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Effect of graded levels of farmyard manure and nitrogen on growth, flowering and bulb production of tuberose (*Polianthes tuberosa*) cv. Suvasini

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ABSTRACT

A field experiment on response of graded levels of farmyard manure and nitrogen on growth, flowering and bulb production of tuberose was carried out from April 2012 to March 2013 at Instructional Farm, Department of Floriculture, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh. The experiment was laid out in Randomized Block Design (RBD) having eight treatments of FYM and nitrogen, viz. 0 t/ha, 10 t/ha, 20 t/ha, 30 t/ha, 60 kg/ha, 120 kg/ha, 180 kg/ha and 240 kg/ha were compared to find out substitute of inorganic fertilizers under agro-climatic conditions of Pasighat. Significant response of graded levels of farmyard manure and nitrogen on growth, flowering and bulb production of tuberose over control was observed during entire studies. Earliness in flowering (70.68 days), highest spike length (91.29 cm), rachis length (24.54 cm), prolonged vase-life (15.40 days), increased fresh weight of bulbs per clump (150.64g) and bulb yield (13.89 tonnes/ha) was associated with application of farm yard manure at 30 t/ha. However, maximum plant height (47.25 cm), number of leaves/clump (91.56), number of florets/spike (27.43), number of bulbs/clump (13.73), number of bulblets/clump (9.48) and fresh weight of bulblets/clump (11.93) was observed with nitrogen at 180 kg/ha which were at par with farmyard manure at 30 t/ha, except number of leaves/clump, number of bulbs/clump and fresh weight of bulblets/clump, respectively. Higher levels of farm yard manure and nitrogen enhanced growth, flowering and bulb production of tuberose as compared to lower dose. Use of higher levels of farm yard manure may be a viable alternative of nitrogenous source for quality production of floricultural crops.

Key words: Bulb production, Farmyard manure, Flowering, Growth, Nitrogen, Tuberose

Tuberose (*Polianthes tuberosa* L.) is a commercial flower crop. Tuberose is an important ornamental bulbous plant next to gladiolus due to its attractive flower, elegance and sweet fragrance. The flowers are widely used for table decoration, floral arrangements, cut flower, loose flower, fragrance and essential oils. Tuberose concrete and absolute find extensive use in high grade perfumery. Nutrition plays an important role in improvement of growth, flowering and bulb production of tuberose (Rathore and Singh 2013). Generally, tuberose responds very well to the application of organic manures and inorganic fertilizers. Nutritional management through organic manure and nitrogen are helpful for enhancing yield, quality of flowers and bulb production. Nitrogen plays an important role in improving the plant growth because of major constituent in chlorophyll, protein and amino acids, resulted in increased production of green leaves. Nitrogen fertilization also improves bulb production by promotion of cell proliferation and storage of starch. It influences emergence, production and quality of tuberose spikes (Singh 1973). The main function of nitrogen is the initiation of meristematic activity which accelerates cell division and cell enlargement. The indiscriminate use of chemical fertilizers adversely affects the soil fertility, renders ecological hazards and leads to depletion of physico-chemical properties of soil. Organic manures are potential alternative to chemical fertilizers for suitable crop production particularly in relation to physical, chemical and biological properties of soil on long term basis. The quantity of organic manures shall be increased gradually by reducing the inorganic fertilizers to resume the lost properties of soil. Nutritional management through organic manure are helpful for enhancing yield, quality of flowers and vase life (Kumar and Sharma 2013). Hence, the present study was carried out to investigate the performance of graded levels of farm yard manure and nitrogen on growth, flowering and bulb production of tuberose cv. Suvasini.

MATERIALS AND METHODS

A field experiment on response of graded levels of farmyard manure and nitrogen on growth, flowering and bulb production of tuberose at was conducted Instructional Farm,

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Department of Floriculture, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh during April 2012 to March 2013. The experiment was laid out in Randomized Block Design (RBD) having eight treatments of FYM and nitrogen, viz. 0 t/ha, 10 t/ha, 20 t/ha, 30 t/ha, 60 kg/ha, 120 kg/ha, 180 kg/ha and 240 kg/ha were compared to find out substitute of inorganic fertilizers under agro-climatic conditions of Pasighat. Full quantity of well decomposed farmyard manure (FYM) as basal dose; half of the quantity of nitrogen, full phosphorus and potash in the respective treatment plots were applied. The remaining dose of nitrogen was top dressed one month after planting of the tuberose bulbs. Nitrogen was applied in the form of urea. Uniform size (4-5cm) of tuberose bulbs cv. Suvasini was planted on raised beds at spacing 30 × 30 cm.The observations on vegetative and flowering characters, viz. plant height, number of leaves per clump, days taken to flowering, spike length, rachis length, number of florets per spike and vase life; bulb characters viz. number of bulbs per clump, fresh weight of bulbs per clump, number of bulblets per clump, fresh weight of bulblets per clump and bulb yield were recorded and analysed statistically as suggested by Panse and Sukhatme (1995).

RESULTS AND DISCUSSION

Performance of FYM and NPK on growth and flowering characters of tuberose

Significant response of graded levels of farmyard manure and nitrogen on growth and flowering characters are presented in Table 1. Maximum plant height (47.25cm) was associated with application of nitrogen at 180 kg/ha which was on par with FYM at 30 t/ha (44.72cm) and highest number of leaves per clump (91.56) was also noticed with nitrogen at 180 kg/ha followed by FYM at 30 t/ha (85.19) and nitrogen at 240 kg/ha (80.73). Kishore (2015) observed that higher dose of nitrogen proved to be the best for attaining the maximum plant height. A balanced supply of nitrogen promotes in translocation of plant growth hormones to shoot and increased the metabolite transport for growth which may lead to significant increase in plant height and number of leaves per clump (Marshner 1983). However, earliness in flowering showed by FYM at 30 t/ha (70.68 days) followed by application of N at 180 kg/ha (75.59 days) and FYM at 20 t/ha (78.68 days). The delayed flowering was observed in control (88.33 days). Early emergence of spike in treatments with FYM might be due to increased availability of nitrogen from organic source which may induce early emergence of spike (Bankar and Mukhopadhyay 1990). Both vegetative and floral characters were found to be improved by the application of organic manure alone and in combination with chemical fertilizers (Sankar and Radha 2011, Barad *et al*. 2015).

Highest spike length and rachis length (91.29 cm, 24.54cm, respectively) was noticed under treatment with FYM at 30 t/ha which was on par with nitrogen at 180 kg/ha (90.23cm, 24.35cm). While, increased number of florets per spike was associated with nitrogen at 180 kg/ha (27.43) which was on par with FYM at 30 t/ha (25.89) followed by nitrogen at 120 kg/ha (24.08). These results corroborate with the findings of Gangwar *et al*. (2013) in tuberose. Increase in spike length, rachis length and number of florets per spike associated with application of farmyard manure and nitrogen might be due to proper utilization of nutrients in protein synthesis and carbohydrate assimilation. Increased spike length due to increased dose of nitrogen and adequate mineralisation of organic manure in rose were also reported by Arvind and Kale (1994). Enhanced vase life was noted with FYM at 30 t/ha (15.40 days) which was on par with nitrogen at 180 kg/ha (14.87 days), while, lowest vase-life was associated with control (10.58 days). The beneficial effect on improving spike length, rachis length, number of florets per spike and vase life might be due to better plant growth by the increased availability of nutrients and accelerated mobility of photosynthates from source to sink as influenced by the growth hormones released or synthesized from organic manure like farmyard manure (Shivakumar *et al*. 2005).

Performance of FYM and NPK on bulb production of tuberose

Graded levels of farmyard manure and nitrogen significantly differed on bulb productions (Table 2). Use of nitrogen at 180 kg/ha produced highest number of bulbs/clump (13.73) followed by nitrogen at 120 kg/ha (11.55)

Table 1 Performance of FYM and NPK ongrowth and flowering of tuberose cv. Suvasini

Treatment	Plant height (cm)	Leaves/ clump	Days taken to flowering	Spike length (cm)	Rachis length (cm)	Florets/ spike	Vase-life (days)
T_1 (Control)	37.27	45.82	88.33	66.48	17.76	14.55	10.58
T_2 (FYM at 10 t/ha)	38.23	60.38	81.06	76.49	19.37	18.95	11.08
T_3 (FYM at 20 t/ha)	41.53	75.93	78.68	85.78	21.22	20.96	12.29
T_4 (FYM at 30 t/ha)	44.72	85.19	70.68	91.29	24.54	25.89	15.40
T_5 (N at 60 kg/ha)	39.99	60.89	82.86	78.32	20.46	19.12	12.80
T_6 (N at 120 kg/ha)	43.28	78.85	79.96	88.37	21.50	24.08	13.85
T_7 (N at 180 kg/ha)	47.25	91.56	75.59	90.23	24.35	27.43	14.87
T_8 (N at 240 kg/ha)	38.71	80.73	86.64	87.26	23.52	21.29	11.23
CD (P=0.05)	2.58	2.88	2.91	3.12	1.91	1.81	1.12
CV (%)	3.55	2.27	2.06	2.15	5.06	4.82	4.50

Table 2 Performance of FYM and NPK onbulb production of tuberose cv. Suvasini

Treatment	Number of bulbs/ clump	Fresh weight of bulbs/clump (g)	Bulblets/ clump	Fresh weight of bulblets/clump (g)	Bulb yield (t/ha)
T_1 (Control)	6.43	72.04	4.59	5.29	7.75
T_2 (FYM at 10 t/ha)	8.87	90.34	6.66	7.69	8.73
T_3 (FYM at 20 t/ha)	9.42	135.43	7.44	7.24	10.10
T_4 (FYM at 30 t/ha)	11.21	150.64	8.88	9.48	13.89
T_5 (N at 60 kg/ha)	10.84	95.41	6.52	8.14	9.50
T_6 (N at 120 kg/ha)	11.55	120.56	8.07	9.54	12.20
T_7 (N at 180 kg/ha)	13.73	140.65	9.48	11.93	13.25
T_8 (N at 240 kg/ha)	8.96	130.38	7.13	7.68	11.15
CD (P=0.05)	0.92	6.37	1.25	0.83	0.93
CV (%)	5.19	3.11	9.73	5.65	4.90

and FYM at 30 t/ha (11.21). Whereas, fresh weight of bulbs/ clump was associated with FYM at 30 t/ha (150.64g) followed by nitrogen at 180 kg/ha (140.65g) and FYM at 20 t/ha (135.43g). The increased fresh weight of bulbs/clump as application of farmyard manure might be due to increased availability of nitrogen which may cause improvement in size of bulbs. These results are in conformity with findings of Yadav *et al*. (2000) which reported that farm yard manure had significant response of increased flower weight in African marigold. Maximum diameter and weight of flowers was also observed by Singh (2006) in rose and Gupta *et al*. (2008) in gladiolus. Significant response with application of farmyard manure on maximum fruit set, fruit retention, fruit yield and minimum fruit drop in litchi was also observed by Rani *et al*. (2013).

Maximum number of bulblets per clump was recorded with nitrogen at 180 kg/ha (9.48) which was on par with FYM at 30 t/ha (8.88). Use of nitrogen at 180 kg/ha showed increased fresh weight of bulblets/lump (11.93g) followed by FYM at 30 t/ha (9.48g) and nitrogen at 60 kg/ha (8.14g). Higher dose of nitrogen responded for maximum number of bulblets/clump and increased fresh weight of bulblets/clump in tuberose was also observed by Rathore and Singh (2013). The formation and development of bulbs/bulblets might be due to the direct response of nitrogen fertilization which may promote cell proliferation and storage of starch efficiently. Cell division and cell enlargement are accelerated by ample supply of nitrogen which initiates meristematic activity in crops (Crowther 1935). However, FYM at 30 t/ ha recorded highest bulb yield (13.89 t/ha) which was on par with nitrogen at 180 kg/ha (13.89 t/ha). The lowest bulb yield was associated with control (7.75 t/ha). The highest bulb yield might be due to increased photosynthetic activity of plants resulted from increased leaf production causing maximum dry matter accumulation and its greater mobilization into the bulbs. Similar results with the influence of better utilization of nitrogen available in soil for increasing production of bulbs and bulblets was also reported by Kumar *et al*. (2002), Talukdar *et al*. (2003) in tuberose cv. Single and Kejkar and Pujara (2015) in spider lily cv. local.Also, organic manure played a significant role for enhancing the bulb yield of tuberose and well-rotten farmyard manure responded good for increased bulb yield. The increase in bulb yield may be due to use of organic manure which helps in improving the fertility and productivity of soils as well as they supply both macro and micro nutrients and improve physical and biological conditions of soil in sustainable crop production. These results are in close conformity with the findings of Kumar and Sharma (2013) in marigold, Nambisan and Krishnan (1983) in tuberose and John *et al*. (2007) in tulip.

Thus, it was apparent through entire investigation that farm yard manure and nitrogen application was significantly associated with growth, flowering and bulb production of tuberose. Higher levels of farm yard manure and nitrogen enhanced growth, flowering and bulb production of tuberose as compared to lower dose. Use of higher levels of farm yard manure may be a viable alternative of nitrogenous source for quality production of floricultural crops.

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