

**RESEARCH ARTICLE :**

# Effect of NPK and organic manures on plant growth, flower yield and flower quality parameters of jasmine (*Jasminum sambac*) var. Double mogra

**■ NARESH CHAMAKUMARI, S. SARAVANAN AND J. RAVI****ARTICLE CHRONICLE :****Received :**

12.07.2017;

**Accepted :**

25.07.2017

**KEY WORDS :**

NPK, Organic manures, Flower yield, Flower quality, Jasmine

**SUMMARY :** Jasmine is one of the important flower crop fetches heavy demand and oldest commercial for its fresh flower. The flower crop cultivated on commercial scale and is highly esteemed for its attractive and fragrant flowers and are popular in the world for its perfume. The present investigation entitled, "Effect of NPK and organic manures on Plant growth, Flower yield and Flower quality of Jasmine (*Jasminum sambac*) var. Double mogra." was under taken at research field Department of Horticulture, Allahabad school of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad during *Kharif* season (2015-2016). The experiment was layout in Randomized Block Design (RBD) with 13 treatments and each treatment replicated thrice. The treatments consist of different combinations of 75%, 50% and 25% RDF (120: 240: 240 g NPK plant<sup>-1</sup>) and Organic manures, FYM, Vermicompost and Neem cake (7: 2.5: 2 kg plant<sup>-1</sup>), including control (No fertilizers and manures) and 100% RDF. The treatment T<sub>6</sub> as (60:120:120 g NPK + 10.5 kg FYM plant<sup>-1</sup>) was found to be statistically significant compared to other treatment combination, which recorded Maximum plant height (71.25 cm), plant spread (24.12 cm), Number of leaves (85.16), Number of branches (15.08cm), Days to first flower bud initiation (123.22), Days for flower bud development (15.08), Duration of flowering (85.25 days), flower bud length (2.25 cm), flower bud diameter (2.50 cm), shelf life of loose flower (47.08 hours), followed by Treatment T<sub>7</sub> (60:120:120 g NPK + 3.7 kg Vermicompost plant<sup>-1</sup>) and lowest yield was obtained from T<sub>0</sub> (control), respectively.

**Author for correspondence :****NARESH  
CHAMAKUMARI**Department of  
Horticulture, Allahabad  
School of Agriculture,  
Sam Higginbottom  
Institute of Agriculture,  
Technology and  
Sciences, ALLAHABAD  
(U.P.) INDIA  
Email: nareshgoudcha  
makuri@gmail.comSee end of the article for  
authors' affiliations

**How to cite this article :** Chamakumari, Naresh, Saravanan, S. and Ravi, J. (2017). Effect of NPK and organic manures on plant growth, flower yield and flower quality parameters of jasmine (*Jasminum sambac*) var. Double mogra. *Agric. Update*, 12(TECHSEAR-2) : 524-529; DOI: 10.15740/HAS/AU/12.TECHSEAR(2)2017/524-529.

## **BACKGROUND AND OBJECTIVES**

Jasmine is one of the most important flowering plants cultivated on commercial scale and is highly esteemed for its attractive and fragrant flowers. The Jasmine belongs to the family Oleaceae, The term Jasmine is

derived from Arabic word 'Jessamine' and Old Persian name 'Yesmyn' meaning fragrance. In Fragrance industry, jasmine has unique importance and popularity, multi-whorled, white-coloured, multi-seasoned flower that has a pride of place in the heart of every South Indian woman.

After green revolution, India has achieved self-sufficiency on the food front. Indian agriculture is changing rapidly and it has adopted other fields of commercialization. In last 10-15 years, the special attention was given towards horticulture as better commercial option. Floriculture, a branch of horticulture is getting prime importance.

The total area under floriculture crops in India during the year 2015-2016 was estimated to be 249 thousand hectare with the production of 2157 thousand metric tons of loose flowers and 472 thousand metric tons of cut flowers. India's total export of floricultural products and flowers was costing 485.90 crores during 2014-2015 (NHB, 2015).

Jasmine flower crop is commercially grown throughout India but grown in large area in Tamil Nadu (14,318 ha area, 17,848 MT production 2014-15), Karnataka (12,000 ha), Andhra Pradesh (10,440 ha area, 52,101 MT), Uttar Pradesh, Mainly in Lucknow and around the area (600ha), Maharashtra and West Bengal in an area of 40,000 ha in India. India exports Jasmine flowers to the neighboring countries like Sri Lanka, Singapore, Malaysia and the Gulf. In India, the flowers are generally harvested when the buds are well developed but still unopened. The buds are in great demand for both fresh market and concrete extraction. The Jasmine flowers are exported to Mumbai, Chennai, Hyderabad, Kolkata, Lucknow city's and other cities in large quantities due to well connected through Rail way and Road and communication system.

The commercially important species grown for loose flowers and perfumery industry are *J.sambac*, *J.grandiflorum*, and *J.auriculatum* (Shoram *et al.*, 2012). *Jasminum sambac* is commonly known as the "Arabian Jasmine" or "Tuscan Jasmine". Jasmine is evergreen twiner or dwarf growing shrub, leaves simple, opposite or in threes, cordate to oblong almost sessile having wavy margins and dark green in colour. Flowers are white, highly scented, borne in clusters of 3-12, usually in small, three forked cymes. Flowers based on number of whorls are single, semi double, small double, the large double and perfectly double like a white rose with 8-10 whorls in variety Double mogra. This species grow both in plains and hills upto 3,030 m above MSL. The Jasmine species *Jasminum sambac* is distributed mainly in Karnataka, Andhra Pradesh, Tamil Nadu and also to some extent in West Bengal states of India

(Bhattacharjee *et al.* (1983). Hence, the great extent of variability is available in *J.sambac* from this region. Essential oil is extracted from the flowers to make perfumes. The different parts of *J.sambac* such as the leaf, stem, bark and roots are important as source of chemicals that are useful in the pharmaceutical industries.

One of the prerequisite for boosting the yield is to provide balanced dose of nutrients for better growth and quality production. Nutrients play an important role in determining the growth and yielding ability of the crop apart from enhancing the qualitative characters. The research over conventional nutritional requirement (recommended dose of NPK fertilizers) has been standardized. However, for getting more quantity of flowers farmers are using chemical fertilizers unscrupulously, which are costly and create threat to soil health. Hence, there is a need to develop sustainable production system, where in chemical fertilizers can be minimized by using alternative sources of nutrients. Use organic manure is one of the untapped means and can supplement nutritional requirement of Jasmine crop. Keeping in view all the above factors an experiment has been conducted to access the effect of NPK and organic manures on plant growth, Flower yield and Flower quality of Jasmine along with the comparative economics of various treatment combinations.

## RESOURCES AND METHODS

An experiment was under taken at research field, Department of Horticulture, Allahabad school of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and science (SHIATS), Allahabad during *Kharif* season (2015-2016). Entitled "Effect of NPK and Organic manures on Plant growth, Flower yield and Flower quality of Jasmine (*Jasminum sambac*) var. Double mogra." The plants of Jasmine are one and half years old and planted at a spacing of 1.5 m x 1.5 m was used for the present investigation. The experimental site is fairly level land with sandy loam soil of uniform fertility status with low clay and high sand percentage.

The treatments consist of different combinations of 75%, 50% and 25% RDF (120: 240: 240 g NPK plant<sup>-1</sup>) and organic manure, FYM, Vermicompost and *Neem* cake (7: 2.5: 2 kg plant<sup>-1</sup>) recommended dose, including control (No fertilizers and manures) and 100% RDF. The organic manures were incorporated as basal application as per treatment schedule. The inorganic fertilizers were

applied in the form of urea, single super phosphate and murate of potash and were applied, respectively in two equal split doses at monthly intervals after transplanting. The organic manures like FYM, Vermicompost and *Neem* cake were applied 15 days prior to transplanting according to the above treatments wise for proper decomposition. The manures and fertilizers were applied 15 cm deep in rings and 20 cm away from the main stem. Gap filling, irrigation, mulching, weeding and plant protection measures were carried out as per the requirement of the crop. The experiment was layout in Randomized Block Design (RBD) with 13 treatments and each treatment replicated thrice. Randomly selected plants from each treatment were tagged for the purpose of recording various observations. Plant growth parameters: plant height, plant spread, Number of leaves, Number of branches, flower parameters: Days to first flower bud initiation (earliness), Days for flower bud development, Duration of flowering. Quality parameters: flower bud length, flower diameter, shelf-life flower, were recorded and these parameters were subjected to statistical analysis as given by Panse and Sukatme (1984).

## OBSERVATIONS AND ANALYSIS

The results of the present investigation presented in Table 1 showed that growth parameters, flower parameters, quality parameters and flower yield parameters.

### Growth parameters:

Growth parameters like plant height, plant spread, no. of leaves and no of branches at different intervals were presented in Table 1.

### Plant height (cm):

Maximum plant height at 60 and 180 days after transplanting was recorded in treatment T<sub>6</sub> with (39.65 cm) and (71.25 cm) (60:120:120 g NPK +10.5 kg FYM Plant<sup>1</sup>), Minimum plant height (51.91 cm) was recorded in treatment (T<sub>0</sub>) control. The probable reason for increasing plant height in the best treatment is due to application FYM act as aslow release Nutrients and it natures the microbial activity of soil due to the largest amount of carbon rich material available for organism. Similar result was reported by Anuburani *et al.* (2008), found in Jasmine (*Jaminum sambac*).

**Table 1: Effect of NPK and organic manures on plant growth parameters at 180 days after transplanting of jasmine (*Jasminum sambac*) var. Double mogra."**

Treatment symbol	Treatment combination	Plant height (cm)						Plant spread (cm)						No. of leaves per plant						No. of branches per plant					
		60 DAT		120 DAT		180 DAT		60 DAT		120 DAT		180 DAT		60 DAT		120 DAT		180 DAT		60 DAT		120 DAT		180 DAT	
		Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
T <sub>0</sub>	Control	26.95	35.63	37.52	51.91	2.91	9.18	16.75	23.33	48.65	16.75	23.33	48.65	16.75	23.33	48.65	16.75	23.33	48.65	16.75	23.33	48.65	16.75	23.33	48.65
T <sub>1</sub>	120:240:240 g NPK Plant <sup>1</sup> (100% RDF)	28.26	37.52	39.39	55.11	3.48	10.06	18.41	25.4	50.317	18.41	25.4	50.317	18.41	25.4	50.317	18.41	25.4	50.317	18.41	25.4	50.317	18.41	25.4	50.317
T <sub>2</sub>	7 kg FYM+2.5 kg Vermicompost+2 kg <i>Neem</i> cake plant <sup>1</sup>	28.70	39.39	46.32	57.06	3.56	10.50	19.11	26	50.75	19.11	26	50.75	19.11	26	50.75	19.11	26	50.75	19.11	26	50.75	19.11	26	50.75
T <sub>3</sub>	90:180:180 g NPK + 3 kg FYM plant <sup>1</sup>	32.70	46.32	45.29	65.68	4.80	12.03	21.72	29	54.75	21.72	29	54.75	21.72	29	54.75	21.72	29	54.75	21.72	29	54.75	21.72	29	54.75
T <sub>4</sub>	90:180:180 g NPK + 1.8 kg Vermicompost plant <sup>1</sup>	31.33	45.29	43.61	64.54	4.50	11.91	21.61	28.91	54.423	21.61	28.91	54.423	21.61	28.91	54.423	21.61	28.91	54.423	21.61	28.91	54.423	21.61	28.91	54.423
T <sub>5</sub>	90:180:180 g NPK+ 1.5 kg <i>Neem</i> cake plant <sup>1</sup>	30.40	43.61	52.55	62.83	4.43	11.54	21.23	27.98	53.83	21.23	27.98	53.83	21.23	27.98	53.83	21.23	27.98	53.83	21.23	27.98	53.83	21.23	27.98	53.83
T <sub>6</sub>	60:120:120 g NPK + 10.5 kg FYM plant <sup>1</sup>	36.95	52.55	50.42	71.25	6.60	14.40	24.12	32.41	57.16	24.12	32.41	57.16	24.12	32.41	57.16	24.12	32.41	57.16	24.12	32.41	57.16	24.12	32.41	57.16
T <sub>7</sub>	60:120:120 g NPK + 3.7 kg Vermicompost plant <sup>1</sup>	35.11	50.42	49.27	68.76	5.36	13.61	23	30.88	55.84	23	30.88	55.84	23	30.88	55.84	23	30.88	55.84	23	30.88	55.84	23	30.88	55.84
T <sub>8</sub>	60:120:120 g NPK + 3 kg <i>Neem</i> cake plant <sup>1</sup>	34.91	49.27	43.05	68.21	4.98	13.02	22.91	30.15	55.41	22.91	30.15	55.41	22.91	30.15	55.41	22.91	30.15	55.41	22.91	30.15	55.41	22.91	30.15	55.41
T <sub>9</sub>	30:60:60 g NPK + 15.5 kg FYM plant <sup>1</sup>	30.22	43.05	40.41	60.96	4.41	11.18	20.65	27.21	52.75	20.65	27.21	52.75	20.65	27.21	52.75	20.65	27.21	52.75	20.65	27.21	52.75	20.65	27.21	52.75
T <sub>10</sub>	30:60:60 g NPK + 5.6 kg Vermicompost plant <sup>1</sup>	29.52	40.41	40.32	59.98	4.24	10.94	19.74	26.37	51.75	19.74	26.37	51.75	19.74	26.37	51.75	19.74	26.37	51.75	19.74	26.37	51.75	19.74	26.37	51.75
T <sub>11</sub>	30:60:60 g NPK + 4.5 kg <i>Neem</i> cake plant <sup>1</sup>	29.46	40.32	36.393	58.45	3.63	10.65	19.41	26.30	50.83	19.41	26.30	50.83	19.41	26.30	50.83	19.41	26.30	50.83	19.41	26.30	50.83	19.41	26.30	50.83
T <sub>12</sub>	30:60:60 g NPK + 5 kg FYM + 1.8 kg Vermicompost + 1.5 kg <i>Neem</i> cake plant <sup>1</sup>	27.82	36.393	0.67	53.41	3.25	9.76	17.53	25	49.66	17.53	25	49.66	17.53	25	49.66	17.53	25	49.66	17.53	25	49.66	17.53	25	49.66
	S.E. <sub>±</sub>	0.67	0.48	0.55	0.28	0.45	0.51	0.61	0.45	0.48	0.51	0.61	0.45	0.48	0.51	0.61	0.45	0.48	0.51	0.61	0.45	0.48	0.51	0.61	0.45
	C.D. (P=0.05)	1.37	1.00	1.14	0.58	0.93	1.04	1.25	0.93	0.98	1.04	1.25	0.93	0.98	1.04	1.25	0.93	0.98	1.04	1.25	0.93	0.98	1.04	1.25	0.93

This was supported by Chaitra and Patil (2007) while the decrease in plant height is due to unavailability of sufficient nutrients at critical stages to plant for its luxuriant growth in China aster.

**Plant spread (cm):**

The maximum plant spread at 60 and 180 days after transplanting (6.60 cm) and (24.12 cm) was recorded in treatment T<sub>6</sub> with (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>), while the minimum plant spread (16.75 cm) was recorded to be in treatment (T<sub>0</sub>) control. Similar results were recorded by Anuburani and Gayathiri (2008), found in Jasmine (*Jaminum sambac*) due to the effect of application of FYM and its nature of releasing of nutrients in the soil and microbial activity in the soil it helps in luxuriant growth of the plants.

**Number of leaves per plant:**

The maximum number of leaves at 60 and 180 days after transplanting (32.41) and (85.16) was recorded in treatment T<sub>6</sub> with (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>), while the minimum number of leaves (75.75) was recorded in the treatment (T<sub>0</sub>) control. Optimum nutrients provided to plants might be accelerated rate of photosynthesis thereby enhancing the vegetative growth of plants were reported by Parya *et al.* (2010) in golden rod.

**Number of branches per plant:**

The maximum number of branches per plant at 60 and 180 days after transplanting (6.16) and (15.08) was recorded in treatment T<sub>6</sub> with (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>), Minimum number of branches per plant (8.33) was recorded to be in treatment (T<sub>0</sub>) control. Similar results were recorded by Anuburani and Gayathiri (2008), found in Jasmine (*Jaminum sambac*) due to the effect of application of FYM and its nature of releasing of nutrients in the soil and microbial activity in the soil it helps in luxuriant growth of the plants.

**Flowering parameters:**

*Days to first flower bud initiation (earliness) :*

The data presented in Table 2, it is observed that different combinations of NPK and organic manures was produced significant effect on days required to first flower bud initiation. Minimum number of days (123.22) for first flower bud initiation (earliness) was recorded in treatment T<sub>6</sub> with (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>)

**Table 2 : Effect of NPK and organic manures on flowering parameters and quality parameters of jasmine (*Jaminum sambac*) var. Double mogra**

Treatment symbol	Treatment combination	Flowering parameters			Quality parameters		
		Days to first flower bud initiation (earliness)	Days for flower bud development	Duration of flowering (days)	Flower bud length (cm)	Flower bud diameter (cm)	Shelf life of loose flower (hours)
T <sub>0</sub>	Control	142.25	20.5	71.66	1.58	1.19	38.08
T <sub>1</sub>	120:240:240 g NPK Plant <sup>-1</sup> (100% RDF)	139.58	19.25	74	1.93	1.34	41.16
T <sub>2</sub>	7 kg FYM+2.5 kg Vermicompost+2 kg <i>Neem</i> cake plant <sup>-1</sup>	138.92	18.66	75.91	1.97	1.45	41.33
T <sub>3</sub>	90:180:180 g NPK + 5 kg FYM plant <sup>-1</sup>	134	16.83	79.08	2.19	2.22	45.96
T <sub>4</sub>	90:180:180 g NPK +1.8 kg Vermicompost plant <sup>-1</sup>	135.42	17.983	78.16	2.15	2.10	45.5
T <sub>5</sub>	90:180:180 g NPK+ 1.5 kg <i>Neem</i> cake plant <sup>-1</sup>	135.92	16.58	78	2.07	2.03	45.3
T <sub>6</sub>	60:120:120 g NPK +10.5 kg FYM plant <sup>-1</sup>	123.22	15.08	85.25	2.25	2.50	47.08
T <sub>7</sub>	60:120:120 g NPK + 3.7 kg Vermicompost plant <sup>-1</sup>	129.5	16.08	83.25	2.22	2.45	46.83
T <sub>8</sub>	60:120:120 g NPK + 3 kg <i>Neem</i> cake plant <sup>-1</sup>	130.5	16.66	82	2.17	2.38	46.33
T <sub>9</sub>	30:60:60 g NPK +15.5 kg FYM plant <sup>-1</sup>	137.25	17.25	77.16	2.03	2.06	44.25
T <sub>10</sub>	30:60:60 g NPK + 5.6 kg Vermicompost plant <sup>-1</sup>	137.67	17.83	76.83	1.99	1.88	43.71
T <sub>11</sub>	30:60:60 g NPK + 4.5 kg <i>Neem</i> cake plant <sup>-1</sup>	138.17	18.16	76	1.94	1.76	42.83
T <sub>12</sub>	30:60:60 g NPK + 5 kg FYM + 1.8 kg Vermicompost + 1.5 kg <i>Neem</i> cake plant <sup>-1</sup>	140.83	19.41	73.83	1.91	1.31	39.667
	S.E.+	6.83	0.51	0.84	0.10	0.12	0.44
	C.D. (P=0.05)	1.72	1.05	1.73	0.21	0.26	0.92



followed by T<sub>7</sub>as (129.5, 60:120:120 g NPK + 3.7 kg Vermicompost plant<sup>-1</sup>), while maximum number of days (142.25) for first flower bud initiation was recorded in the treatment (T<sub>0</sub>) control.

The time taken for first flower bud appearance is an important character which decides their early flower yield. Similar result was reported by Shoram *et al.*, (2012); Anuburani and Gayathiri (2008) found in Jasmine (*Jasminum sambac*) due to application FYM act as a slow release Nutrients and it natures the microbial activity of soil due to the largest amount of carbon rich material available for organism.

#### *Days taken for flower bud development:*

The data presented in Table 2, it is observed that different combinations of NPK and Organic manures was produced significant effect on days required to first flower bud initiation. Minimum number of days (15.08) taken for flower bud development was recorded in treatment T<sub>6</sub> with the application of (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>), while maximum number of days (20.5) taken for for flower bud development was recorded to be in treatment (T<sub>0</sub>) control.

#### *Duration of flowering (days):*

Maximum number of days (85.25) for duration of flowering was recorded in the treatment T<sub>6</sub> with (60:120:120 g NPK +10.5 kg FYM plant<sup>-1</sup>) followed by T<sub>7</sub>as (83.25, 60:120:120 g NPK + 3.7kg Vermicompost plant<sup>-1</sup>), while minimum number of days (71.66) for duration of flowering was recorded in the treatment (T<sub>0</sub>) control the data was showed in Table 2.

#### **Quality parameters:**

Data on quality parameters such as flower bud length, flower bud diameter and shelf-life of loose flower (hours) was ascertained by visualizing the withering of flower. Presented in the Table 2.

Quality parameters like Flower bud length (2.25cm), Flower bud diameter (2.50 cm), Shelf-life of loose flower (46.83 hours) were showed the significant difference in recorded due to application of different combinations of NPK and organic manures. The treatment T<sub>6</sub> as (60:120:120 g NPK + 10.5 kg FYM plant<sup>-1</sup>) recorded of the Maximum, followed by T<sub>7</sub> as (60:120:120g NPK + 3.7 kg Vermicompost plant<sup>-1</sup>). Minimum was recorded in treatment (T<sub>0</sub>) control, respectively.

Increasing trend in Quality parameters was recorded

when FYM (farm yard manure) combined with 50% recommended dose (60:120:120 g NPK) nutrients this is due to enhanced physiological activity and also more cell elongation, the accelerated mobility of photosynthetic from source to the sink due to the readily available nitrogen from the FYM and NPK fertilizers. Another reason might be due to the better nutritional status of plant which was favored by the treatments. Similar results were also reported by Bhattacharjee *et al.* (1983) in *J.grandiflorum*, Prakash *et al.* (2002) and Gauhane *et al.* (2004) in Marigold, were also observed similar result in their experiments.

#### **Conclusion:**

From the present investigation it is concluded that in respect of cultivation of Jasmine (*Jasminum sambac*) var. Double mogra, the application of Treatment T<sub>6</sub> *i.e.* 50% RDF (60:120:120 NPK g Plant<sup>-1</sup>) along with 50% Farm Yard Manure (10.5 kg FYM Plant<sup>-1</sup>) were showed the significant effect on Maximum plant growth, flower yield and flower quality of Jasmine. Followed by treatment T<sub>7</sub>as (60:120:120 g NPK +3.7 kg vermicompost plant<sup>-1</sup>).

#### **Acknowledgement:**

We authors are greatly thankful to Prof. (Dr.) V.M Prasad Head, Department of Horticulture his guidance and support during the research Trail and also Thankful to Department of soil science and Department of Agro-metrology for their information.

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#### Authors' affiliations :

S. SARAVANAN AND J. RAVI, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, ALLAHABAD (U.P.) INDIA

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