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# Effect of Different Growing Media on the Growth and Development of Dahlia (*Dahlia pinnata*) Under the Agro-Climatic Condition of Dera Ismail Khan

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**Abstract:** An experiment was conducted to investigate the effect of different growing media on the growth and development of Dahlia (*Dahlia pinnata*). Seven different growing media including sand, silt, leaf mold, sand + silt, sand + leaf mold, silt + leaf mold and sand + silt + leaf mold, were used to check the growth and development of dahlia in pots. The over all best performance was recorded in media sand + silt + leaf mold for almost all the parameters; plant height (42.08 cm), stem thickness (1.93 cm), number of branches per plant (3.6), minimum days to flowering (91.66), number of flowers per plant (10.6), number of petals per flower (13), diameter of flower (8.8 cm) and vase life of flower (5 days). The media leaf mold alone also performed significantly well for all the parameters including the maximum 42.55 leaves per plant. Sand, when used alone as a growing medium showed the least response and provided unsatisfactory results for all the parameters.

**Key words:** Dahlia (*Dahlia pinnata*), growing media, growth, development

## INTRODUCTION

Dahlia (*Dahlia pinnata*) is one of the most popular winter flowering plant belonging to family Compositae. It is a very attractive ornamental plant, usually grown at borders. They are tender perennials also treated as annuals, consisting of hundreds of cultivars. There are many flower colors, except blue. Many types are grown from seeds but the prominent cultivars are propagated by stem cuttings or by division of the tuberous roots (Larson, 1980). It requires sandy loam or loam soils, moderately fertile with good water holding capacity and with pH ranging for 7.0 to 8.0 for better production of dahlia.

The survival of the plant usually depends upon the favorable environmental factors, Growing media is one of the most important factors required for the survival and production of dahlia flower, because it not only supports the plant but also provides moisture and mineral nutrient to it. On the importance of the media, some previous work has been done as; Ahmad (1989) found that the mixture of leaf mold, garden soil and sand resulted in early flowering and the number of flowers was highest, in rose. Aquila and Pasini (1989) observed maximum plant height and number of leaves in *Diffenbachia* plants when planted in leaf mold medium. Khan and Khan (1991) reported that the bulb of Dahlia was best developed in the leaf mold or house waste compost. Tahir *et al.* (1997) reported that *Lagerstroemia speciosa* showed maximum shoot length (99.94 cm), number of leaves (42.95), number of first grade roots (20.86), second grade roots (251.86) and third grade roots (686.33), shoot thickness (0.62 cm), stem weight (40.85 g), shoot weight (25.32 g), weight of first grade (4.84 g) and second grade roots (1.55 g) in media containing sand + silt + sawdust. Subhanullah *et al.* (1995) found that in *Tecoma grandiflora,* maximum number of roots per plant (10.58) and root length (13.18 cm) were observed in sand + clay + silt + sawdust. The root thickness (0.754 cm) and root weight (25.4 g) were maximum in sand + silt + sawdust. First grade and other grade root ratio was maximum (2.76) in medium clay + sawdust and minimum (1.60) in sand + clay + sawdust. Mahros (1999) observed that bulbs grown in clay soil recorded the earliest sprouting and flowering, they produced the highest yields of flowering stalks and bulbs and had the best quality inflorescence. Meanwhile, the clay + sand medium produced the longest and heaviest stems. Sreerama *et al.* (1999) reported that root length of chrysanthemum cuttings was significantly greater in cocopeat than in the other media (gravel or soil). Kapoor *et al.* (2000) investigated the effect of different growing media for the propagation of bulb scales of Lilium and reported that number of bulblets/scale, mean diameter and weight of bulblets was significantly higher with vermiculite than with the other treatments. Conte-e-Castro *et al.* (2001) recommended the use of urban waste compost alone for chrysanthemum production. Salim *et al.* (2002) noted earliest sprouting of

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gladiolus corms in 5.33 and 5.66 days in sand and sand + leaf mold and late sprouting of 7.66 days was recorded in clay, silt + clay, clay + leaf mold and leaf mold respectively. Hundred percent sprouting was found in sand, silt, leaf mold, sand + silt, silt + leaf mold and clay + leaf mold, whereas 77.33% sprouting was noted in clay. The lowest plant survival of 77 and 88.6% was found in clay and sand respectively. Earliest flowering (87.33 days) was recorded in sand + silt and latest of 122.7 days in sand. Maximum number of flowers (10.0 per plant) was found in leaf mold, sand + leaf mold, silt + leaf mold while least number of flowers (7.33) was observed in sand. Maximum flowering size of 8.43 cm was observed in sand + leaf mold and least of 6.06 cm in clay. Naz *et al.* (2006b) reported that the over all performance of phlox was better in media sand + silt + leaf mold for plant height (30.00 cm), number of branches per plant (3.6), minimum days to flowering (60), number of flowers per plant (10.6) and vase life of flower (3 days). Leaf mold alone also performed significantly well for all the parameters including the maximum 42.55 leaves per plant. Whereas, when sand was used as growing media it performed very badly.

Keeping in view the importance of growing media, the present study was conducted to observe the most appropriate growing media for this important ornamental plant.

## MATERIALS AND METHODS

The experiment was conducted at Department of Horticulture, Faculty of Agriculture, Gomal University. The experiment was laid out in Randomized Complete Design (RCD) with three replications. The seeds were sown on 15$^{th}$ October 2005 into module trays containing sand and garden soil (3:1) v/v and were kept at room temperature for 4 weeks until the seedling attain a height of about 4 cm. Seedlings were transplanted in the pots containing the following different growing media.

$T_1$ = Sand, $T_2$ = Silt, $T_3$ = Leaf mold, $T_4$ = Sand + Silt, $T_5$ = Leaf mold + Sand, $T_6$ = Leaf mold + Silt and $T_7$ = Leaf mold + Silt + Sand.

Regular cultural practices i.e. irrigation, hoeing and weeding were done throughout the growing season. The data was recorded for plant height (cm), stem thickness (cm), number of branches per plant, number of leaves per plant, days to flowering, number of flowers per plant, number of petals per flower, diameter of flower (cm), vase life of flowers (days). The data of all the above mentioned parameters were individually subjected to the analysis of variance technique (Steel and Torrie, 1980). Subsequently, the significant means were separated by the Least Significant Difference Test by using the MSTATC computer program.

## RESULTS AND DISCUSSION

**Plant height (cm):** The data showed that different growing media had a significant effect on the dahlia plant height (Table 1). The maximum plant height (42.08 cm) was recorded in $T_7$ (sand + silt + leaf mold) followed by (36.41 cm) in $T_6$ (silt + leaf mold) and (36.19 cm) in $T_3$ (leaf mold). All these treatments showed a non-significant behaviour against each other and were statistically at par. While, the minimum plant height (13.03 cm) was observed in $T_1$ (Sand). Similar results were reported by Naz *et al.* (2006b) who stated that an average of 30 cm high plant in *Phlox drummondi* was achieved when a combination of sand + silt + leaf mold was used as growing media.

**Stem thickness (cm):** The data on stem thickness is depicted in Table 1. The different growing media have significantly affected the stem thickness, as $T_7$ (Sand + silt + leaf mold) has produced the maximize stem thickness (1.93 cm) followed by statistically similar stem thickness (1.86 cm) in $T_6$ (silt + leaf mold). Good stem thickness (1.14, 1.16 and 1.06 cm) was also reported in $T_5$ (sand + leaf mold), $T_4$ (sand + silt) and $T_3$ (leaf mold), respectively. While, the least stem thickness (0.66 cm) was observed in $T_1$ (sand). Tahir *et al.* (1997) also reported that sand + silt + clay (1:1:1) had a significant effect on the shoot thickness of stem cuttings of *Lagerstroemia*.

**Number of branches/plant:** More branches per plant (3.6) were observed in $T_7$ (sand + silt + leaf mold) followed by statistically similar number of branches per plant (3) in $T_6$ (silt + leaf mold) as shown in Table 1. Statistically similar results were observed in $T_5$ (sand + leaf mold), $T_3$ (leaf mold) and $T_4$ (sand + silt) with 2.6, 2.6 and 2.3 branches per plant. The minimum (2) branches were observed in both $T_1$ (sand) and $T_2$ (silt). Present findings get support from the work done by Naz *et al.* (2006b) who also

Table 1: Effect of different growing media on the plant height (cm), stem thickness (cm), number of branches per plant, number of leaves per plant and days taken to flowering of Dahlia pinnata

| Treatments | Plant height (cm) | Stem thickness (cm) | No. of branches/ plant | No. of leaves/ plant | Days taken to flowering |
|---|---|---|---|---|---|
| $T_1$ | 13.03cd | 0.66d | 2.00c | 8.52d | 125.00a |
| $T_2$ | 16.16c | 0.96cd | 2.00c | 15.05cd | 123.66ab |
| $T_3$ | 36.19ab | 1.06c | 2.60b | 42.55a | 101.66c |
| $T_4$ | 15.49cd | 1.16bc | 2.30bc | 18.49c | 119.66ab |
| $T_5$ | 31.61b | 1.46b | 2.60b | 33.62bc | 111.33bc |
| $T_6$ | 36.41ab | 1.86ab | 3.00ab | 33.81bc | 103.70c |
| $T_7$ | 42.08a | 1.93a | 3.60a | 34.02b | 91.66d |
| LSD | 8.16 | 0.42 | 0.82 | 4.75 | 6.80 |

Mean followed by different letter(s) shows significant result at 5% level of significance. $T_1$ = Sand, $T_2$ = Silt, $T_3$ = Leaf mold, $T_4$ = Sand + silt, $T_5$ = Leaf mold + sand, $T_6$ = Leaf mold + silt and $T_7$ = Leaf mold + silt + sand

reported that the highest number of branches in *Phlox drummondi* plant was obtained, when a growing media containing sand + silt + leaf mold was used.

**Number of leaves per plant:** Significantly more (42.55) leaves per plant were produced by the plants growing in $T_3$ (leaf mold) followed by $T_7$ (sand + silt + leaf mold), $T_6$ (silt + leaf mold) and $T_5$ (sand + leaf mold) with 34.02, 33.81 and 33.62 leaves per plant, respectively. The sand ($T_1$) produced the least (8.52) leaves per plant. Naz *et al.* (2006a) also reported that leaf mold has increased the number of leaves in *Antirrhinum majus.* These results show that the combination of sand + silt + leaf mold had a very profound effect on the vegetative growth of the Dahlia plant, due to the presence of high nutrients, compactness and more water availibilty to the plant at the root zone.

**Days taken to flowering:** Days taken to flowering were significantly affected by different growing media. Plants took more time to flower where the nutrients availability was restricted i.e. $T_1$ (sand), $T_2$ (silt) and $T_4$ (sand + silt) with 125.00, 123.66 and 119.66 days to flower, respectively. On the other hand, plants grown in nutrient enriched media took less time to flower i.e. 91.66 and 101.66 days to flowering in $T_7$ (sand + silt + leaf mold) and $T_3$ (leaf mold), respectively. Present results are in agreement with Ahmad (1989) who found that the mixture of leaf mold, garden soil and sand resulted in early flowering in rose.

**Number of flowers per plant:** Flowering is a complex process in plant's life for which the plants requires optimum growth and nutrients and thus the media containing more nutrients produced higher number of flowers. More flowers per plant (10.7) were counted in $T_7$ (Sand + silt + leaf mold) followed by 9.6 and 9 flowers per plant in $T_6$ (silt + leaf mold) and $T_5$ (sand + leaf mold), respectively. $T_1$ (sand), $T_2$ (silt) and $T_4$ (sand + silt) showed poor results by giving only 1 flower/plant. Leaf mold alone was better in performance, in which the plants produced 6 flowers per plant. The similar results were observed by Ahmad (1989) who reported that the number of flowers was highest for roses grown in the mixture of leaf mold, garden soil and sand.

**Number of petals per flower:** Number of petals/flower is genetic character of a plant, varies from cultivar to cultivar and is used for the identification of specific cultivar. But, different growing media significantly affected number of petals per flowers, as the media containing optimum nutrient availability showed better results. Maximum petals (13) per flower were counted in $T_7$ (sand + silt + leaf mold) followed by 11.0, 10.6 and 10 petals per flower in $T_3$ (Leaf mold), $T_6$ (silt + leaf mold) and $T_5$ (sand + leaf mold), respectively, as shown in Table 2. Whereas, the minimum (8.0) petals per flower were observed in $T_1$ (sand).

Table 2: Effect of different growing media on the number of flowers per plant, number of petals per flower, diameter of the flower (cm) and vase life of flower (days) of Dahlia pinnata

| Treatments | No. of flowers/plant | No. of petals per flower | Diameter of flower (cm) | Vase life of flower (days) |
|---|---|---|---|---|
| $T_1$ | 1.00d | 8.00cd | 4.60e | 2.00c |
| $T_2$ | 1.00d | 8.60c | 5.10de | 4.00b |
| $T_3$ | 6.00c | 11.00b | 5.50d | 4.60ab |
| $T_4$ | 1.00d | 8.30cd | 5.40de | 3.30bc |
| $T_5$ | 9.00b | 10.00bc | 6.60c | 4.60ab |
| $T_6$ | 9.60ab | 10.60bc | 7.80b | 4.30ab |
| $T_7$ | 10.70a | 13.00a | 8.80a | 5.00a |
| LSD | 1.65 | 1.72 | 0.65 | 0.79 |

Mean followed by different letter(s) shows significant result at 5% level of significance. $T_1$ = Sand, $T_2$ = Silt, $T_3$ = Leaf mold, $T_4$ = Sand + silt, $T_5$ = Leaf mold + sand, $T_6$ = Leaf mold + silt $T_7$ = Leaf mold + silt + sand

**Diameter of flower (cm):** Data regarding diameter of flower showed that maximum diameter of flower (8.8 cm) was noted in $T_7$ (sand + silt + leaf mold) followed by 7.8 and 6.6 cm flower diameter observed in $T_6$ (silt + leaf mold) and $T_5$ (sand + leaf mold), respectively. The minimum flower diameter (4.6 cm) was reported in $T_1$ (Sand). As the sand has lower water holding capacity and is deficient in many nutrients, thus these factors could be responsible for least diameter of flower and vice versa.

**Vase life of flower (days):** This parameter is related to post-harvest handling of cut flowers. This is one of the most important commercial aspects of dahlia production. Significantly longer vase life (5) was counted for the plants grown in $T_7$ (sand + silt + leaf mold). Statistically similar results were reported for $T_3$ (Leaf mold), $T_5$ (sand + leaf mold), $T_6$ (Silt + leaf mold) and $T_2$ (Silt) with 4.6, 4.6, 4.3 and 4.0 days, respectively. The minimum (2.0) vase life was recorded for the plants grown in $T_1$ (sand). Naz *et al.* (2006b) also reported similar results by stating that the combination of Sand + Silt and Leaf mold had eventually increased the flower vase life of *Phlox drummondi.*

## CONCLUSIONS

The following conclusion is made on finding of this research project:

- The plants grown in media (sand + silt + leaf mold) were proved superior in all the growth and developmental parameters studied such as plant height, stem thickness, number of branches per plant, number of flowers per plant, number of petals per flower, diameter and vase life of the flower.

- Plant growth and developmental parameters were minimal when sand, or silt alone were used as the growing media, as they were deficient in plant nutrients.

As the data is recorded on one year research trail, therefore, it is recommended that for the confirmation of the results, this trial should be repeated at least for another year

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