7	2
L <sub>3</sub> T <sub>4</sub>	2.9	0.16	1.3	2
L <sub>3</sub> T <sub>5</sub>	2.7	0.26	1.2	2

**Table 7: Scores on brittleness, shape-retention, colour retention and overall acceptability under drying methods for flowers**

Treatments	Brittleness	Shape retention	Colour retention	Overall acceptability
F1T <sub>1</sub>	2.6	1.6	2.5	2
F1T <sub>2</sub>	2.7	1.9	2.7	2
F1T <sub>3</sub>	1.8	2.4	3.4	3
F1T <sub>4</sub>	2.4	2.1	2.9	2
F1T <sub>5</sub>	2.4	2.3	3.1	3
F2T <sub>1</sub>	1.6	0.6	2.4	2
F2T <sub>2</sub>	1.8	0.8	2.6	1
F2T <sub>3</sub>	1.9	1.3	2.4	3
F2T <sub>4</sub>	2.1	1.2	2.5	3
F2T <sub>5</sub>	2.3	1.0	2.8	3
F3T <sub>1</sub>	3.5	1.3	1.5	1
F3T <sub>2</sub>	3.7	1.25	2.9	0
F3T <sub>3</sub>	3.6	1.5	2.7	1
F3T <sub>4</sub>	3.9	1.6	3.2	1
F3T <sub>5</sub>	3.9	1.2	3.4	1

<b>6. Recommended Varieties</b>	:	NIL
<b>7. Details of new lines / hybrids</b>	:	NIL
<b>8. Meteorological data</b>	:	

Monthly Average	Average Temperature		Relative humidity (%)	Rainfall (mm)
	Max (°C)	Min (°C)		
April 2015	35.19	26.73	53.70	248.0
May	34.36	27.18	55.16	132.2
June	35.45	28.01	63.63	21.6
July	35.33	27.89	55.40	9.8
August	35.28	25.49	58.40	33.0
September	35.19	26.45	58.67	201.8
October	33.05	25.47	71.66	85.0

November	30.66	23.81	69.60	369.0
December	30.90	23.26	54.80	43.0
January 2016	32.18	22.00	48.32	0
February	34.66	22.61	43.02	4-8
March	37.35	25.68	0	0

<b>9. Research Publications</b>	:	NIL
<b>10. Training / Symposium attended</b>	:	NIL
<b>11. Other relevant information</b>	:	NIL

**TAMIL NADU AGRICULTURAL UNIVERSITY**

**From**

**Dr. T. Thangaselvabai, Ph.D.,**  
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Department of Floriculture and Medicinal Crops,  
Horticultural College and Research Institute,  
Periyakulam East - 625 604.

**To**

**The Director DFR**  
Director,  
ICAR-Directorate of Floricultural Research  
College of Agriculture Campus  
Shivajinagar, Pune 411005

**No. P&H / DF&MC / HC&RI/ PKM / AICRIP –Annual Report / 2016 dated 14.06.2016**

**Sir,**

**Sub:** Department of Floriculture and Medicinal Crops – HC&RI, Periyakulam  
AICRP Floriculture – Annual Report – Sending - Regarding.

**Ref:** Letter No. DIR / DFR /2016/ 15 dt 11.04.2016

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Please find enclosed the annual report for the year 2015-16, in the format mentioned in reference cited above.

**Professor and Head**