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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, FLOWERING AND YIELD OF DAHLIA (*DAHLIA VARIABILIS L.*). CV. KENYA WHITE

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Abstract

The present investigation to study the Effect of Integrated Nutrient Management on growth, flowering and yield dahlia (*Dahlia variabilis L.*) cv. Kenya White was carried out under Allahabad agro climatic conditions at the experimental field of the Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Deemed to-be University, Allahabad during 2013-2014. The experiment was laid out in R.B.D with three replication and ten treatments separately. Significantly highest plant height (91.83 cm), maximum number of leaves per plant (25.32), maximum stem girth (22.32 mm), was recorded in treatment T_8 30:19.5:12 gm NPK/Plot + *Azo* + PSB + FYM. However, with respect to diameter of flower maximum diameter (17.33 cm) maximum weight (91.96 g), maximum flower yield per plant (33.01 kg) was recorded in treatment ($T_{7)}$ 27:18:11.25 gm NPK/Plot + *Azospirullum*+PSB. Apart from growth and yield parameter treatment ($T_{7)}$ found to be most economically viable in terms of gross return (Rs. 9,28,260/ha), net return (Rs. 5,96,732 /ha) and benefit cost ratio (1:2.88). As the study was undertaken only for winter season, it needs further confirmation by conducting more trails under Allahabad agro climatic condition.

Key words : Dahlia (*Dahlia variabilis L.*), growth, yield, flowering, INM, Economics.

Introduction

Dahlia is one of the most popular bulbous flowers grown in many parts of the world for its beautiful ornamental blooms of varying shades of colours for the beautification of gardens and cut flowers. It is a tuberous rooted, half-hardy herbaceous perennial belonging to the family Asteraceae having its origin in Mexico, which received its name by Cavanilles in the year 1791, to commemorate the work of a Swedish Botanist Dr. Andreas Dahl, a pupil of Linneaus.

Dahlia occupies a place of pride in any garden anywhere. Dahlias are easy to grow both in field and in pot and are extensively used for exhibition, garden display and home decoration. For exhibition and garden display all types of dahlias are used. Dwarf growing types are suitable for beds and borders (pure / mixed borders). Large flowering dahlias in pots are popular for terrace garden or *verandah* display. The long-stemmed flowers of various forms and colours are used in flower arrangement. Cut flowers of pompon and miniature types stay fresh in flower vases for many days and also better to make moderately good garlands.

Among the twelve species of dahlia commonly found in the higher parts of Mexico, eight species *viz., Dahlia variabilis, D. imperialis, D. exelsa, D. coronata, D. coccinea, D. merkii, D. zuarezii* and *D. rosea* are generally important species. Out of these eight species, *D. variabilis* and *D. rosea* are of horticultural importance, which include showy, fancy types, anemone flowered, cactus and semi cactus types, peony, decorative, ball types, fimbriated, water lily, star type and also the parents of most of the pompon cultivars.

Though there are about 20 species and many cultivars of dahlia with different number, placement, texture, colour and size of florets with different peduncle length, symmetry and vigour available in the world, there

Table 2: Effect of integrated nutrient management on number of leaves per plant of Dahlia (*Dahlia variabilis*) at different intervals.

Treatments	30 DAT	60 DAT	90 DAT	120 DAT
T_0	11.00	11.66	17.74	18.91
T_1	11.58	12.04	19.28	21.01
T_2	12.24	11.96	17.69	20.14
T_3	10.28	11.81	18.17	19.75
T_4	11.04	11.16	17.61	19.45
T_5	11.27	11.20	17.35	22.54
T_6	11.25	11.80	17.74	22.11
T_7	11.49	8.42	18.07	21.71
T_8	13.54	13.91	21.34	25.32
T_9	11.22	11.85	17.22	19.63
F- test	NS	NS	Sig	Sig
S. Ed. (±)	0.89	1.71	0.71	1.23
C. D. (P = 0.05)	-	-	1.49	2.58

Table 1: Effect integrated nutrient management on plant height (cm) of Dahlia (*Dahlia variabilis l.*) at different intervals.

Treatments	30 DAT	60 DAT	90 DAT	120 DAT
T_0	11.32 cm	22.92 cm	45.93 cm	66.80 cm
T_1	9.50 cm	23.12 cm	44.43 cm	85.01 cm
T_2	6.42 cm	23.16 cm	43.94 cm	84.29 cm
T_3	8.71 cm	24.65 cm	45.42 cm	80.44 cm
T_4	9.00 cm	23.46 cm	46.55 cm	86.60 cm
T_5	9.87 cm	23.51 cm	44.91 cm	79.74 cm
T_6	10.34 cm	24.64 cm	44.76 cm	76.62 cm
T_7	10.38 cm	22.81 cm	45.00 cm	75.98 cm
T_8	14.42 cm	27.42 cm	54.19 cm	91.83 cm
T_9	10.07 cm	23.15 cm	41.93 cm	82.37 cm
F- test	Sig	Sig	Sig	Sig
S. Ed. (±)	1.41	1.25	2.22	4.19
C. D. (P = 0.05)	2.97	2.62	4.67	8.80

is still scope for improving these characters through breeding. The range of variation in dahlia is quite large. Considering the importance of the crop and potentiality of cultivating this crop, there is a need for its improvement and to develop accessions suitable for specific agro-ecological conditions and also for specific use

Dahlia are used with advantage for making bouquets and wreaths or vase decorations. The long clean and stiff foot stocks are very suitable for both handling and decoration purposes. There are certain medicinal and nutritional uses of dahlia. Tubers of this plant contain significant amount of insulin and fructose and small quantities of medicinally active compounds such as phytin and benzoic acid. An insulin extract from tuber of dahlia is used in diagnosis of renal function. Seeds of dahlia are a good source of fats and proteins. Seeds contain more than 16 per cent oil and 20.9 to 47.0 per cent protein. The root exudate is nematotoxic and the mortality of the nematode was increased with increase in the concentration of exudates and exposure period of nematode species such as *Hoplolaimus indicus, Tylenchus filiformis, Helicotylenchus indicus, Meloidogyne incognita* and *Tylenchorhynchus brassicae* (Vikas, 2009).

Dahlias prefer rich, fertile, moist and well- drained soil with pH 6.5 in areas with heavy or clay type soil, use well- rotten manure or suitable organic matter and sand in equal quantities to make it ideal for planting. Dahlia grows better in high organic residues. Leaf mold, compost or FYM can also be used for good results. Dahlia like other plants needs NPK in large amounts and other elements like Fe, Zn, Cu, and Cl in small quantities. Nutrition is an important factor which is directly related to growth and flowering of dahlia. Many experiments regarding fertilizer applications has been conducted in different parts of the world to improve the growth and flowering of dahlia.

The size of plant, tuber corms weight, number of flowers and growth was increased significantly with increasing rates of N and P_2O Present study was therefore, investigated to observe the influence of different combination.e., N, P2O5 SSP and FYM on the growth and flowering of dahlia which ultimately improve the production of cut flower as well as tuber and develop interest of growers to cultivate Dahlia for making high return. (M. Ahmed, *et al.*, 2004).

Vermicompost besides being a rich source of micronutrients also acts as a chelating agent and regulates the availability of metabolic micronutrients to the plants apart from increasing the plant growth and yield by providing nutrients in the available form. Use of vermicompost in agriculture was first reported by Hopp and Slater (1979). Poultry manure contributes to the nation annually 0.3, 0.26, and 0.14 million tons of N, P2O5 SSP and K_2O MOP, respectively. Apart from this, it also contain 60 to 100 ppm Zn and 380 to 1450 ppm Fe (Garg, *et al.*, 1971). Due to its rapid mineralization, poultry manure has been recognized as a valuable source of plant nutrients for crops. In this organic manure, 60 percent of the nitrogen is present as uric acid and remaining 40 per cent as stable organic nitrogen (Srivastava, 1988).

Materials and Methods

An investigation to study the effect of Integrated Nutrient Management (INM) on growth flowering and yield of Dahlia (*Dahlia variabilis L.*) cv. Kenya White

Table 3: Effect of integrated nutrient management on stem girth (mm) of Dahlia (*Dahlia variabilis*) at 120 DAT.

	Treatments	Stem girth (mm)
T_0	Control00:00:00 kg NPK/ha	12.25
T_1	9:9:6.75 gm NPK/Plot + *Azospirullum*	19.34
T_2	12:10.59:7.5 gm NPK/Plot + PSB	19.95
T_3	15.9:12:8.25 gm NPK/Plot + FYM	20.14
T_4	18:13.5:9 gm NPK/Plot + VC	19.56
T_5	21:15:9.75 gm NPK/Plot + *Azospirillum*+ FYM	20.88
T_6	24:16.5:10.5gm NPK/Plot + *Azospirilum* + VC	18.10
T_7	27:18:11.25 gm NPK/Plot + *Azospirullum*+PSB	16.31
T_8	30:19.5:12 gm NPK/Plot + *Azospirullum*+ PSB + FYM	22.32
T_9	33:21:12 gm NPK/Plot + *Azospirullum*+ PSB + VC	20.12
F- test		NS
S. Ed. (±)		4.00
C. D. (P = 0.05)		-

Table 4: Effect of different integrated nutrient management on diameter of flower (cm) of Dahlia (*Dahlia variabilis*) at 120 DAT.

	Treatments	Diameter of flower (cm)
T_0	Control00:00:00 kg NPK/ha	10.65
T_1	9:9:6.75 gm NPK/Plot + *Azospirullum*	14.50
T_2	12:10.59:7.5 gm NPK/Plot + PSB	15.76
T_3	15.9:12:8.25 gm NPK/Plot + FYM	16.05
T_4	18:13.5:9 gm NPK/Plot + VC	15.55
T_5	21:15:9.75 gm NPK/Plot + *Azospirillum*+ FYM	15.58
T_6	24:16.5:10.5gm NPK/Plot + *Azospirilum* + VC	14.71
T_7	27:18:11.25 gm NPK/Plot + *Azospirilum*+PSB	17.33
T_8	30:19.5:12 gm NPK/Plot + *Azospirilum*+ PSB + FYM	15.17
T_9	33:21:12 gm NPK/Plot + *Azospirilum*+ PSB + VC	14.76
F- test		Sig
S. Ed. (±)		1.80
C. D. (P = 0.05)		3.79

was carried out under Allahabad agro climatic conditions at the experimental field of the Department of Horticulture, Allahabad school of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, the experiment period comprised the month of mid-November to mid-March.

The details pertaining to the materials and methods adopted are presented here; The experimental site is situated at of a latitude of 20p and 15p North and longitude of 60p 3" East and at an altitude of 98 meters above mean sea level (MSL).

The area of Allahabad district comes under subtropical belt in the South East of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the loacation reaches upto 46p C - 48p C and seldom falls as low as 4p C - 5p C. The relative humidity ranged between 20 to 94 percent. The average rainfall in this area is around 1013.4 mm annually. The experiment was laid out in randomized block design (RBD) with three replications. The treatments in each replication were allotted randomly. Ten treatments having one variety were tried in the experimental design. Different combinations were made with Nitrogen (N), Phosphorus (P) and Potassium (K) per plot along with, organic fertilizers like *Azospirullum*, PSB, FYM and vermicompost. T_0- Control 00:00:00 kg NPK/ha, T_1-9:9:6.75 gm NPK/Plot + *Azospirullum*, T_2 -12:10.59:7.5 gm NPK/ Plot+PSB, T_3- 15.9:12:8.25 gm NPK/ Plot+FYM,T_4-18:13.5:9 gm NPK/Plot+VC, T_5- 21:15:9.7gm NPK/Plot+*Azospirillum*+FYM, T_6- 24:16.5:10.5 gm NPK/ Plot+*Azospirilum*+VC,T_7-27:18:11.25 gm NPK/Plot+*Azospirullum*+PSB,T_8- 30:19.5:12gm NPK/ Plot+*Azospirullum*+PSB+FYM,T_9 -33:21:12 gm NPK/Plot+*Azospirullum*+PSB+VC

Results and Discussion

1. Among the different treatments studied with respect of plant height. Significantly, maximum plant height (91.83cm) was recorded in treatment T_8(30:19.5:12 gm NPK/Plot+*Azo*+PSB+FYM) whereas, minimum plant height (66.80cm) was recorded in T_0 (00:00:00 kg NPK/ha).
2. Significantly, maximum number of leaves per plant (25.32) was recorded in treatment T_8 (30:19.5:12 gm NPK/Plot+*Azo*+PSB+FYM) however, minimum number of leaves per plant (18.91) was recorded in T_0 (00:00:00 kg NPK/ha).
3. Maximum girth of stem (22.32 mm) was recorded in treatment T_8(30:19.5:12 gm NPK/Plot + *Azo* + PSB + FYM) and minimum girth of stem (12.25) was recorded in T_0 (00:00:00 kg NPK/ha).
4. Significantly, maximum diameter of flower (17.33) was recorded in treatment T_7 (27:18:11.25 gm NPK/Plot + *Azo*+PSB) and minimum diameter of flower (10.65) was recorded in T_0 (00:00:00 kg NPK/ha).
5. Significantly, maximum weight of flower (91.96 g) was recorded in treatment T_7(27:18:11.25 gm NPK/Plot + *Azo*+PSB)whereas, minimum weight of flower (47.26) was recorded in T_0 (00:00:00 kg NPK/ha).

Table 5: Effect of integrated nutrient management on weight of flower (g) of Dahlia (*Dahlia variabilis*)at 120 DAT.

	Treatments	Weight of flowers (g)
T_0	Control00:00:00 kg NPK/ha	47.26
T_1	9:9:6.75 gm NPK/Plot + *Azospirullum*	50.92
T_2	12:10.59:7.5 gm NPK/Plot + PSB	64.70
T_3	15.9:12:8.25 gm NPK/Plot + FYM	53.46
T_4	18:13.5:9 gm NPK/Plot + VC	75.61
T_5	21:15:9.75 gm NPK/Plot + *Azospirillum*+ FYM	55.95
T_6	24:16.5:10.5gm NPK/Plot + *Azospirilum* + VC	68.99
T_7	27:18:11.25 gm NPK/Plot + *Azospirilum*+PSB	91.96
T_8	30:19.5:12 gm NPK/Plot + *Azospirilum*+ PSB + FYM	53.19
T_9	33:21:12 gm NPK/Plot + *Azospirilum*+ PSB + VC	73.95
F- test		Sig
S. Ed. (±)		2.89
C. D. (P = 0.05)		6.07

Table 6: Effect of integrated nutrients management on flower yield per plant at 120 DAT.

	Treatments	Flower yield per plant (kg)
T_0	Control00:00:00 kg NPK/ha	19.50
T_1	9:9:6.75 gm NPK/Plot + *Azospirullum*	21.92
T_2	12:10.59:7.5 gm NPK/Plot + PSB	20.78
T_3	15.9:12:8.25 gm NPK/Plot + FYM	21.00
T_4	18:13.5:9 gm NPK/Plot + VC	21.33
T_5	21:15:9.75 gm NPK/Plot + *Azospirillum*+ FYM	20.92
T_6	24:16.5:10.5gm NPK/Plot + *Azospirilum* + VC	20.25
T_7	27:18:11.25 gm NPK/Plot + *Azospirilum*+PSB	33.01
T_8	30:19.5:12 gm NPK/Plot + *Azospirilum*+ PSB + FYM	24.17
T_9	33:21:12 gm NPK/Plot + *Azospirilum*+ PSB + VC	20.17
F- test		NS
S. Ed. (±)		4.52
C. D. (P = 0.05)		-

6. Maximum number of flowers per plant (33.01) was recorded in treatment T_7 (27:18:11.25 gm NPK/Plot+*Azo*+PSB) and minimum number of flowers per plant (19.50) was recorded in T_0 (00:00:00 kg NPK/ha).
7. Optimum nutrients provided to plants might accelerate the rate of photosynthesis thereby enhancing the vegetative growth of plants. The production of increased plant height, number of leaves, number of flowers per plant, flower yield might be due to the influence of inorganic fertilizers along with organic manures and biofertilizers. Similar findings were reported by Ahmed *et al.*, (2004) and Sabah (2014) in dahlia.

Economics of different treatments

1. Maximum gross return was recorded in treatment T_7 with (27:18:11.25 gm NPK/Plot + *Azo*+PSB) (Rs. 9,28,260/ha) and the minimum (Rs. 5,48,580/ha) was recorded in treatment T_o (00:00:00 NPK).
2. Maximum net return (Rs.5,96,736/ha) was recorded in treatment T_7 with (27:18:11.25 gm NPK/Plot + *Azo*+PSB) and the minimum (Rs. 2,24,356 /ha) was recorded in treatment T_o (00:00:00 NPK).
3. Maximum Benefit cost ratio(1:2.88) was recorded in T_7 with (27:18:11.25 gm NPK/ Plot + *Azo*+PSB)and the minimum (1:1.69) was recorded in treatment T_0 (00:00:00 NPK).
4. Maximum gross return, net return and cost: benefit ratio was observed in the treatment

Table 7: Economics of integrated nutrient management on cultivation of Dahalia.

Treatments	Common cost of cultivation (Rs./ha)	Cost of Fertilizers and Manures	Total cost of cultivation (Rs./ha)	Flower yield (q/ha)	Income from flower (Rs./ ha)	Tuber yield (q/ha)	Income from tuber (Rs./ha)	Gross return= Income from flower + tuber (Rs./ha)	Net return (Rs./ ha)	Benefit: Cost ratio
T_0	324224	_	324224	6.09	304500	10.17	244080	548580	224356	1.69
T_1	324224	3900	328124	7.14	357000	10.48	251520	608520	280396	1.85
T_2	324224	5550	399774	8.93	446500	11.43	272160	718660	388886	2.18
T_3	324224	6370	330594	9.17	448500	11.98	287520	746020	415426	2.26
T_4	324224	7020	331244	9.63	481500	12.47	299280	780786	449542	2.36
T_5	324224	7350	331574	9.98	499000	12.86	308640	807640	476066	2.44
T_6	324224	7700	331924	10.45	522500	13.40	321600	844100	512196	2.54
T_7	324224	8950	333174	11.84	592000	14.04	335960	928960	596736	2.88
T_8	324224	7850	332074	10.59	529500	13.51	324240	853740	521666	2.57
T_9	324224	8000	332224	11.15	557000	13.86	332620	889620	55644	2.67

T_7 with 30:19.5:12 gm NPK/Plot+*Azo*+PSB+FYM.

5. As the economics is the need of the farmers while taking decision regarding the adoption of the technique and scientific knowledge. Hence, 27:18:11.25 gm NPK/Plot + *Azo*+PSB gave the highest gross return, net return, and highest benefit is to cost ratio was due to higher productivity and higher quality of flowers. Which increase the market value of the flowers.

Conclusion

On the present investigation conducted in Dahlia, it can be concluded that high-quality production of dahlia can be attained by application of treatment ($T_{8)}$ 30:19.5:12 gm NPK/Plot + *Azospirullum*+ PSB + FYM gave significantly superior plant growth however, treatment ($T_{7)}$ 27:18:11.25 gm NPK/Plot + *Azospirullum*+PSB recorded highest flower yield (11.84 q/ha)and found to be most economically viable in terms of gross return (Rs. 9,28,260/ha), net return (Rs. 5,96,732 /ha) and benefit cost ratio (1:2.88).As the study was undertaken only for winter season, it needs further confirmation by conducting more trails.

References

Ahmad, I., T. Ahmad, M.S. Zafar and A. Nadeem (2007). Response of an elite cultivar of zinnia (*Zinnia elegans*) cv. giant dahlia flowered) to varying levels of nitrogenous fertilizer. *Sarhad J. Agric.,* **32(2)**.

Ahmed, M., M. Fareed Khan and H. Abdulhamid and Altaf (2004). Effect of Urea, DAP and FYM on Growth and Flowering of Dahlia (*Dahlia variabilis*) *I. J. of Agri. & biology,* 1560-8530/393–395.

Garg, A.C., M.A. Idnani and T.P. Abraham (1971). Organic manures, India Council of Agricultural Research Technology Bulletin, New Delhi, 21-2.

Pimpini, F. and G. Zanin (2002). Spike corm and cormel production in *Gladiolus hybridus* (Hort.) as affected by soil type and fertilization culture protette (Italy), **31(9):** 107-114.

Ramachandra, C. (1982). Studies effect of dates of planting with different levels of nitrogen and phosphorous on growth and flower production of china aster (*Callistephus chinensis* Nees cv. Ostrich Plume). M. Sc. (Agri.) Thesis, University of Agricultural Sciences, Bangalore.

Said Al-Busaidi, K.T. (2013). Effects of organic and inorganic fertilizers addition on growth and yield of banana (Musa AAA cv. Malindi) on a saline and non-saline soil in Oman. *Academic journals*, 10.5897.

Sabah, S.S. (2014). Effect of different organic and inorganic manure on flower and tuber yield in Dahlia (*Dahlia variabilis L.)* cv. Glory of India as intercropping with Damask Rose European Academic Research 4.

Samia, I., H. Umer and K. Nauman (2012). Effect of Different Potting Media Combinations on Growth and Vase Life of Tuberose (*Polianthes tuberosa* linn.) *Pak. J. Agri. Sci.,* **49(2):** 121-125.

Srivastava, O.P. (1988). Role of organic matter in crop production. *Indian Journal of Agricultural Chemistry*, **31(1):** 1-12.

Vikas, (2009). Performance of dahlia (*Dahlia variabilis* L.) accessions under transitional zone of Karnataka. University of Agricultural Sciences, Dhrawad.