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Effect of organic manure on growth and flowering attributes of dog flower (*Antirrhinum majus*)

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ABSTRACT

A field experiment was undertaken in Phek, Nagaland, to investigate the effects of organic manure on the growth and flowering attributes of dog flower (*Antirrhinum majus*). The trial was statistically designed as a Randomized block design with seven treatments and three replications. In this experiment, three locally available organic manure *viz*., pig manure, poultry manure and forest debris were used. The results showed that, all vegetative parameters (plant height, no. of leaves per plant, no. of shoots per plant, leaf length and width) and flowering parameters (minimum days to first bud initiation, 1st flower opening, 50% flowering, 100% flowering, maximum spike length, no. of buds per spike, and no. of spikes per plant) was found to be statistically superior in the treatment where the soil was enriched with a combination of pig manure @1kg/ m^2 + forest debris @1kg/m^2.

Key words: *Antirrhinum majus, Dog flower, Forest debris, Organic farming, Pig manure, Poultry manure.*

Introduction

Snapdragon, botanically known as *Antirrhinum majus* is native to Western North America and the Western Mediterranean region and belongs to the family Plantiginaceae. The name "Snapdragon" comes from the appearance of its flowers that resembles the jaw and nose of a dragon, and the word "Snapdragon" comes from the Greek word. Anti means "like" and snapdragon means "nose". Furthermore, when you squeeze the flower, the head opens, and when you release it, it snaps closed. The leaves are spirally arranged, wide and spear-shaped, 1-7 cm long and 2-2.5 cm wide. Colours ranges from white, purple, yellow, red, pink, burgundy, bronze, orange. Snapdragon is popular for its decorative and aesthetic value, edible properties, and medicinal properties. They are widely cultivated for flashy flowers that make flashy bedding and container plants. The flowers have long green spikes and a wide range of petal colours, making them excellent cut flowers. They also make excellent filler plants for planters, baskets and bouquets. Besides the values of their gorgeous and fragrant flowers, snapdragon leaves and flower are also used to treat tumours, ulcers, inflammation and haemorrhoids. Snapdragon flower extract reduces infiltration, migration, and adhesion of human lung and colon cancer cells, as well as inhibiting cell growth (Seo *et al*., 2020). In Russia, snapdragon seed oil has been extracted and used in place of olive oil (Tolety and Sane, 2011). Snapdragon flower (*Anti-*

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rrhinum majus L.) is one of the most commonly used edible flowers in the preparation of various foods and drinks. These flowers are used in the extraction of essential oils, the extraction of natural pigments, food and beverage additives, etc. Therefore, these flowers can be further used extensible in pharmaceutical, nutraceutical, cosmetic and aromatherapy industries. It is important to produce a chemical-free product, so organic manure should be used as a source of nutrients to grow healthy and organic plants.

Application of organic manure plays an important role in yield and its attributes, as well as nutrient absorption, and directly enhances the physical condition of the soil. It reduces soil bulk density, increases water retention capacity, CEC, builds beneficial soil microorganisms, improves good soil structure and strengthens stable soil aggregates (Doran, 1995; Drinkwater *et al*., 1995). The use of bio-fertilizers and organic fertilizers in agriculture has become more and more popular these days not only to reduce the cost of fertilizers, but also to reduce the adverse effects of fertilizers on the soil and plant environment and increase crop productivity (Vyas, 1988). Hence, the present investigation was carried out to study the response of organic manure on growth and flowering attributes of dog flower (*Antirrhinum majus)*.

Materials and Methods

For this study, the land was ploughed repeatedly and was levelled uniformly and brought to a fine tilth. All the stones, gravels, brick pieces, plastics and other foreign materials along with weeds and grasses were removed manually by deep digging. Pig manure, poultry manure, and forest debris were gathered from nearby farmers' farms and used in the experiment. The healthy, uniform sized, disease free 1 months old rooted plant seedlings of dog flower (*Antirrhinum majus*) were transplanted in the well prepared field on 12 February 2022 under the open field condition. Planting was done on the sunken beds of 1.0m x 1.0m size accommodating 9 plants per plot with the spacing of 30cm x 30cm. The present experiment comprises of seven different treatments, T1 – Control, T2 – soil + forest debris 0.5 Kg/m^2 + poultry manure 0.5 kg/m^2 + pig manure 0.5 Kg/m^2, T3 – Soil + poultry manure 1 Kg/m^2, T4 – Soil + forest debris 0.5 Kg/m^2 + poultry manure 1 Kg/m^2, T5 – Soil + pig manure 1 Kg/m^2, T6 – Soil + forest debris 0.5 Kg/m^2 + pig manure 1 Kg/m^2 , T7 – Soil + forest debris 0.5 kg/m^2, replicated thrice in RBD. Basal application of ½ kg/m^2 of organic manure, such as chicken, pig manure and forest debris was done on 12th February 2022 as per treatment and again the flower crop was top dressed with remaining half doses of organic manure one months after transplanting as per the treatments. Light irrigation was given soon after transplantation. All the intercultural operation was performed regularly and data on vegetative and flowering parameters were recorded. Statistical model followed for this field experiment was RBD (Randomized Block Design) and statistical analysis was done using ICAR Wasp 2.0 software.

Results and Discussion

The present experiment revealed that all the vegetative and flowering growth parameters of *Antirrhinum majus* were significantly influenced by different organic manure. The results obtained were presented as under:

Vegetative parameters

Plant height: Maximum plant height at 45 DAT and 60 DAT were obtained in treatment T6 recording (26.43 cm) and (33.63 cm) respectively, where the soil was enriched with 0.5 Kg/m^2 forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5 (26.40cm) where the soil was enriched with pig manure 1 Kg/m^2. And these two treatment was found to be statistically superior to other treatment. Whereas, minimum plant height for both 45 DAT and 60 DAT was obtained in T1 i.e., control (Table 1).

Number of shoots per plant: Maximum number of shoots per plant at 45 DAT and 60 DAT were obtained in treatment T6 recording (15.63) and (19.46) respectively, where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5(19.43) where the soil was enriched with 1 Kg/m^2 pig manure. Whereas, minimum no. of shoots per plant for both 45 DAT and 60 DAT was obtained in treatment T1 i.e., control (Table 1).

Number of leaves per plant: Maximum number of leaves per plant at 45 DAT and 60 DAT were obtained in treatment T6 recording (198.43) and (280.00) respectively where the soil was enriched

with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5(277.33) where the soil was enriched with 1 Kg/m^2 pig manure. Whereas, minimum no. of leaves per plant for both 45 DAT and 60 DAT was obtained in treatment T1 i.e., control. (Table 1).

Leaf length (cm) and leaf width (cm): Maximum leaf length(5.46cm) and width (2.23 cm) were recorded in treatment T6 where the soil was enriched with 0.5 Kg/m^2 of forest debris +1 Kg/m^2 pig manure was found to be statistically at par with treatment T5, where the soil was enriched with 1 Kg/m^{2}pig manure.

Results revealed a significant difference in vegetative parameters as influenced by different organic manure. All the vegetative parameters was found to be superior in treatment where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was reported to be statistically at par with T5, where the soil was enriched with 1 Kg/m^2 pig manure. Similar finding has been reported by Atiyeh *et al*. (2002) in marigold, who reported that 30 percent and 40 percent pig dung vermi compost for marigolds produced the best vegetative development. Chastain *et al*., (1999), discovered that using pig manure which contains 13 essential plant nutrients may provide a portion, or all, of the plant requirements. Another reason could be because nitrogen is readily available, resulting in a balanced C: N ratio, which aids in increased vegetative growth, higher photosynthetic activity. Higher availability of nitrogen in the soil, which is an essential component of protein and chlorophyll, may also contribute to increased leaf production (Kumar and Singh, 2007).

Flowering Parameters

Days to first bud Initiation (numbers)

The minimum days to first flower bud initiation was obtained in T6 (61.33) where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5(60.00) where the soil was enriched with 1 Kg/m^2 pig manure. Whereas, the maximum days to first flower bud initiation was obtained in treatment T1(83.00) i.e., control. (Table 2)

Days to first flower opening (number)

The minimum days to first flower opening was obtained in T6 (72.33) where the soil was enriched with 1 Kg/m^2 pig manure and was found to be statistically at par with T5(72.66) where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure. Whereas, the maximum days to first flower opening was obtained in treatment T1 (91.00) i.e., control. (Table 2)

Days to 50 % flowering (number)

Treatments T5(80.33) and treatments T6 (80.33) was found to be statistically at par with each other on number of days to 50% flowering, where the soil was enriched with 1 kg/m^2 pig manure and 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure respectively. Whereas, the maximum days to 50% flowering was obtained in treatment T1 (102.66) i.e., control (Table 2).

Table 1. Effect of different organic manure on vegetative growth parameters of dog flower (*Antirrhinum majus*)

Treatment No.	Plant height at 45 DAT (cm)	Plant height at 60 DAT (cm)	No. of shoots At 45 DAT	No. of shoots at 60 DAT	No. of leaves at 45 DAT	No. of leaves at 60 DAT	Leaf length (cm)	Leaf width (cm)
T1	19.44^{d}	25.43^{e}	5.10^{c}	5.76^{d}	84.66^{f}	134.76^{f}	4.26^{c}	1.76^{c}
T2	22.63^{b}	29.30^{b}	7.10^{b}	9.43^{bc}	130.33^{c}	189.00^{c}	5.10^{b}	2.00^{b}
T3	21.63^{bc}	27.66^{cd}	7.06^{b}	8.76^{c}	119.43^{d}	179.76^{d}	5.16^{b}	2.00^{b}
T4	21.84^{bc}	28.60^{bc}	7.43^{b}	10.34^{b}	154.00^{b}	218.66^{b}	5.13^{b}	2.03^{b}
T5	26.40^{a}	33.63^{a}	15.10^{a}	19.43^{a}	197.76^{a}	277.33^{a}	5.46^{a}	2.23^{a}
T6	26.43^{a}	33.76^{a}	15.63^{a}	19.46^{a}	198.43^{a}	280.00^{a}	5. 60^{a}	2.26^{a}
T7	21.10^{c}	26.76^{d}	5.53^{c}	6.43^{d}	87.60^{e}	137.60^{e}	4.30^{c}	1.80^{c}
CD0.05%	1.265	2.707	0.755	0.993	1.246	2.707	0.25	0.13

*Here T1; Control, T2; soil + forest debris 0.5 Kg/m^2 + poultry manure 0.5 Kg/m^2 + pig manure 0.5 Kg/m^2, T3; Soil + poultry manure 1 Kg/m^2, T4; Soil + forest debris 0.5 Kg/m^2 + poultry manure 1 Kg/m^2, T5; Soil + pig manure 1 Kg/m^2, T6; Soil + forest debris 0.5 Kg/m^2 + pig manure 1 Kg/m^2, T7; Soil + ½ kg forest debris

Days to 100 % flowering (number)

Minimum days to 100% flowering was obtained in T6 (92.33) where the soil was enriched with 1 Kg/m^2 pig manure and was found to be statistically at par to T5 (92.66) where the soil was enriched with 0.5 Kg/m^2 forest debris and 1 Kg/m^2 pig manure. Whereas, the maximum days to 100% flowering was obtained in treatment T1 (118.00) i.e., control (Table 2).

Spike length

The maximum spike length was recorded in T6 (26.86) where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5 (26.73) where the soil was enriched with 1 Kg/m^2 pig manure followed by treatment T_4 (15.10), T3(14.84) and T2(13.83). Among all the treatments, treatment T6 and treatment T5 was found to be statistically superior. Whereas, the minimum spike length was recorded in treatment T1(11.30) i.e., control (Table 3).

Number of buds per spike

The maximum number of buds per spike was obtained in treatment T6 (28.53) where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found tobe statistically at par with 1 Kg/m^2 pig manure T5 (28.00) Whereas, the minimum spike length was recorded in treatment T1(17.43) i.e., control (Table 3).

Number of spike per plant

The maximum number of spike per plant was recorded in T6 (11.43), where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5 (11.30), where the soil was enriched with 1 Kg/m^2 pig manure. Among all the treatments, treatment T6 and treatment T5 was found to be statistically superior. Whereas, the minimum spike length was recorded in treatment T1(4.86) i.e., control (Table 3).

Results reveal a significant difference in flowering parameters as influenced by different organic manure. Maximum spike length, no. of buds per spike, no. of spike per plant and minimum no. of

Table 3. Effect of different organic manure on no. of spike per plant, spike length (cm), no. of buds per spike in dog flower (*Antirrhinum majus).*

Treatment No.	No. of spike per plant	Spike length (cm)	No. of budsper spike
T1	4.86^{c}	11.30^{e}	17.43^{d}
T2	6.20^{b}	13.83^{c}	19.66^{c}
T3	5.86^{b}	14.84^{bc}	19.43^{c}
T4	6.06^{b}	15.10^{b}	21.86^{b}
T5	11.30^{a}	26.73^{a}	28.00^{a}
T6	11.43^{a}	26.86^{a}	28.53 ^{a}
T7	4.90^{c}	12.66^{d}	19.00^{c}
CD 0.05%	0.607	1.14	1.353

*Here T1; Control, T2; soil + forest debris 0.5 Kg/m^2 + poultry manure 0.5 Kg/m^2 + pig manure 0.5 Kg/m^2, T3; Soil + poultry manure 1 Kg/m^2, T4; Soil + forest debris 0.5 Kg/m^2 + poultry manure 1 Kg/m^2, T5; Soil + pig manure 1 Kg/m^2, T6; Soil + forest debris 0.5 Kg/m^2 + pig manure 1 Kg/m^2, T7; Soil + ½ kg forest debris.

Table 2. Effect of different organic manure on number of Days to 1st Bud initiation, 1st flowering, 50% flowering and 100% flowering in dog flower *(Antirrhinum majus*).

Treatment No.	No. of days to 1st bud initiation	No. of days to 1st flower opening	No. of days to 50% flowering	No. of days to 100% flowering
T1	83.00^{a}	91.00^{a}	102.66 ^{a}	118.00^{a}
T2	71.33^{c}	79. 66^{c}	88.00^{b}	99. 66^{b}
T3	75.33^{b}	84.00^{b}	88.66^{b}	99.00^{b}
T4	68.00^{d}	77.33^{d}	84.00^{c}	96. 66^{c}
T5	60.00^{e}	72. 66^{e}	80.33^{d}	92. 66^{d}
T6	59.33^{e}	72.33	80.33^{d}	92. 33^{d}
T7	81.33^{a}	90.66^{a}	101.66^{a}	117.00^{a}
CD 0.05%	2.28	1.700	2.07	1.46

*Here T1; control, T2; soil + forest debris 0.5 Kg/m^2 + poultry manure 0.5 Kg/m^2 + pig manure 0.5 Kg/m^2, T3; soil + poultry manure 1 Kg/m^2, T4; soil + forest debris 0.5 Kg/m^2 + poultry manure 1 Kg/m^2, T5; soil + pig manure 1 Kg/m^2, T6; soil + forest debris 0.5 Kg/m^2 + pig manure 1 Kg/m^2, T7; soil + ½ kg forest debris.

days to first bud initiation, first bud opening, first flowering, 50% flowering, 100% flowering were recorded in treatment, where the soil was enriched with 0.5 Kg/m^2 of forest debris and 1 Kg/m^2 pig manure and was found to be statistically at par with T5, where the soil was enriched with 1 Kg/m^2 pig manure. This could be because organic manure provides essential nutrients, allowing for rapid sucrose export to the shoots, which has a positive impact on spike emergence, flower bud initiation, and flower bud opening. Kuppuswamy *et al*., (1992) reported that the earliness of flowering could be attributed to faster enhancement of vegetative growth, and storing sufficient food material for differentiation of bud into flower bud. Lahav *et al*. (1973) observed that heavy manuring enhanced growth that resulted into hasten the flowering. Renuka and Sankar (2001) also observed earliness of flowering in tomato with the application of organic manure. This might be due to the balanced supply of nutrients through organic sources that promotes the translocation of phytohormones to the shoots (Marchner, 1983).

Conclusion

The results of the present investigation entitled "Effect of organic manure on growth and flowering attributes of dog flower (*Antirrhinum majus*) revealed that application of forest debris 0.5 kg/m^2 + 1 kg/m^2 pig manure performed better than all the other treatment which resulted in highest values for plant height, number of shoots, number of spikes, number of buds per spike, and spike length number of leaves, leaf length and width. The treatment was also found positive for early flower bud initiation and opening of flower. Therefore, from the present investigation, it was concluded that for the sustainable crop production of dog flower (*Antirrhinum majus)* as cut flower production under open field condition in Phek, Nagaland, the soil should be supplemented with locally available forest debris@ 0.5kg/m^2 and pig manure@1kg/m^2 and are recommended to the farmers to grow healthy plant and thereby produce higher yield of dog flower (*Antirrhinum majus*) to meet the needs of the consumers and improve the farmers economic growth.

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