

EFFECT OF DIFFERENT ORGANIC MANURE WITH COMPLEMENT BY NPK FERTILIZER ON GROWTH, FLOWERING AND YIELD OF DAHLIA (*DAHLIA VARIABILIS*) CV. GLORY OF INDIA AS INTERCROPPING WITH (*ROSA DAMASCENE*)

Saleh Shehab Sabah[■], V.M. Prasad[♦] and S.Saravanan[□]

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ABSTRACT

The experiment to study the effect of different organic manure with complement by NPK Fertilizer on growth, flowering and yield of Dahlia (*Dahlia variabilis*) cv. glory of India as intercropping with (*Rosa damascene*) was conducted at ornamental horticulture nursery farm, Department of Horticulture, SHUATS, Technology and Sciences, Allahabad-211007 (U.P.) during 2012-2013. One cultivar of Dahlia (*Dahlia variabilis*) cv. glory of India was planted in four different planting media : control, FYM, FYM + NPK, Poultry manure, Poultry manure + NPK and Vermicompost, Vermicompost + NPK in different combinations. The experiment was laid out in randomized block design with split plot arrangement. Media mostly affected the parameters studied during the experiment. Maximum plant height (92.17cm), number of leaves (19.08cm), major Stem girth (25.07ml), size of vegetative growth to leaves (65.66cm), leaf blade (29.50cm), diameter of flower (26.11cm), weight of the flower (92.67g) and weight of tuber (996.67g) were recorded among FYM + NPK and Poultry manure + NPK . Whereas, minimum plant height (60.58cm), number of leaves (17.83cm), major Stem girth (11.35ml), size of vegetative growth to leaves (24.61cm), leaf blade (15.08cm), diameter of flower (17.17cm), weight of the flower (51.33g) and weight of tuber (232.67g).were produced by the control, vermicompost and FYM without using NPK as a complement dose. Among the treatments, some parameters showed significant variation grown in FYM + NPK and Poultry manure + NPK. Maximum plant height (92.17cm), number of leaves (19.08cm) was recorded in T₆ (Poultry manure 30 t ha⁻¹ + Urea 7.4635g + 7.35g P₂O₅ + 2.1 g K₂O per plant), major Stem girth (25.07ml) was recorded in T₃ Farm yard manure (FYM) 30 t ha⁻¹ + Urea 6.45 g + 8.3625g P₂O₅ + 0.975 gm K₂O per plant, size of vegetative growth to leaves (65.66cm) was recorded in T₂ (Farm yard manure (FYM) 20 t ha⁻¹ + Urea 7.4625 g + 8.7 g P₂O₅ + 1.6875g K₂O per plant.), leaf blade (29.50cm) was recorded in T₉ (Vermicompost 30 t ha⁻¹ + Urea 5.8875 g + 7.4625 g P₂O₅ + 0.3g K₂O per plant), diameter of flower (26.11cm), weight of the flower (92.67g) and weight of tuber (996.67g) was recorded in T₆ (Poultry manure 30 t ha⁻¹ + Urea 7.4635g + 7.35g P₂O₅ + 2.1 g K₂O per plant).

Key Words: *Dahlia*, *NPK Fertilizer*, *Farm yard manure*, *Poultry manure*, *Vermicompost*, *Growth and Yield*.

INTRODUCTION

Dahlia is one of the most popular bulbous flower 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 belonging to the family Asteraceae having its origin in Mexico (Willis, 1966). Dahlia (*Dahlia variabilis*) is a very beautiful flower which by virtue of extra-ordinary quality has attained attention of many people all over the world. It is a perennial, half hardy, herbaceous plant with tuberous root system and erect growing habit. In India it is mostly grown as winter flower because of severe climatic conditions during summer. Number of chromosomes to (*Dahlia variabilis* L) 2n = 64 (Ajeet and Salaria, 2010).

Dahlia has many ornamental characteristics such as wide range of plant heights (varies from 30 -180 and more than 250 cm), single and collaret varieties, decorative in various sizes with double flowers having broad petals and cactus varieties (double with narrow petals) show a pompon Dahlia have ball- like flowers and these are orchid- flowered and anemone flowered types. Dahlia offers a most extensive colour range with two colours in same flower. 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. Dahlias are also suitable for planting in front of shrubberies or between newly planted shrubbery to fill up the inter space in front and bring more colours (Ajeet and Salaria, 2010). Dahlia can hold their own among Roses and Oriental Lilies, are lovely with many annuals, and pair beautifully with ornamental Goldenrod (Solidago) and fall-blooming Asters.(www.white flower farm-plantsmen since 1950.com). The lasting quality of a flower is of great importance in the cut flower trade. Like Holland, India also can develop an industry of dahlia which will enable us to earn more coveted foreign exchange by exporting tuber's seeds and flowers. In India due to the great diversity in soil and climatic conditions the flowers can be raised for trading during a long spell of the year.

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 (www.tnau.agri portal.com.)

The Damask rose (*Rosa damascene*) is perennial shrub producing fragrant flowers is used for production of rose water, rose 'Attar', gulkand, rose hair oil 'Otto'. It is cultivars in Ajmer in

■M.Sc Student, ♦Professor and Head, □Associate Professor

■Ministry of Higher Education of Iraq, Al Muthanaa University

♦, □Department of Horticulture, Allahabad School of Agriculture, SHUATS, Allahabad - 211007 (U.P)

Rajasthan, Palampur, and Kulla districts in Himachal Pradesh and Aligarh, kannauj and Lucknow in Uttar Pradesh. Floral extracts like essential oils, alkaloids, sapogenins, pigments, dyes etc. have tremendous demand in both domestic and international markets. Extracting and isolating natural dyes from flowers is becoming important (Ajeet and Babita Singh Salaria, 2010).

MATERIALS AND METHODS

Experimental site

The experiment was conducted in the Floriculture Research Farm of the Department of Horticulture, SHIATS, Allahabad during the last of November 2012-2013. The experimental field is situated on the experimental field is situated on department of horticulture experimental field.

Climate of the region

The annual mean temperature is 26.1°C (79.0 °F); monthly mean temperature are 18-29 °C (64-84 °F).

Layout of experiment

The experiment was conducted with Randomized Block Design (RBD) with 10 treatments each replicated three times. The allocation of treatments to the individual plots was done using random numbers in each replication.

Nursery prepare

A normal size of nursery bed (3.0 m x 1.0 m) was prepared in the departmental nursery in the month of November 2012. The soil of nursery bed was prepared thoroughly and than a mixture consisting of five parts of clean garden soil, two parts of FYM and one part of clean sand was used as a 2 - 3 cm thick bedding before the tubers were sown in 15 cm deep lines at 30cm apart in the bed. Then the tubers were covered with a thin layer of above mixture and water was sprinkled. Thereafter, whenever water was required, irrigation was provided in the nursery bed.

Field prepare

The experimental field was prepared by hand digging from east to west, the layout was applied to division replications, rows and plants locations. Weeding and hard pruning of Damask rose was very important to transition among Damask rose plants, the pits was made by khurpi tool and removed depth roots of weeds and burring, then start by mixing of organic manure and NPK with selected pits according to the experiment layout as top dressing, the small pools are made surrounded the plant pits and established drip irrigation organization with fixed bamboo stalks beside all the pits at 10 cm from plant location after light irrigation and fixed on the top of stalks the treatments tags. The transplanted from the nursery to the filed was in the (29th of November, 2013) in morning at 7 o'clock after reach the seedlings to pair of leaves by experiences labors follow to horticulture department.

Organic manure and fertilizers (NPK) were applied according to recommended doses for dahlia, i.e. Urea :- P_2O_5 : K_2O @ 100: 120: 100 kg ha⁻¹. Urea was applied in three equal splits. Half dose of nitrogen, total phosphorus and potash were applied as basal dressing before transplanting. Balance quantity of N_2 was applied in two equal split doses of one-fourth each at 30 DAT and 45 DAT until 15 days after transplanting.

Treatment details

Design of experiment

The following treatments were applied

- T0 - Control
- T1 - Farm yard manure (FYM) 10t ha⁻¹
- T2 - FYM 20 t ha⁻¹ + Urea 7.4625 g + 8.7g P_2O_5 + 1.6875g K_2O per plant.
- T3 - FYM 30 t ha⁻¹ + Urea 6.45 g + 8.3625g P_2O_5 + 0.975 g K_2O per plant.
- T4 - Poultry manure 10 t ha⁻¹.
- T5 - Poultry manure 20 t ha⁻¹ + Urea 6.7875 g + 8.0256g P_2O_5 + 2.4375 g K_2O pe plant.
- T6 - Poultry manure 30 t ha⁻¹ + Urea 6.35g + 7.35g P_2O_5 + 2.1 g K_2O per plant
- T7 - Vermicompost 10 t ha⁻¹
- T8 - Vermicompost 20 t ha⁻¹ + Urea 6.6375g + 8.1 g P_2O_5 + 1.2375 g K_2O per plant.
- T9 - Vermicompost 30 t ha⁻¹ + Urea 5.8875 g + 7.4625 g P_2O_5 + 0.3g K_2O per plant.

Samples were taken from all the growing media before planting the corms and then at an interval of 45 days, these samples were then analyzed in the soil laboratory, Department of Soil and Environmental Sciences, Allahabad School of Agriculture Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad-211007 (U.P.) for Nitrogen, Phosphorus, Potassium (NPK), Organic Matter content and pH.

Plant height (cm)

Plant height of dahlia plants significantly varied by application of different treatments. Plant height at 100 DAT (days after transplanting) and increased significantly from a maximum of (92.17 cm) in treatment receiving (T_6) and it was on par with T_5 (88.08cm) and T_2 (87.07cm) However, minimum plant height (60.58 cm) was recorded in the control (T_0).

Table - 1: Effect of Different Organic Manure with Complement by NPK Fertilizer on plant height (cm) of Dahlia (*Dahlia variabilis*) at different intervals.

Treatments	20 DAT	40 DAT	60 DAT	80 DAT	100 DAT
T_0	10.71	10.71	26.75	46.25	60.58
T_1	8.67	8.58	25.00	54.18	84.08
T_2	9.37	9.46	25.21	47.25	87.07
T_3	8.79	8.79	25.88	49.08	82.17
T_4	9.43	9.42	27.75	54.58	85.67
T_5	7.75	7.92	23.75	48.75	88.08
T_6	8.62	8.63	24.83	56.25	92.17
T_7	8.13	8.13	21.43	43.08	69.50
T_8	10.50	11.83	21.92	40.92	75.75
T_9	10.08	10.08	26.04	49.50	84.33
F- test	NS	S	S	S	S
S. Ed. ($\pm$)	0.952	1.079	1.727	4.444	4.444
C. D. ($P=0.05$)	2.018	2.288	3.661	9.422	15.819

The increase in the plant height in the treatment T_6 might be due to the beneficial effects of poultry manure and NPK. The decrease in the plant height may be due to unavailability of sufficient nutrients at critical developmental stages which

decrease growth rate. Similar findings were reported by (Oyededeji *et al.* (2014) observed that except for the length, is in order NPK > poultry manure > control in amaranthus species. (Kumar, 2002) in China aster and marigold respectively. Chaitra and Patil (2007) observed significant increase in plant height of China aster applied with Biofertilizers + NPK.

These results are in line with the work of Nowsheen (2006) Poultry manure + Azotobacter + wood ash + phosphate solubilizing bacteria + oil cake recorder the highest values for plant height (23.39). Said Al-Busaidi (2013) Chicken manure may be a better alternative organic fertilizer. The combined effect of date palm straw and composted manure on plant growth of field-grown banana requires further study, Nalawadi, *et al.* (1982). While in marigold, application of 225 kg N + 120 kg P₂O₅ per hectare increased the plant height.

Number of leaves/plant.

At 100 DAT regarding the number of leaves/plant also showed significant differences among the treatment means. Maximum number of leaves was recorded with T₉ (19.67) and it was on par with T₆ (19.08) and T₅ (19.00). Minimum number of leaves was recorded in T₂ (17.83). As number of leaves/plant depends upon number of vegetative buds formed on main stem. When all three sources of fertilizers were applied, it resulted in maximum height of the plant and more number of leaves per plant. Minimum number of leaves/ plant in T₂ might be due to absence of N for leaf bud formation and intercropping.

Table - 2: Effect of Different Organic Manure with Complement by NPK Fertilizer on number of leaves per plant of Dahlia (Dahlia variabilis) at different intervals.

Treatments	20 DAT	40 DAT	60 DAT	80 DAT
T ₀	10.83	11.00	17.67	18.33
T ₁	9.33	9.33	16.33	18.17
T ₂	9.50	9.50	17.67	17.83
T ₃	10.17	10.33	18.83	18.50
T ₄	10.17	10.00	18.17	18.83
T ₅	6.83	10.17	18.17	19.00
T ₆	10.50	10.84	17.50	19.08
T ₇	10.00	10.00	17.33	18.83
T ₈	10.33	10.50	16.33	18.33
T ₉	10.17	10.17	17.17	19.67
F- test	NS	NS	NS	NS
S. Ed. (±)	1.042	1.675	1.396	1.721
C. D. (P = 0.05)	2.209	3.550	2.960	3.649

These results for number of leaves could be attributed because of better micro and macro nutrients flow along with plant growth substances into the plant system in the treatments applied with vermicompost combination with inorganic fertilizers. The growth regulators like NAA and cytokinins released by Biofertilizers might have resulted in breaking of apical dominance and accelerated higher number of leaves. The above results are collaborated with the findings of Hossain *et al.* (2012) The results indicated that all the fertilizer treatments improved growth as shown by the number of leaves, was obtained in the treatment with poultry manure alone and with 25% NPK + 75% poultry manure.

Girth of main stem (m.m).

The data regarding the girth of main stem. also showed significant differences among the treatment means. Maximum girth of main stem was recorded with T₃ (25.07) and it was on par with T₆ (24.80) and T₈ (23.02). Minimum size of girth of main stem was recorded in T₀ (11.35) control.

Table - 3: Effect of Different Organic Manure with Complement by NPK Fertilizer on Girth of Major Stem of Dahlia (Dahlia variabilis).

Treatments	Girth of Major Stem (m.m)
T ₀	11.35
T ₁	16.47
T ₂	24.16
T ₃	25.07
T ₄	13.89
T ₅	22.60
T ₆	24.80
T ₇	11.44
T ₈	20.89
T ₉	23.02
F- test	S
S. Ed. (±)	0.793
C. D. (P = 0.05)	1.682

These results are in line with the findings of Karavadia and Dhaduk (2002). The maximum plant main stem diameter in annual chrysanthemum cv. Local white were recorded by the application of nitrogen at 150 kg per ha, in combination with 100 kg each of P₂O₅ and K₂O.

Size of vegetative growth (cm).

The data regarding the size of vegetative growth. Also showed significant differences among the treatment means. Maximum size of vegetative growth was recorded with T₃ (65.66) and it was on par with T₄ (63.28) and T₅ (61.66). Minimum size of vegetative growth was recorded in T₁ (24.61) control.

Table - 4: Effect of Different Organic Manure with Complement by NPK Fertilizer on the size of vegetative growth to leaves of Dahlia (Dahlia variabilis).

Treatments	Size of vegetative growth to leaves (cm)
T ₀	24.61
T ₁	45.77
T ₂	65.66
T ₃	63.28
T ₄	42.22
T ₅	61.66
T ₆	59.99
T ₇	36.88
T ₈	56.55
T ₉	56.66
F- test	S
S. Ed. (±)	1.183
C. D. (P = 0.05)	2.508

These results are in line with the findings of **Singh *et al.* (2005)** recorded that the addition of FYM to the soil also increased the yield parameters. Application of FYM (5 t/ha) in rose resulted in production of maximum leaf area.

Leaf blade (cm).

The data regarding the size of leaf blade, also showed significant differences among the treatment means. Maximum size of leaf blade was recorded with T₉ (31.50) and it was on par with T₃ (29.50) and T₁ (28.42). Minimum size of vegetative growth was recorded in T₀ (15.08) control.

Table - 5: Effect of Different Organic Manure with Complement by NPK Fertilizer on Leaf blade of Dahlia (*Dahlia variabilis*).

Treatments	Leaf blade (cm)
T ₀	15.08
T ₁	21.58
T ₂	28.42
T ₃	29.50
T ₄	19.63
T ₅	26.67
T ₆	28.17
T ₇	16.50
T ₈	27.17
T ₉	31.50
F- test	S
S. Ed. (±)	0.571
C. D. (P = 0.05)	1.210

These results are in line with the findings of **Maheshwar *et al.* (2005)** recorded plant height (56.80 cm) was found to be significantly higher with the application of nitrogen @ 105 kg per ha⁻¹. Maximum leaf area (5667.23 cm² /plant) and leaf area index (5.58 cm² /plant) were recorded in 105 kg nitrogen per ha⁻¹.

Flower diameter (cm)

The data regarding the size of flower diameter, also showed significant differences among the treatment means. Maximum size of flower diameter was recorded with T₆ (29.11) and it was on par with T₃ (26.11) and T₄ (22.66). Minimum size of flower diameter was recorded in treatment T₇ (17.17).

Table - 6: Effect of Different Organic Manure with Complement by NPK Fertilizer on flower diameter of Dahlia (*Dahlia variabilis*).

Treatments	diameter of flower (cm)
T ₀	18.08
T ₁	17.83
T ₂	21.61
T ₃	26.11
T ₄	22.66
T ₅	19.50
T ₆	29.11
T ₇	17.17
T ₈	22.00
T ₉	21.33
F- test	S
S. Ed. (±)	0.789
C. D. (P = 0.05)	1.672

These results are in line with the findings of **Ahmed *et al.* (2004)**. Recorded that the effect of urea, FYM and P₂O₅ was studied on growth and flowering Dahlia cultivars. Urea, P₂O₅ and FYM in different combinations showed significant results, while single FYM and urea did not affect on size of flowers.

Weight of flower (g)

The effect was significant and superior at T₇ (92.67g), followed by T₆ (77.33g) and T₄ (76.66g), whereas minimum size of diameter of flower (17.17g) was recorded in treatment T₈.

Table - 7: Effect of Different Organic Manure with Complement by NPK Fertilizer on weight of flower (gm) of Dahlia (*Dahlia variabilis*).

Treatments	Weight of flower (gm)
T ₀	51.67
T ₁	51.33
T ₂	65.66
T ₃	76.66
T ₄	56.67
T ₅	77.33
T ₆	92.67
T ₇	51.33
T ₈	47.33
T ₉	72.89
F- test	S
S. Ed. (±)	3.443
C. D. (P = 0.05)	7.298

These results are in line with the findings of **Sheergojri *et al.* (2013)** recorded that the highest fresh flower weight and longest vase life was observed in treatment 75 kg N ha⁻¹.

Weight of tuber

The data regarding the weight of tubers, also showed significant differences among the treatment means. Maximum weight of tubers was recorded with T₆ (996.67) and it was on par with T₂ (935.33) and T₃ (912.67). Minimum weight of tubers was recorded in T₀ (281.33) control.

Table - 8: Effect of Different Organic Manure with Complement by NPK Fertilizer on weight of tubers (g) of Dahlia (*Dahlia variabilis*).

Treatments	Weight of tubers (g)
T ₀	281.33
T ₁	225.48
T ₂	650.03
T ₃	912.67
T ₄	349.33
T ₅	643.33
T ₆	996.67
T ₇	232.67
T ₈	449.33
T ₉	523.33
F- test	S
S. Ed. (±)	9.624
C. D. (P = 0.05)	20.404

These results are in line with the findings of **Farhad *et al.* (2009)** recorded that the parameters including plant height, number of rows per cob, number of grains per row, 1000-grain weight, grain yield, biological yield and harvest index were significantly affected by application of Poultry manure. Maximum values for all these parameters were recorded with the application of 12 t ha⁻¹ Poultry manure.

CONCLUSION AND RECOMMENDATIONS

In view of the experimental results obtained during the present investigation, treatment T₆ (Poultry manure 30 t ha⁻¹ + Nitrogen 100kg ha⁻¹ + P₂O₅ 120kg ha⁻¹ + K₂O 100kg ha⁻¹) was found most suitable treatment for growth, yield and economic returns for cultivation of Dahlia with (*Rosa damascina*) Damask rose under the agro-climatic condition of Allahabad. However, since this is based on one year experiment, further trials may be needed to substantiate the results.

Therefore, it is recommended that poultry manure 30 t/h⁻¹ + NPK competition to 100:120:100 Urea, P₂O₅ and K₂O should be used for maximum flowers and corms production. In case, poultry manure is not available, farm yard manure (FYM) 30t/h⁻¹ + NPK competition to 100:120:100 Urea, P₂O₅ and K₂O would be a good alternative.

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