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Impact of NPK on Quality and Yield of Floral Buds of Jasmine *(Jasminum sambac* L. Aiton) during Summer Season

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ABSTRACT: The current study entitled "Impact of NPK on Quality and Yield of Floral Buds of Jasmine (*Jasminum sambac* L. Aiton) during Summer Season" was carried out at Educational Garden of Department of Floriculture and Landscaping, College of Agriculture, O.U.A.T., Bhubaneswar during last week of December 2021 to November 2022. Total of nineteen treatments with various combinations of N, P and K fertilizers (Kg/ha) were taken in this experiment which was fitted to RBD and replicated thrice. Out of all the treatments, treatment T13 ,which contains a fertilizer combination of N=100 kg/ha, P=120 kg/ha, and K=120 kg/ha was determined to be the most fruitful in resulting luxuriant floral bud characteristics i.e. minimum days taken for flower bud appearance (62.25 days), minimum days taken from first bud appearance to full flower bud development (10.83 days), highest bud diameter(1.02 cm), bud length (3.47 cm), weight of fifty buds(20.18 g), number of buds(102.75), yield of flower buds (55.28 q/ha). Therefore, it is advised that the jasmine crop in Odisha condition be fertilized with N=100 kg/ha, P=120 kg/ha, and K=120 kg/ha in order to achieve optimal development, ideal flowering buds, and yield qualities.

Keywords: NPK levels, Floral bud, Jasmine, diameter, Yield.

INTRODUCTION

Jasmine, renowned as one of the most ancient and fragrant flowers, occupies a very close place in the hearts of the Indian population, who harbor a deep appreciation for aromatic blooms. The term "Jasmine" finds its roots in the Persian word 'Yasmyn,' signifying fragrance, and has been associated with spiritual significance in India throughout its extensive history. The captivating aroma emitted by jasmine is so widely admired that the very word "jasmine" has become synonymous with fragrance. Over the centuries, jasmine has graced the gardens of numerous countries, including Central Asia, Afghanistan, Iran, Nepal, and various tropical and sub-tropical regions. Many jasmine species, with their origins traced back to the Southern Foothills of the Himalayas, are native to India. Belonging to the 'Oleaceae' family, the Genus Jasminum encompasses around 300 species scattered across the warmer regions of Europe, Asia, Africa, and the Pacific. *Jasminum sambac* is commonly called as Arabian jasmine or motia or mughra which is evergreen, makes bushy growth and produces flowers of varying degree of doubleness, single and semi double flowers. Flowers are used for making of bouquets, garlands and also in cosmetic industry for preparation of hair oils, attars, soapsetc. Jasmine is mostly used in adorning hairs for women in religious and ceremonial functions (Thakur, 2014). *Jasminum sambac* blossoms are used to make green tea, which has been shown to be extremely beneficial in preventing cancer. All human groups can benefit from the relaxing and pain-relieving properties of jasmine tea, both physically and emotionally (Inoue *et al.*, 2003). Jasmine tea can lengthen life, control endocrine and neurological functions, boost immunity, prevent radiation exposure and speed up metabolism due to its anti-lipid peroxidation action (Zhang *et al.*, 1997). Jasmine can help in lose of weight and has antioxidant qualities as well. By increasing leptin levels, which are the primary source of burning issues related to fattiness and obesity, the serum and hepatic lipid levels can be reduced (Li *et al*., 2011). As no known synthetic aromatic molecule can replace the flavor and odor of jasmine blossoms, they have a unique status in the perfume industry (Gowda *et al.*, 1986.).

Jasmine is grown in commercial scale all over the India, but broadly cultivated in few states like Tamilnadu, Karnataka, Andhra Pradesh, Uttar Pradesh, Maharashtra, West Bengal and Odisha. Although a variety of elements, such as soil fertility, irrigation, plant density, plant protection strategies, etc., affect the effective production of jasmine, crop output is mostly influenced by the manurial schedule. A major factor influencing the low output of flower buds in plants is improper nutrition, which causes nutrient imbalance. Major nutrient deficiencies, specifically in N, P, and K are common under typical agro climatic conditions and can seriously hinder the development of flower buds as N, P and K play very crucial roles in growth and development of plant. More photosynthetic activities, vegetative growth, and glucose uptake in plants all depend on nitrogen, which is also an essential component of protein, nucleic acid, and amino acids (Rolaniya *et al*., 2017; Mohanty *et al.*, 2021). Phosphorus is an well-known element in constitution of phospholipids, enzymes, nucleic acids, energy storage and plays very important role in transmission of proper metabolism (Tisdale *et al.*, 1995). Potassium is very much essential for production of amino acids, protein, disease resistance, transpiration, chlorophyll and improves quality of several ornamental flower crops (Luthra *et al.*, 1983). Since this kind of study has never been carried out in the state of Odisha for Jasmine before, it has been decided to investigate the various bud features of jasmine under varying concentrations of N, P, and K.

MATERIALS AND METHODS

The experiment was carried out at Educational Garden of Department of floriculture and Landscaping, College of Agriculture, O.U.A.T., Bhubaneswar from last week of December 2021 to November 2022 in RBD to study the effect of nutrient management on bud quality and bud yield of *Jasminum sambac* L. Aiton with nineteen treatments *viz.*, T_1-60-120-120 (RDF); T_2-60-120-100; T_3-60-100-120; T_4-60-100-100; T_5-60-80-120; T_6-60-80-100; T_7-80-120-120; T_8-80-120-100; T_9-80-100-120; T_{10}-80-100-100; T_{11}-80-80-120; T_{12}-80-80-100; T_{13}-100-120-120; T_{14}-100-120-100; T_{15}-100-100-120; T_{16}-100-100-100; T_{17}-100-80-120; T_{18}-100-80-100; T_{19}-Control (NPK-Kg/ha), replicated thrice. The treatments were imposed on five year old plant bushes of *Jasminum sambac* L. Aiton. Pruning, an essential operation in Jasmine was done at a level of 45 cm length above the ground during last week of November, 2021. After pruning 5 Kg FYM /bush was applied and in first week of December basal application of fertilizer was carried out in which all dose of phosphorus and 50% of N and 50% of K were applied and rest 50% of N and 50% of K were applied at Top dressing i.e., third week of January. Fertilization was done according to treatment. N Total number of days were calculated from the date of first fertilization to first flower bud initiation in randomly selected four bush .To assess how many days it took for flower buds to develop in each treatment, an average was calculated for each treatment. Days were measured from the date of the first flower bud appearance to the entire growth of the flower bud in four randomly chosen bushes in order to calculate the number of days required for the first flower bud opening. An average was then calculated for each treatment. Diameter and length buds of four tagged plant bush from each net plot was measured. The collected data were computed and averaged. The weight of a fully grown, tight flower bud that is commercially marketable in size, with outer petals that curve slightly and loosen along with the calyx, was measured and stated in grams for each of the four tagged bushes in each replication, and averages were recorded. For the duration of the peak flowering season, the number of flower buds on each plant bush was counted daily, totalled for each replication, expressed as the number of flower buds on each bush separately from each of the four tagged bushes, and averages were noted. The collected values were averaged, totalled, and expressed in grams. The weight of flower buds recorded for each plant was multiplied by 10,000 for each replication per treatment in order to determine the floral production per hectare.

RESULT AND DISCUSSION

It has been experimented that earliest days taken for first flower bud initiation i.e. 62.25 days was observed in treatment T_{13} (N=100Kg/ha, P=120Kg/ha, K=120Kg/ha) and earliest days taken for first full flower bud development after first bud appearance was 10.83 days recorded in treatment T_{13} and also this was significantly superior over the rest treatments. And maximum days taken for first flower bud initiation (75.75 days) and first full flower bud (16.25 days) development was observed in treatment T_{19} having no fertilizer combination. This might be due to the reason that nutrient absorption capacity of plants also got enhanced and thus, plants were able to put up the necessary vegetative in less time, which allowed for an earlier flower bud initiation as compared to RDF and other treatments. These findings are consistent with those of Giri and Beura (2021) in Hybrid gerbera and Ravindra *et al.* (2018) in African marigold. This could also be the result of optimal nutritional availability, which is crucial for the continuous production of cytokine and protein, both of which have an immediate impact on the process of cell division. A comparatively slower rate of vegetative growth combined with the accumulation of carbohydrates encourages the transport of phytohormones to the shoots, likely causing early flower bud initiation and eventual full flower bud development. These results are close conformity with Naggar (2009).

Maximum flower bud diameter (1.02 cm) and flower bud length (3.47 cm) were determined in treatment number T_{13} (N=100Kg/ha, P=120Kg/ha, K=120Kg/ha) as a result of sufficient nutrient delivery, particularly nitrogen, which may have promoted cell elongation and raised flower bud diameter. However, minimum bud diameter i.e. 1.02 cm and bud length *i.e.* 3.13 cm were observed in control (T_{19}) treatment having no fertilizer combinations. Bud diameter and length increased, which may be the result of enhanced photosynthetic activity, enhanced nutritional availability, and preservation of healthy plant physiological processes. These elements increase food production, which may subsequently be put to better use in the growth of buds. Such result is in accordance with the results of Kishore *et al.* (2016) in African marigold cv. Pusa Narangi Gainda, Tembhare *et al*. (2016) in china aster cv. Poornima, Ayemi *et al.* (2017) in gerbera and Patel *et al.* (2020) in *Coreopsis tinctoria*.

Experimental results showed that maximum number of buds per bush (102.75) were observed in T13(N=100Kg/ha, P=120 Kg/ha, K=120 Kg/ha) followed by treatment T_{15} (N=100Kg/ha, P=100 Kg/ha, K=120 Kg/ha) which was impacted by the nutrients Nitrogen and Potassium. The amount of blooms per plant was found to be strongly influenced by interactions of Nitrogen and Potassium. In one hand, nitrogen was very crucial in guiding food reserves to the site of flower bud differentiation, resulting in more blooms per bush. Yet, potassium also contributed to the acceleration of numerous enzymatic processes that enhanced the quantity of blossoms on a bush. As there was no application of nitrogen and potassium, the control treatment (T_{19}) produced the fewest number of flower buds per bush (37.25). The findings of Talukdar *et al.* (2003) on tuberose and Satar *et al*. (2012); Dorajeerao *et al.* (2012) on chrysanthemum are all in agreement with the results. The rise in the number of flower buds per bush may be caused by enhanced photosynthate allocation to the economic section of the plant system as well as by the hormonal balance within the plant system according to Rajasekar *et al.* (2016).

The effects of nitrogen and potassium were responsible for the maximum weight (20.18g) of fifty number of buds in treatment T_{13} (N=100Kg/ha, P=120 Kg/ha, K=120 Kg/ha). This outcome might be attributed to the involvement of nitrogen, since a higher level of ample nitrogen supply may have accelerated photosynthetic activities in plants. This would have meant that more assimilates were available for flower development, leading to an increase in the weight of buds. The outcomes concur with those of Ahirwar *et al.* (2012) for African marigold and Chawhan (2012) in solid ago.

In case of flower bud yield per hectare (quintal) treatment T_{13} (N=100Kg/ha, P=120 Kg/ha, K=120 Kg/ha) showed excellent result that means maximum flower bud yield per hectare (q) (55.28 q) observed in treatment T_{13}which might be due to applied chemical fertilizer with increased concentration of N, P and K in soil, which enhances its contribution in photosynthetic activities that's why, ultimately enhancing the yield.

Table 1: Impact of NPK on Quality and Yield of Floral Buds of Jasmine *(Jasminum sambac* L. Aiton) during Summer Season.

Treatment (NPK- Kg/ha)	Number of days taken for 1st flower bud initiation	Number of days taken from bud to 1st full flower bud initiation	Flower bud diameter (cm)	Flower bud length (cm)	Number of buds per bush	Weight of 50 number of buds (g)	Bud yield per hectare (quintal)
T_1-60-120-120 (RDF)	67.91	14.50	0.89	3.24	54.08	14.54	34.63
T_2-60-120-100	69.50	14.75	0.88	3.22	45.08	14.32	31.53
T_3-60-100-120	70.00	15.08	0.88	3.21	51.41	14.01	30.81
T_4-60-100-100	71.59	15.25	0.87	3.19	44.00	13.71	28.33
T_5-60-80-120	71.83	15.50	0.85	3.16	47.67	13.50	25.16
T_6-60-80-100	71.83	15.83	0.84	3.15	40.75	13.29	23.06
T_7-80-120-120	69.33	12.67	0.95	3.36	78.83	17.77	49.46
T_8-80-120-100	69.59	13.00	0.94	3.33	64.00	17.48	47.90
T_9-80-100-120	69.25	13.25	0.94	3.32	75.33	17.18	45.25
T_{10}-80-100-100	69.41	13.67	0.93	3.31	66.75	16.77	43.27
T_{11}-80-80-120	71.67	14.00	0.91	3.30	66.99	16.49	42.37
T_{12}-80-80-100	70.50	14.25	0.90	3.29	60.17	16.02	39.47
T_{13}-100-120-120	**62.25**	**10.83**	**1.02**	**3.47**	**102.75**	**20.18**	55.28
T_{14}-100-120-100	64.41	11.17	1.00	3.44	90.92	19.99	54.16
T_{15}-100-100-120	65.33	11.50	0.99	3.42	97.92	19.67	53.33
T_{16}-100-100-100	67.75	11.75	0.98	3.41	85.42	19.34	52.32
T_{17}-100-80-120	68.91	11.91	0.97	3.40	84.75	19.06	51.55
T_{18}-100-80-100	69.33	12.33	0.96	3.39	84.42	18.68	50.66
T_{19}-Control	75.75	16.50	0.79	3.13	37.25	12.93	19.00
C.D at 5%	0.83	0.28	0.027	0.13	10.54	1.45	1.37
SE(m)	0.291	0.0992	0.0095	0.0048	3.6778	0.506	0.480

CONCLUSION AND FUTURE SCOPE

Based on the results of the experiment, treatment T_{13} (N=100Kg/ha, P=120Kg/ha, K=120Kg/ha) applied twice in split doses as 50 Kg N/ha, 60Kg K/ha, 100 Kg P/ha in basal dose and rest 50 Kg N/ha, 60Kg K/ha in top dressing was proved to be more efficient in boosting various flowering bud attributes such as flower bud diameter, bud length, number of buds per bush, weight of fifty buds and yield of buds per hectare as well as early appearance of first flower bud and minimum days taken from flower bud appearance to full development of flower buds. Hence, it has been recommended that fertilizer dose of N=100Kg/ha, P=120Kg/ha, K=120Kg/ha in the form of urea, SSP and MOP produced luxuriant flower bud yield in Jasmine under Odisha condition and this recommendation will solve the long awaiting problems of fertilizer application in jasmine for high flower bud production in Odisha.

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Conflict of Interest. None.

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