Influence of Biofertilizer Application on Growth, Yield and Quality Parameters of Jasmine (*Jasminum Auriculatum*)

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***Abstract*—** Field experiments were conducted to study the effect of biofertilizers on growth, yield, quality and nutrient content in Jasmine with different levels of chemical fertilizers. The biofertilizers used included the lignite based cultures of *Azospirillum*, *Pseudomonas striata*, *Pseudomonas fluorescens* and *Trichoderma viridae*. Biofertilizer application enhanced various growth parameters at all stages of growth compared to chemical fertilizer application alone. Application of biofertilizers along with 50 per cent NPK brought about results on par with 100 per cent NPK fertilizer with respect to chlorophyll content, floral characteristics such as days taken to 50 per cent flowering, number and weight of flowers per plant, diameter of flowers, ten flower weight, flower yield per plant and shelf life of flowers, indicating replacement of NPK chemical fertilizers to the extent of 50 per cent. Biofertilizer application improved chlorophyll content by 4.7 per cent, shelf-life of the loose flowers by over 33 per cent when compared to 100 per cent NPK treatment. Flower diameter, stalk length and petal length were increased by 8.6 per cent, 11.2 per cent and 13.4 per cent respectively due to T6 treatment (50% RDF+biofertilizers). Biofertilizer application improved the total microbial population in the rhizosphere by several times. T6 treatment resulted in the highest colonization of N2 fixers, P-soluiblizers, *P. fluorescens* and *T. viridae* in the rhizopshere of jasmine when compared to all other treatments. In addition to 50 per cent savings on chemical fertilizers, about 10 per cent increase in flower yield was obtained due to T6 treatment. T6 treatment exhibited significantly higher activities of urease, dehydrogenase and phosphatase at all stages when compared to T1 treatment (100% RDF).

***Keywords*—**Biofertilizers, Jasmine, Growth, Quality.

I. Introduction

JASMINE is one of the oldest fragrant flowers and is especially appreciated in India.The term jasmine is probably derived from the Persian word 'Yasmin' meaning 'fragrance'.Jasmines are widely grown in warm parts of southern Asia, Europe, Africa and the Pacific regions. It is the national flower of the Philippines adopted by its government in 1937. And, recently in 1990, Indonesian government also has adopted it as the national flower. Jasmine belongs to the family Oleaceae. Although more than 2,000 species are known, 40 species have been identified in India and 20 are cultivated in South India (Bhattacharjee, 1980). Jasmine can be grown in a variety of climate and soils. Generally, it prefers midtropical climate for proper growth and flowering. Commercially grown important *Jasminum* species are *J. sambac, J. auriculutum*, *J. grandiflorum* and *J. multiflorum*. In India, Jasmines are cultivated throughout the country. However, the largest area under Jasmine flower production is in Tamil Nadu followed by Karnataka. The annual production of flowers in India is worth more than Rs.120 million (Dadlani, 2004). Apart from internal trade, fresh flowers of jasmine are exported to Malaysia, Singapore and Srilanka. In Karnataka, *Jasminum auriculatum* is grown in Huvinahadagali and Hagaribommanahalli taluks in Bellary District, Harpanahalli in Davangere District and to some extent in Lakkundi in Gadag District. It is grown in an area of 3,451 ha with an estimated production of nearly 20,244 tonnes of fresh flowers (Dadlani, 2004). Hadagali mallige, locally known as "Vasane mallige", is a household name in Karnataka and its fragrance known around the world. Recently, Mysore mallige, Udupi mallige and Hadagali mallige have been registered under the Intellectual Property Rights (IPR). The Geographical Indication (GI) status has provided executive rights to the local community to cultivate these three species and continue to grow for many more years. Department of Horticulture, Government of Karnataka is also promoting cultivation of these species to protect the rare plant species by conducting workshops to create more awareness.

It is well known that enzymes play key roles in the transformation, recycling and availability of plant nutrients in soil. They are likely to be influenced by fertilizers and manures. Various enzyme activities were found to be maximum in FYM treatment. Higher rates of NPKfertilization enhanced the activities of soil enzymes and the effect was more pronounced with FYM in combination with fertilizers (NPK) (Singaram and Kamalakumari, 1993).

II. Material And Methods

The present investigation on the response of jasmine (*Jasminum auriculatum*) to biofertilizers was carried out in the Floriculture unit of the Department of Horticulture, College of Agriculture, University of Agricultural Sciences, Dharwad during 2007-08. A field experiment was conducted

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in three years old jasmine plantation in the Floriculture Unit. The lignite based cultures of *Azospirillum*, *Pseudomonas striata*, *Pseudomonas fluorescens* and *Trichoderma viridae* were obtained from the Department of Agricultural Microbiology, University of Agricultural Sciences, Dharwad and used @ 8 kg/ha each. FYM was applied uniformly to all the treatments @ 9.0 t per ha as per the package of practices. The treatments imposed were as below.

T1 – 100% RDF
T2 – 75% RDF
T3 – 50% RDF
T4 – 100% RDF + Biofertilizers (microbial consortium)
T5 – 75% RDF + Biofertilizers (microbial consortium)
T6 – 50% RDF + Biofertilizers (microbial consortium)

Where,
RDF = Recommended dose of NPK (60:120:120 g/plant)

For recording various biometric observations, ten branches at random from each plant were tagged and used for recordingr plant height, number of branches, days required
for first bud initiation, first flowering, number of flowers, days for 50 per cent flowering and
flower yield. The daily harvested flowers weight was recorded for 50 days and computed to get flower yield (g/plant).

III. Results And Discussion

The data on plant height and number of branches of jasmine on per cent increase over initial values are furnished in Table I. In plant height, there was no different due to different treatments. T1 remained superior at all days of sampling, although statistically on par with other treatments. In the number of branches also, there was no significant difference amongst the treatments. However, T6 treatment (50% RDF + biofertilizers) was promising with the per cent increase over control of 157, 235 and 310 respectively at 30, 60 and 90 DAP. Incase of plant canopy also, there was no significant difference amongst the treatments. T2 wassuperior with 4.6 per cent increase over initial at 30 DAP and T2 with 109.6 per cent and 134.5 per cent increase at 60 DAP and 90 DAP respectively. Significant increase in plant height and spread due to combined application of *Azospirillum*, PSB and inorganic fertilizers has been reported earlier in crossandra (Narashima Raju and Haripriya, 2001) and gundumalli (Manonmani, 1992). Similar results were obtained by the application of *Azotobacter* + PSB + VAM in *Valeriana jatamansi* (Salathia, 2005) and gladiolus (Srivastava and Govil, 2005) as well.

The data on days taken for the appearance of the first flower bud, first flowering and 50 per cent flowering as influenced by combination of bioinoculants and inorganic fertilizers are presented in Table II. T4 plants receiving 100 per cent RDF + biofertilizers flowered early and took significantly least number of days to 50 per cent flowering (148.67). Treatments T5 (75% RDF + biofertilizers) and T6 (50% RDF + biofertilizers) showed on par results with that of treatment T4. The highest number of days to 50 per cent flowering (157.33) was recorded in the plants receiving 50 per cent recommended dose of fertilizers. T6 (150.83) was on par with T1 (152.33). The earliness of bud initiation in biofertilizer-inoculated plants may be ascribed to easy uptake of nutrients and simultaneous transport of growth promoting substances like cytokinin to the axillary buds, resulting in breakage of apical dominance. Ultimately, this has resulted in a better sink for faster mobilization of photosynthates and early transformation of plant parts from vegetative to reproductive phase. Our results are in line with the findings of many other scientists in jasmine (Vasanthi, 1994), marigold (Chandrikapure *et al.*, 1999), crossandra (Narasimha Raju and Haripriya, 2001), *Limonium* (Gayathri *et al.*, 2004)

The data pertaining to number of flowers, weight of flowers, ten flower weight and total flower yield are presented in Table III.

Significant differences among the treatments were observed in the weight of flowers per plant parameter. The treatment T4 (100% RDF + biofertilizers) recorded the maximum weight of flowers 5.56 g/plant which was followed by treatment T5 with 5.248 g/plant. The treatment T3 (50% RDF) recorded the lowest weight of flowers (4.49 g/plant). T1 and T6 was on par with each other. The observations showed significantly different values pertaining to flower yield per plant. The treatment T4 (receiving 100 per cent recommended dose of fertilizers + biofertilizers) resulted in the highest flower yield (0.264 g/plant) which was followed by treatment T5 with 0.246 g/plant. The least yield of 0.211 g/plant was recorded in T3 treatment. And, T6 was on par with T1 treatment.

IV. Conclusion

Biofertilizer application enhanced various growth parameters at all stages of growth compared to chemical fertilizer application alone. Application of biofertilizers along with 50 per cent NPK brought about results on par with 100 per cent NPK fertilizer with respect to chlorophyll content, floral characteristics such as days taken to 50 per cent flowering, number and weight of flowers per plant, diameter of flowers, ten flower weight and flower yield per plant andmshelf life of flowers, indicating replacement of NPK chemical fertilizers to the extent of 50 per cent.

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TABLE I
PER CENT INCREASE OVER INITIAL VALUES OF PLANT HEIGHT, NUMBER OF BRANCHES AND PLANT CANOPY OF JASMINE AS INFLUENCED BY BIOFERTILIZERS

Treatment	Number of flower/picking /plant at peak flowering	Weight of flower at peak flowering (g)	Total flower yield at the end of 50 days (g/plant)	Ten flowers weight (g)
T1	60.3	4.92	235	0.82
T2	60.0	4.70	222	0.78
T3	59.4	4.49	211	0.76
T4	62.1	5.56	264	0.90
T5	60.5	5.24	246	0.87
T6	59.5	4.96	231	0.83
S.Em.±	0.552	0.041	1.52	0.004
CD @ 5%	1.609	0.121	4.42	0.012
DAP- Days After Pruning				

TABLE II
INFLUENCE OF BIOFERTILIZERS ON FLOWERING OF JASMINE

Treatment	Plant height (cm)			Number of branches			Plant canopy (cm)		
	per cent increase over initial values								
	30 DAP	60DAP	90 DAP	30 DAP	60DAP	90 DAP	30 DAP	60DAP	90 DAP
T1	87.9	180.7	364.9	107	189	235	35.4	109.6	134.5
T2	75.1	147.0	334.8	54	125	153	48.6	72.8	97.5
T3	68.7	156.9	305.9	102	119	161	44.2	73.7	101.3
T4	83.0	177.1	352.4	90	173	262	37.3	93.2	115.0
T5	85.5	166.0	364.4	91	163	236	43.2	75.3	99.2
T6	70.3	143.2	286.6	157	235	310	41.3	73.9	98.7
S.Em.±	6.749	16.327	26.579	25.126	44.845	57.998	13.564	15.668	16.547
CD @1%	NS	NS	NS	NS	NS	NS	NS	NS	NS

TABLE III
EFFECT OF BIOFERTILIZER APPLICATION ON JASMINE YIELD PARAMETERS

Treatment	Days taken for bud initiation (DAP)	Days taken for first flowering (DAP)	Days taken for 50 per cent flowering (DAP)
T1	114.83	121.33	152.33
T2	114.33	120.83	155.83
T3	113.83	120.33	157.33
T4	110.00	116.50	148.67
T5	108.33	114.83	150.17
T6	108.50	115.00	150.83
S.Em.±	1.713	1.713	1.222
CD @ 5%	4.989	4.989	3.559