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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON FLOWERING AND FLOWER YIELD OF DAHLIA (*DAHLIA VARIABILIS* L) CV. KENYA ORANGE

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Abstract

A field experiment entitled "Effect of Integrated Nutrient Management on Flowering and Flower yield of Dahlia (*Dahlia variabilis* L.) cv. Kenya orange" was carried out in Experimental field, Department of Horticulture, Shiats during Rabi season of 2015-2016. The experiment was laid out in randomized block design (RBD) with three replications. Thirteen treatments having one variety were tried in the experimental design. Different treatment combinations were made with different percentages of Recommended Dose Fertilizer (RDF) for Dahlia 100:120:100 kg of Nitrogen (N), Phosphorus (P) and Potassium (K) per hectare, along with organic fertilizers like FYM, Vermicompost, Poultry manure and Bio fertilizers like *Azotobacter*. Observations to be recorded earliness minimum (57.40 days) for flower bud emergence, flower diameter maximum (22.06 cm), flower weight maximum (63.89 g), flower yield per plant maximum (697.81 g), number of flowers per plant maximum (9.87), flower yield per hectare maximum (9.60 t/ha) was produced by $\mathbf{T_4}$ whereas minimum was received in treatment $\mathbf{T_0}$ (control). At all flowering stages, treatment comprising of $\mathbf{T_4}$ (75% RDF+ Vermicompost @1.25 t/ha) was superior for all other treatments.

Key words: Dahlia, INM, Kenya orange, RDF, flowering and flower parameters,

Introduction

Dahlia (*Dahlia variabilis*) 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 or Compositae. Special characters of Kenya orange Dahlias are Good for cut flowers, Good for screening, Good for Hedges and Borders, Attracts butterflies, Attracts bees, Suitable for road median planting, Grows best in cooler regions and 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 verandas 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. Dahlia is used with advantage for making bouquets and wreaths or vase decorations. 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 (singh, 2006).

Concept of Integrated Nutrient Management is 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. Advantages of Integrated Nutrient Management are enhances the availability of applied As well as native soil nutrients, synchronized the nutrient demand of the crop with nutrient Supply from native and applied sources provides balanced nutrition to crops and minimizes the antagonistic effects resulting from

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hidden deficiencies and nutrient imbalance. Improves and sustains the physical, chemical and biological functioning of soil. Minimizes the Deterioration of soil, water and ecosystem by promoting carbon sequestration, reducing Nutrient losses to ground and surface water bodies and to atmosphere (Sultana *et al*., 2006) and Zhang *et al*., 2010).

Materials and methods

A field experiment entitled "Effect of Integrated Nutrient Management on flowering and flower yield of Dahlia (*Dahlia variabilis* L.) cv. Kenya orange'' was carried out on Experimental field, Department of Horticulture, Sam Higginbottom Institute of Agricultural Technology and Sciences (SHIATS) during Rabi season of 2015-2016. Geographically, Allahabad is located at of $20^0 15'$ North latitude, $60^0 3'$ East longitude. The experiment was laid out in randomized block design (RBD) with three replications. The treatments in each replication were allotted randomly. Thirteen treatments having one variety were tried in the experimental design. Different treatment combinations were made with different percentages of Recommended Dose Fertilizer (RDF) for Dahlia 100:120:100 kg of Nitrogen (N), Phosphorus (P) and Potassium (K) per hectare, along with organic fertilizers like FYM, Vermicompost, Poultry manure and Bio fertilizers like *Azotobacter* (Sabah 2014). Treatments are 13 *viz*, T_0- control, T_1- 75% RDF + *Azotobacter* @2.5 kg/ha, T_2-75% RDF + Poultry manure @0.83 t/ha, T_3-75% RDF+FYM @5 t/ha, T_4-75% RDF + Vermicompost @ 1.25 t/ha, T_5- 50% RDF + *Azotobacter* @5kg/ha, T_6-50% RDF + Poultry manure@1.66 t/ha, T_7- 50% RDF + FYM @ 10 t/ha, T_8- 50% RDF + Vermicompost @ 2.5t/ha, T_9- 25% RDF + *Azotobacter* @ 7.5 kg/ha, T_{10}-25% RDF+ Poultry manure@2.5t/ha, T_{11}- 25% RDF + FYM @ 15 t/ha,T_{12}- 25% RDF+ Vermicompost@3.75 t/ha. The observations were recorded regarding the floral parameters like days to flower bud emergence, Flower Diameter(cm), flower weight(g) and Flower yield parameters like Total number of flowers per plant, Flower yield per plant (g), Flower yield per plot (g), Flower yield per ha (t).

Floral parameters to be recorded

Days to flower bud emergence

Number of days to flower appearance was counted from five selected plants from each replication of all the treatments. The average of each replication was recorded and subjected to statistical analysis.

Flower Diameter (cm)

The flower diameter and weight of flower to five randomly selected plants were measured, averaged and subjected to statistical analysis. The diameter of fully opened flowers was measured on two perpendicular axes and the values were averaged as centimetre.

Weight of flower (g)

The flower weight to five randomly selected plants

Effect of integrated nutrient management on Flower bud emergence of Dahlia (*Dahlia variabilis* L.) cv. Kenya orange.

Treatments No.	Combinations	Days to flower bud emergence
T_0	Control	73.07
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	60.20
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	60.53
T_3	75% RDF + FYM@5 t/ha	61.27
T_4	75% RDF + Vermicompost @ 1.25 t/ha	57.40
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	65.60
T_6	50% RDF + Poultry manure @ 1.66 t/ha	64.53
T_7	50% RDF + FYM @10 t/ha	65.60
T_8	50% RDF + Vermicompost @2.5 t/ha	61.20
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	66.27
T_{10}	25% RDF + Poultry manure @2.5 t/ha	67.87
T_{11}	25% RDF + FYM @15 t/ha	66.60
T_{12}	25% RDF + Vermicompost @3.75 t/ha	70.20
F- test		**S**
S. Ed. (±)		**1.056**
C. D. (P = 0.05)		**2.180**

Effect of integrated nutrient management on Flower diameter (cm) of Dahlia (*Dahlia variabilis* L.) *cv. Kenya Orange.*

Treatments No.	Combinations	Flower diameter (cm)
T_0	Control	17.23
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	18.59
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	19.33
T_3	75% RDF + FYM@5 t/ha	18.43
T_4	75% RDF + Vermicompost @ 1.25 t/ha	22.06
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	19.03
T_6	50% RDF + Poultry manure @ 1.66 t/ha	18.51
T_7	50% RDF + FYM @10 t/ha	18.17
T_8	50% RDF + Vermicompost @2.5 t/ha	19.63
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	18.17
T_{10}	25% RDF + Poultry manure @2.5 t/ha	18.07
T_{11}	25% RDF + FYM @15 t/ha	18.23
T_{12}	25% RDF + Vermicompost @3.75 t/ha	18.20
F- test		**S**
S. Ed. (±)		**0.624**
C. D. (P = 0.05)		**1.287**

Effect of integrated nutrient management on Flower weight (g) of Dahlia (*Dahlia variabilis* L.) *cv. Kenya orange.*

Treatments No.	Combinations	flower weight (g)
T_0	Control	41.51
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	49.15
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	51.11
T_3	75% RDF + FYM@5 t/ha	51.74
T_4	75% RDF + Vermicompost @ 1.25 t/ha	63.89
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	50.22
T_6	50% RDF + Poultry manure @ 1.66 t/ha	52.25
T_7	50% RDF + FYM @10 t/ha	54.82
T_8	50% RDF + Vermicompost @2.5 t/ha	54.36
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	51.89
T_{10}	25% RDF + Poultry manure @2.5 t/ha	50.68
T_{11}	25% RDF + FYM @15 t/ha	52.56
T_{12}	25% RDF + Vermicompost @3.75 t/ha	49.47
F- test		**S**
S. Ed. (±)		**2.277**
C. D. (P = 0.05)		**4.700**

Effect of integrated nutrient management on Total number of flowers per plant of Dahlia (*Dahlia variabilis* L.*)* cv. Kenya orange.

Treatments No.	Combinations	Total no. of flowers per plant
T_0	Control	6.60
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	7.87
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	7.67
T_3	75% RDF + FYM@5 t/ha	7.33
T_4	75% RDF + Vermicompost @ 1.25 t/ha	9.87
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	7.60
T_6	50% RDF + Poultry manure @ 1.66 t/ha	6.93
T_7	50% RDF + FYM @10 t/ha	7.33
T_8	50% RDF + Vermicompost @2.5 t/ha	8.20
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	7.27
T_{10}	25% RDF + Poultry manure @2.5 t/ha	7.53
T_{11}	25% RDF + FYM @15 t/ha	6.87
T_{12}	25% RDF + Vermicompost @3.75 t/ha	6.93
F- test		**S**
S. Ed. (±)		**0.243**
C. D. (P = 0.05)		**0.501**

were measured, averaged and subjected to stastical analysis.

Flower yield parameters to be recorded

Total number of flowers per plant

Number of flowers per plant was counted from five selected plants from each replication of all the treatments and the average of each replication was recorded and subjected to statistical analysis.

Effect of integrated nutrient management on Flower yield per plant (g) of Dahlia (*Dahlia variabilis* L.) *cv. Kenya orange.*

Treatments No.	Combinations	Flower yield per plant (g)
T_0	Control	266.00
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	360.79
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	359.64
T_3	75% RDF + FYM@5 t/ha	697.81
T_4	75% RDF + Vermicompost @ 1.25 t/ha	429.26
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	373.22
T_6	50% RDF + Poultry manure @ 1.66 t/ha	364.57
T_7	50% RDF + FYM @10 t/ha	384.30
T_8	50% RDF + Vermicompost @2.5 t/ha	409.49
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	360.49
T_{10}	25% RDF + Poultry manure @2.5 t/ha	356.81
T_{11}	25% RDF + FYM @15 t/ha	366.49
T_{12}	25% RDF + Vermicompost @3.75 t/ha	318.80
F- test		**S**
S. Ed. (±)		**59.346**
C. D. (P = 0.05)		**122.491**

Effect of integrated nutrient management on Flower yield per plot (g) of Dahlia (*Dahlia variabilis* L.) cv. Kenya orange.

Treatments No.	Combinations	Flower yield per plot (g)
T_0	Control	1330.00
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	1803.95
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	1798.20
T_3	75% RDF + FYM@5 t/ha	2146.30
T_4	75% RDF + Vermicompost @ 1.25 t/ha	3489.05
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	1866.10
T_6	50% RDF + Poultry manure @ 1.66 t/ha	1822.85
T_7	50% RDF + FYM @10 t/ha	1921.50
T_8	50% RDF + Vermicompost @2.5 t/ha	2047.45
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	1802.45
T_{10}	25% RDF + Poultry manure @2.5 t/ha	1784.05
T_{11}	25% RDF + FYM @15 t/ha	1832.45
T_{12}	25% RDF + Vermicompost @3.75 t/ha	1594.00
F- test		**S**
S. Ed. (±)		**4.523**
C. D. (P = 0.05)		**9.336**

Flower yield per plant (g)

Flower yield per plant was recorded under different treatments at 120 days after transplanting.

Effect of integrated nutrient management on Flower yield per plant (g) of Dahlia (*Dahlia variabilis* L.) *cv. Kenya orange.*

Treatments No.	Combinations	Flower yield per hectare (t/ha)
T_0	Control	3.60
T_1	75% RDF + *Azotobacter*@ 2.5 kg/ha	5.00
T_2	75% RDF+ Poultry manure@ 0.83 t/ha	4.90
T_3	75% RDF + FYM@5 t/ha	5.90
T_4	75% RDF + Vermicompost @ 1.25 t/ha	9.60
T_5	50% RDF +*Azotobacter*@ 5 kg/ha	5.10
T_6	50% RDF + Poultry manure @ 1.66 t/ha	5.00
T_7	50% RDF + FYM @10 t/ha	5.30
T_8	50% RDF + Vermicompost @2.5 t/ha	5.60
T_9	25% RDF + *Azotobacter* @ 7.5 kg/ha	5.00
T_{10}	25% RDF + Poultry manure @2.5 t/ha	4.90
T_{11}	25% RDF + FYM @15 t/ha	5.00
T_{12}	25% RDF + Vermicompost @3.75 t/ha	4.40
F- test		**S**
S. Ed. (±)		**0.127**
C. D. (P = 0.05)		**0.262**

Flower yield per plot (g)

The observations on flower yield per plot (g)was calculated on the basis of flower yield per plant after harvesting weighed by using electronic balance and expressed in grams.

Flower yield per ha (t)

The Flower yield per hectare was calculated on the basis of flower yield per plot and expressed in tonnes.

Results and discussion

Minimum number of days (57.40) for first flower bud emergence (earliness) was obtained in T_4 followed by T_8. Maximum number of days (73.07) for first flower bud emergence (earliness) was observed in treatment (T_0) control. The diameter of flower was recorded maximum in T_4 (22.06 cm) followed by T_8 (19.63cm). whereas minimum diameter of flower (17.23 cm) was received in treatment T_0 (Control). Similar findings were reported by Sheergojri *et al.* (2013) in Dahlia. Maximum weight of flower was received T_4 (63.89 g) followed by T_7 (54.82g). Where as minimum (41.51 g) was recorded in treatment T_0 (control). Similar findings were reported by Sabah (2014) in Dahlia. Maximum number of flowers per plant (9.87) were observed in treatment T_4 followed by T_8 (8.20). Lowest (6.60) was received followed by (T_0) control. Maximum flower yield per plant (697.81 g) was obtained in treatment T_4 followed by T_3 (429.26 g) and minimum (266.00 g) was received followed by T_0 (control). Maximum flower yield per plot (3489.05 g) was observed in T_4 followed by T_3 (2146.30 g) and minimum (1330.00g) was recorded followed by T_0 (control). Maximum flower yield per hectare (9.60 t/ha) was recorded in treatment T_4 followed by T_3 (5.90 t/ha) and minimum (3.60 t/ha) was received followed by T_0 (control).

Conclusion

On the basis of performance of Dahlia flowering and flower yield on various treatments of inorganic, organic and biofertilizers. The best treatment regarding application of 75% RDF along with Vermicompost @1.25 t/ha was found to have significant effect on flowering and flower yield parameters in dahlia.

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