Effect of Integrated Nutrient Management on Plant Growth and Tuber Yield of Dahlia (*Dahlia variabilis*) cv. Kenya White

ABSTRACT

The experiment was carried out at Experimental field, Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences [formerly known as Allahabad Agriculture Institute Deemed University, AAI-DU] during the Spring season 2014-2015. The experiment consists of Thirteen treatments *viz.*, (T_0) Control-RDF (100:120:100 N P K kg ha^{-1},), (T_1) 75% RDF + AZ@ 2.5 kg ha^{-1},, (T_2) 75% RDF + FYM @ 10 ton ha^{-1}, (T_3) 75% RDF + VC@ 10 ton ha^{-1}, (T_4) 75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}, (T_5) 50% RDF +AZ@ 2.5 kg ha^{-1}, (T_6) 50% RDF + FYM@ 10 ton ha^{-1}, (T_7) 50% RDF + VC@ 10 ton ha^{-1}, (T_8) 50% RDF + AZ @ 2.5 kg ha^{-1}+FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}, (T_9) 25% RDF + AZ@ 2.5 kg ha^{-1}, (T_{10}) 25% RDF + FYM@ 10 ton ha^{-1}, (T_{11}) 25% RDF + VC@ 10 ton ha^{-1}+, (T_{12}) 25% RDF + AZ @ 2.5 kg ha^{-1}+FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}. The treatments were replicated thrice in a Randomized Complete Block Design. The results revealed that Plants treated with 75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha (T_4) significantly recorded maximum vegetative and Tuber yield attributes like plant height (91.87 cm), plant spread (92.38 cm), Number of Branches per plant (7.27), number of leaves per plant (26.53), number of tubers per plant (4.80), maximum tuber weight (958.53) and Maximum tuber yield per plant was recorded in T_4 (75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha) (43.33g) followed by T_3 (75% RDF + VC @ 10 t/ha) (40.95g).

Key words: Dahlia, Kenya White, Tuber yield, RDF (Recommended Dose of Fertilizer), *Azotobacter*, Vermicompost, FYM.

INTRODUCTION:

Dahlia is one of the most popular bulbous flower crop grown in the world for its beautiful ornamental blooms of various 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. Dahlia occupies a place of pride in any garden and they are grown both in field and pot culture 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. There are so many factors responsible for growth and development of plants such as soil type, prevailing climatic conditions of an area, nutritional factors, irrigation, plant density per unit area, season of growing, etc. among them Nutrition plays a major role in growth, flowering and yield of flower crop. Integrated nutrient management refers to the maintenance of soil fertility and of plant nutrient supply at an optimum level for sustaining the desired productivity through optimization of the benefits from all possible sources of organic, inorganic and biological components in an integrated manner. Application of nutrients from organic as well as inorganic sources. It aims at improving their physico-chemical

and biological properties of the soil. Integrated Nutrient Management refers to regulated nutrient supply for optimum crop growth and higher productivity, improvement and maintenance of soil fertility, Zero adverse impact on agro-ecosystem quality by balanced fertilization of organic manures, inorganic fertilizers and bio-inoculants. Keeping the above facts in view, an experiment was conducted "Effect of integrated nutrient management on plant growth and tuber yield of Dahlia (*Dahlia variabilis*) cv. Kenya white under Allahabad agro climatic conditions."

MATERIALS AND METHODS

The present experiment was carried out at Experimental field, Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences [formerly known as Allahabad Agriculture Institute Deemed University, AAI-DU] during the during the Spring season 2014-2015. The experiment consists of Thirteen treatments *viz.,* (T_0) Control-RDF (100:120:100 N P K kg ha^{-1},), (T_1) 75% RDF + AZ@ 2.5 kg ha^{-1},, (T_2) 75% RDF + FYM @ 10 ton ha^{-1}, (T_3) 75% RDF + VC@ 10 ton ha^{-1}, (T_4) 75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}, (T_5) 50% RDF +AZ@ 2.5 kg ha^{-1}, (T_6) 50% RDF + FYM@ 10 ton ha^{-1}, (T_7) 50% RDF + VC@ 10 ton ha^{-1}, (T_8) 50% RDF + AZ @ 2.5 kg ha^{-1}+FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}, (T_9) 25% RDF + AZ@ 2.5 kg ha^{-1}, (T_{10}) 25% RDF + FYM@ 10 ton ha^{-1}, (T_{11}) 25% RDF + VC@ 10 ton ha^{-1}+, (T_{12}) 25% RDF + AZ @ 2.5 kg ha^{-1}+FYM @ 10 ton ha^{-1}+VC @ 10 ton ha^{-1}. The treatments were replicated thrice in a Randomized Complete Block Design. Organic Manure and fertilizers (NPK) were applied according to recommended doses for dahlia, i.e. Urea: SSP: MOP @ 100: 120: 100 kg ha^{-1}. Organic manure *viz.,* FYM and Vermicompost was well incorporated in the experimental field before transplanting the seedlings in advance. 40 days old healthy and uniformly grown seedlings were transplanted with a spacing of 45cm x 60 cm. Nitrogen, phosphorous and potassium were applied in the form of Urea, Single Super Phosphate (SSP) and Muriate of potash (MOP), respectively. At the time of transplanting, half of the dose of N and full doses of phosphorous and potassium was applied and remaining two doses of Nitrogen was applied after 30 days transplanting. All the growth and tuber yield parameters were recorded timely and the data were analyzed in Randomized Complete Block Design (RCBD) as per Gomez and Gomez (1984).

Result and Discussion

Growth Parameters

From the data presented in table 1 clearly shows that all the growth parameters were significantly influenced by different treatment combinations. The growth parameters like plant height (91.87 cm), plant spread (92.38 cm), number of Branches per plant (7.27) and number of leaves per plant (26.53) were recorded maximum in T_4 (75%RDF+ AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha) whereas, all the growth parameters were recorded minimum in T_0, i.e. control. The results clearly shows that combined application of nutrients viz., 75% RDF, Azotobacter, Farm Yard Manure (FYM) and Vermicompost (VC) enhanced the vigorous growth of the plant. It might be due to presence of more readily available forms of nutrients i.e., nitrogen, phosphorous, potassium in combination with organic sources viz., Azotobacter, FYM and VC helped in fixing atmospheric nitrogen and solubilized phosphorous. Application of Azotobacter with RDF might also secretes some growth promoters viz., auxin, gibberellins, organic acids and vitamins, in soil with bio inoculation which increases the photosynthetic activity of the plant and better flow of essential nutrients leading to better growth of the plant these results are in conformity with the Kulkarni (1990) in aster, Chandrikapure *et al,* (1999) in marigold and Kumar *et al.* (2003) in aster.

Table 1: Effect of Integrated Nutrient Management on Growth and Tuber yield parameters of Dahlia (*Dahlia variabilis*) cv. Kenya white

Treatments		Plant Height (cm)	Plant Spread (cm)	Number of Branches Per plant	Number of leaves	Tuber weight (g)	Number of tubers per plant	Tuber Yield Per plant
T_0	Control-RDF (100:120:100 N P K Kg/ha)	67.03	81.07	6.47	19.20	193.33	2.47	29.52
T_1	75% RDF + AZ@ 2.5 kg/ha	85.93	89.64	6.87	23.20	849.00	3.87	38.28
T_2	75% RDF + FYM @ 10 t/ha	86.43	90.76	7.00	23.80	899.00	4.00	38.57
T_3	75% RDF + VC@ 10 t/ha	89.90	91.87	7.00	25.27	941.67	4.40	40.95
T_4	75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10t/ha	91.87	92.38	7.27	26.53	958.53	4.80	43.33
T_5	50% RDF +AZ@ 2.5 kg/ha	75.30	85.57	6.67	21.00	461.33	3.93	33.80
T_6	50% RDF + FYM@ 10 t/ha	82.00	88.01	6.60	22.87	650.00	3.67	35.71
T_7	50% RDF + VC@ 10 t/ha	84.27	89.61	6.47	22.80	716.00	3.93	38.28
T_8	50% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha	88.83	90.13	6.87	24.80	923.87	4.53	39.24
T_9	25% RDF + AZ@ 2.5 kg/ha	70.70	83.23	6.67	20.53	233.00	3.40	30.00
T_{10}	25% RDF + FYM@ 10 t/ha	71.80	85.06	6.67	20.40	346.67	3.53	33.04
T_{11}	25% RDF + VC@ 10 t/ha	76.27	86.46	6.93	20.80	524.40	3.53	34.28
T_{12}	25% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha	79.67	86.87	7.07	21.87	558.53	4.00	35.71
F- test		S	S	S	S	S	S	S
S. Ed. (±)		0.340	0.187	0.148	0.303	2.537	0.136	1.492
C. D. (P = 0.05)		0.702	0.386	0.305	0.624	5.236	0.281	3.080

Tuberous yield parameters

The data revealed that different treatment combination affected all the tuberous yield parameters as shown in Table 1. The maximum tuber weight (958.53g), number of tubers per plant (4.80) and maximum tuber yield per plant was recorded in T_4 (75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha) (43.33g) followed by T_3 (75% RDF + VC @ 10 t/ha) (40.95g). The increase in tuber weight, number of tubers/plant, tuber yield might be due to recommended dose of fertilizers application along with Azotobacter and Vermicompost, where cell enlargement and increased production of carbohydrate synthesis may be caused by Azotobacter which transferred into tuber development. Recommended dose of Fertilizers application made readily available form of nutrients to plants, in which phosphorous helped in easy proliferation and better root formation which lead to increase in tuber yield parameters. These results are in conformity with Kumar *et al* (2019), Pandey *et al*, (2017), Sabah *et al*. (2014) and Sheergojri *et al* (2013).

Conclusion

From the above investigation, it can be concluded that integrated approach i.e., application of Recommended dose of fertilizers along with organic manures and biofertilizers showed significant improvement in all growth and yield parameters of Dahlia var. Kenya White. Among the different treatment combination applied, Treatment T4 (75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha) found best with respect to growth parameters where as maximum tuber weight, number of tubers per plant and maximum tuber yield per plant was recorded in T_4 (75% RDF + AZ @ 2.5 kg/ha +FYM @ 10 t/ha +VC @ 10 t/ha) followed by T_3 (75% RDF + VC @ 10 t/ha) (40.95g).

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