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Research Article

EFFECT OF POTTING MEDIA ON GROWTH, FLOWERING AND BULB PRODUCTION OF HIPPEASTRUM (H*ippeastrum hybridum* Hort.)

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Abstract

A pot experiment was conducted at the Horticulture Research Farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur-1706, during the period from March, 2008 to May, 2009 to investigate the suitable potting media for flower and bulb production of hippeastrum. The potting media containing a mixture of rice husk and cowdung at the ratio of 1:1 supplemented with 10 g per pot (30 cm) each of TSP and MP was found to be the best for bigger size of flower (14.20 x 13.70 cm) and flower scape (44.40 x 27.30 cm), the highest number (7.4) and weight (252.5 g) of bulblets, the maximum diameter (76.0 mm) and weight (218.4 g) of mother bulb and total bulb yield (470.9 g) of hippeastrum. But the maximum number (3.8) of flower per scape and the longest flowering duration (11.60 days) were obtained from the potting media containing a mixture of soil, rice husk, cowdung and coirdust in 1:1:1:1 ratio supplemented with 10 g each of TSP and MP.

Key words: Hippeastrum; potting media; flower and bulb yield.

Introduction

Hippeastrum (*Hippeastrum hybridum* Hort.) are the most eye catching and decorative flowering plants and its popularity is not only for their outstanding aesthetic beauty but also their bright prospect for marketing as cut flower and potted plant in every big and small city in Bangladesh. The cut flowers of hippeastrum are used for various purposes in our daily life, like social function, interior decoration, wedding parties and self-adornment.

The flower growers of Bangladesh are now cultivating the traditional flower crops, which do not give them high return. Recently as the commercial cultivation of cut flowers have a good potential, introduction and popularization of large-flowered hippeastrum gains importance.

It is grown mainly as a pot plant in the home or as a cut flower in greenhouses. The city dwellers can easily grow hippeastrum plants on the rooftop for decoration of their residence, offices or in different occasion venues temporary or permanently by pot culturing.

Hippeastrum needs optimum media for their proper growth and flowering in pot culture. To culture hippeastrum in pot well decomposed cow dung, rice husk, coir dust and good loamy soil can be used which are easily available everywhere in the country with little or no cost. Hippeastrum grows well in either clay or plastic pots but those in clay pots may need to be watered more frequently than those in plastic pot. Considering the facts, the study was undertaken to evaluate the effect of different potting media on growth, flowering and bulb production of hippeastrum and to identify the suitable potting media other than soil alone for successful production of hippeastrum.

Materials and Methods

A pot experiment was conducted at the Horticulture Research Farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur-1706, during the period from March, 2008 to May, 2009. The study was carried out in a sub-tropical climate characterized by heavy rainfall during the period from July to September and scanty rainfall during the period from October to March. The mean annual rainfall of the area is about 2200 mm of which 78 to 92% occurs during April to September (Karim and Egashira, 1994). The mean maximum air temperature varies between 19.9^{0}C in January to 31.3^{0}C in May and the minimum air temperature ranges from 17.6^{0}C in January to 28.6^{0}C in April.

The pot were prepared with sandy loam soil, rice husk, cow dung and coir dust which were used together and

individually. All the mixtures were made on a volume/volume basis. The size of the pots used in this experiment was 30 cm. The potting media were made available two months before planting of bulbs and kept in a shady place covering with polythylene paper. At that time, cow dung, rice husk and coir dust were already decomposed. Watering was done to decompose coir dust and rice husk twice in a week for one month. The pots were washed and cleaned thoroughly before filling up of potting media. Fifteen pots in each treatment for 3 replications were filled with required potting media according to the treatments. At first for filling up the 15 pots of a treatment, required amount of cowdung was placed on a concrete floor. Then the required amount of potting media (for 15 pots) such as rice husk was placed over the layer of cowdung. Then rice husk and cowdung was mixed uniformly with the help of spade. Then the pots were filled with uniformly mixed potting media. In the same way mixing of potting media for other treatments were done and filling of pots were completed. Then the pots were kept for one month for settle down of the composting materials. Water was given twice in a week in each pot for well decomposition of the potting media. Before 15 days of transplanting each pot was supplied with TSP and MP at the rate of 10 g/pot. The fertilizer was well mixed into the potting media with the help of khurpi.

The experiment were comprised of seven treatments viz. T_1 = 100% Sandy loam soil, T_2 = 100% Rice husk, T_3 = 100% Coir dust, T_4 = 50% soil + 50% cowdung (V/V), T_5 = 50% soil + 50% coirdust (V/V), T_6 = 50% rice husk + 50% cowdung (V/V) and T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V). Each of the above treatment was supplemented with TSP and MP at the rate of 10 g per pot (Plate 1 & 2).

The experiment was laid out in a randomized complete block design (RCBD) with 3 replications. One bulb was planted in a pot, containing the potting media according to the treatments and five pots were constituted the unit of treatment. Thus total 105 pots were used for setting the experiment.

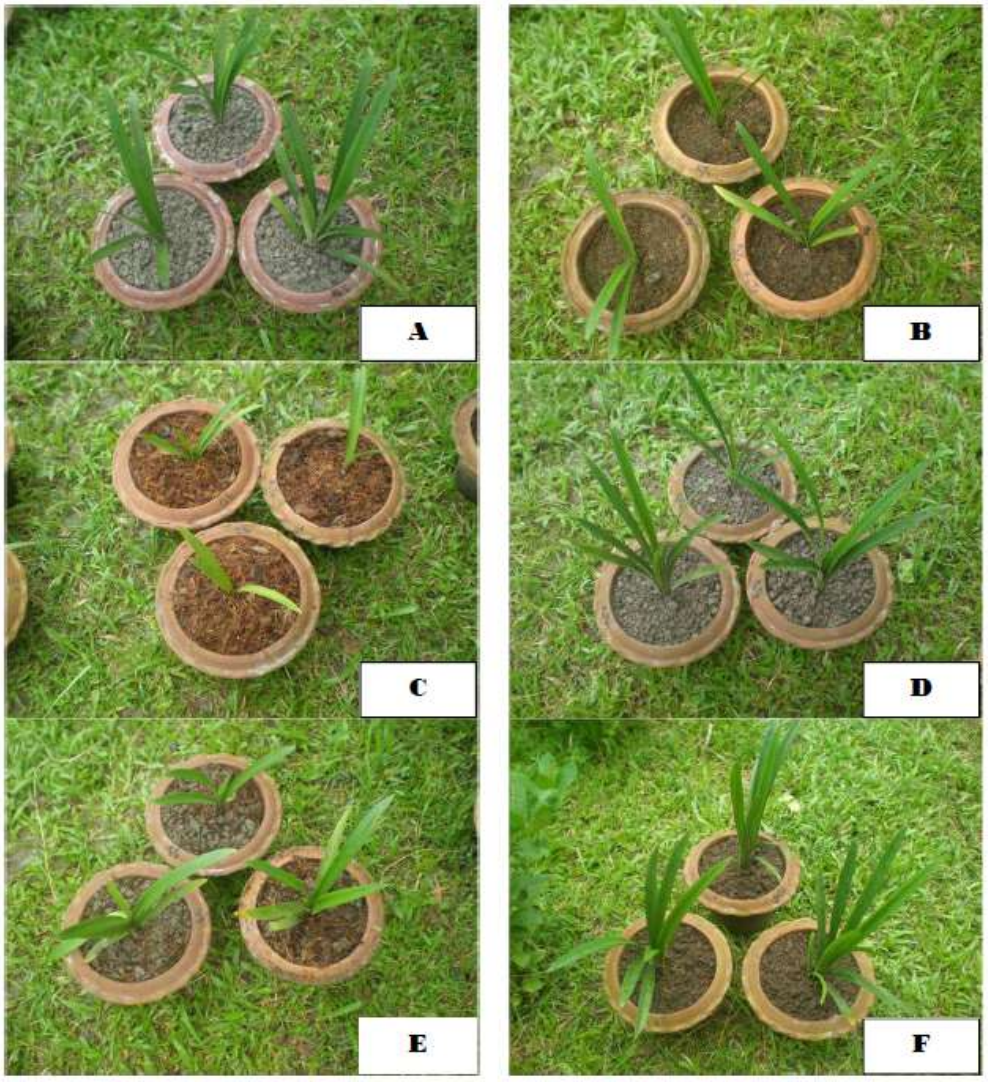

Plate 1: Plants grown in potting media contained (A) 100% sandy loam soil (B) 100% rice husk (C) 100% coir dust (D) 50% soil + 50% cowdung (V/V) (E) 50% soil + 50% coir dust (V/V) and (F) 50% rice husk + 50% cowdung (V/V).

Plate 2: Plants grown in potting media contained (G) 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V) and (H) general view of planted bulb in different potting media.

Uniform sizes (5 cm diameter) of whole bulbs were taken for planting in a pot. The bulbs were planted at 7-10 cm deep in the soil and the soil around it was gently pressed. While planting, the bulbs were usually kept one-third to one-half above soil and only one bulb was planted in a 30 cm pot.Only urea at the rate of 3, 3 and 4 g per pot was applied at 20, 50 and 80 days after planting of bulbs respectively.Weeding was done in the pot whenever it was necessary to keep the pots free from weeds. Hippeastrum plants need frequent watering. The pots were watering at every alternate day to keep the media moistened.Dithan M-45 @ 2 g per liter of water was sprayed once to the plants as protective measures against fungal diseases.

Data were collected on the following parameters for interpretation of the result of the experiment: i) Days to first leaf emergence, ii) Leaves per plant, iii) Plant height, iv) Leaf breadth, v) Plants per pot, vi) Days to flower scape emergence, vii) Days to flower bud appearance, viii) Days to first flower open, ix) Flowers per scape, x) Flower length, xi) Flower diameter, xii) Flower scape length, xiii) Flower scape diameter, xiv) Flowering duration, xv) Bulblets per pot, xvi) Grades of bulblets (by number %) : It was calculated by using following formula

$$\text{Grades of bulblets (\%)} = \frac{\text{Number of grades bulblets per pot}}{\text{Total number of bulblets obtained per pot}} \times 100$$

xvii) Weight of bulblets per pot, xviii) Bulb diameter, xix) Bulb weight and xx) Bulb yield.

The recorded data for different characters were analyzed statistically using MSTAT C program to find out the variation among the treatments by F-test. Treatment means were compared by Duncan's Multiple Range Test (DMRT) for interpretation of results (Gomez and Gomez, 1984). Number of grades bulblets per pot Total number of bulblets obtained per pot

To know the initial nutrient status of the potting media samples were collected randomly from each pot according to the treatments. About 50 g potting media were collected from each pot at a depth of 7.5 cm from the surface and mixed thoroughly and 100 g was taken randomly. The collected sample then air-dried and the soil along with the potting media of each treatment was analyzed followed by standard methods for determination of N, P, K, Ca, Mg, S, Na, and organic C (Appendix 1).

Results and Discussion

All the parameters of vegetative, flowering and bulb characteristics showed highly significant variation among the treatments except number of leaves per plant at 30 DAP and leaf breadth at 30 DAP. The results of the present study have been described and discussed character-wise under the following headings.

Days to First Leaf Emergence

Highly significant variation was observed in days required to first leaf emergence by different potting media (Fig. 1). Days required to first leaf emergence were recorded earlier (10.4 days) in T_1, while T_2 took the longest period (18.4 days) for first leaf emergence. No significant variation was found in T_3, T_4 and T_7. This may be due to high moisture availability in 100% soil media which influenced the physiological activity of bulb that results in first emergence of leaf compare to other potting media. But this result is not similar to Choi-JongJin *et al.* (2002). They conducted an experiment with different potting media of Asiatic hybrid lily (*Lilium sp*.) and found that days to emergence, to visible flower bud and to flowering were not affected by the growing media.

Leaves per Plant

Different potting media had highly significant influence on leaf number at different days after planting (Fig. 2) except 30 and 60 DAP. Numbers of leaves increased gradually with the period up to 180 DAP, and then it was declined. This might be happened due to physiological process of the plant. Up to 180 DAP the plant of hippeastrum continued their vegetative growth, and then they started their reproductive phase which causes senescence of older leaves and ultimately it results in lower number of active leaves per plant. However, the highest leaves (10.60) were obtained from T_6 at 180 DAP which was statistically identical to T_4 and T_7. On the other hand, the lowest number (4.60) of

leaves was produced in T_3 followed by T_2. Similar trend was found in case of leaf number per plant by different potting media at different DAP. The best performance of T_6 might be due to high water holding capacity, good aeration and cation exchange capacity of the media. This result is also supported by the findings of Choi-JongJin *et al.* (2002). They observed that T_6 (composted rice hull + sawdust + pine bark) at 1:1:1 (v/v/v) and T_1 (peat moss + composted rice hull) at 1:1 (v/v) was more appropriate medium for production of the highest number of leaves and fresh weight than all other potting media.

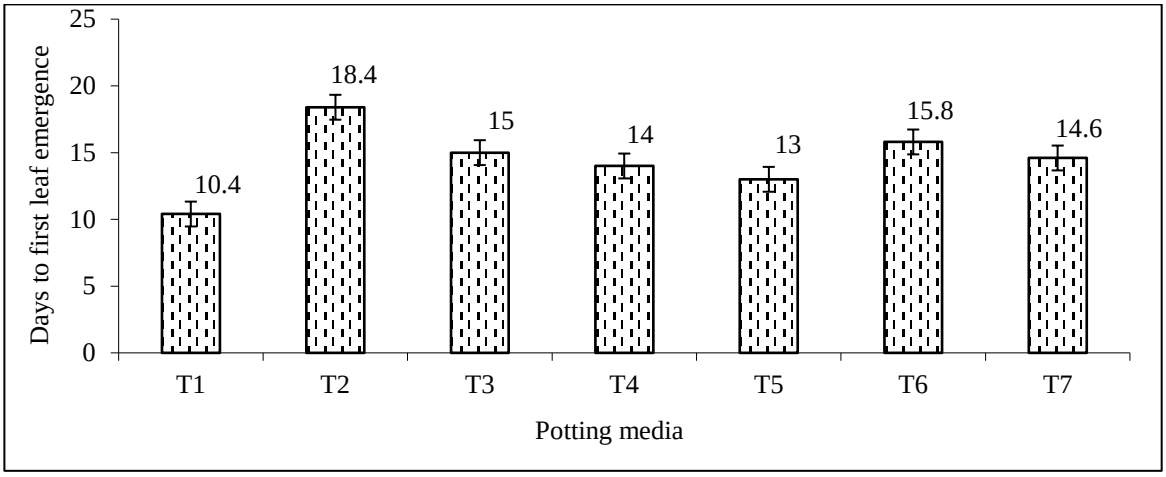

Fig. 1: Effect of different potting media on days required to first leaf emergence of hippeastrum.

Here

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4= 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

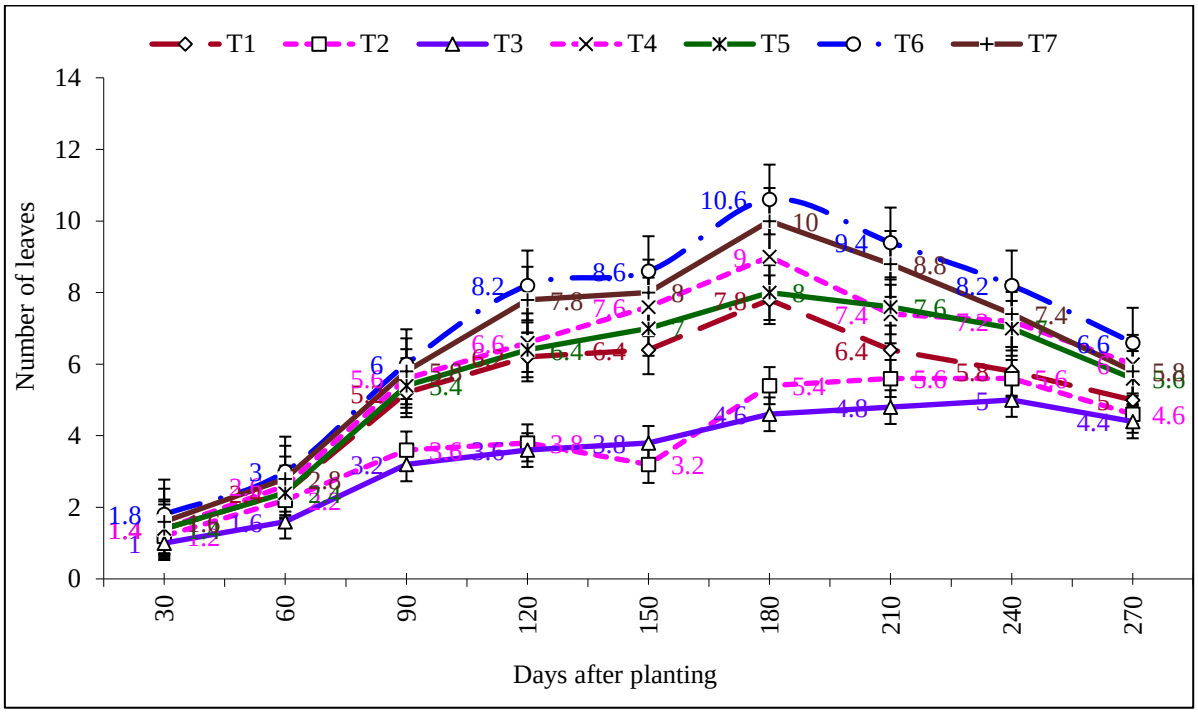

Fig. 2: Effect of potting media on leaves per plant of hippeastrum at different days after planting (DAP).

Here

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4= 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

Plant Height

Highly significant variation in plant height of hippeastrum was recorded due to different potting media (Fig. 3).Like number of leaves, there was a gradual increase in plant height up to 180 DAP and then it was declined. The longest plant (53 cm) was measured in T_6 while the dwarf plant (23.20 cm) was produced in T_3 at 180 DAP. Similar trend was also noted in plant height by different potting media at different DAP. The longest plant might be attributed to the available nutrients especially excess N effect in the potting media contained 50% rice husk + 50% cowdung. This result agrees with the findings of Dash *et al.* (2003). They stated that plant height was maximum when maximum dose of nitrogen and potash was present in the media.

Leaf Breadth

Regarding leaf breadth, a highly significant variation was also noted as influenced by different potting media (Fig. 4). From the Fig. it was observed that leaf breadth gradually increased with the increment of time and it was found maximum (5.38 cm) at 180 DAP in T_6 followed by T_4 and T_7.On the other hand, the narrowest leaf (2.26 cm) was produced in T_3 at 180 DAP which was statistically similar with T_2. Similar trend was also found in leaf breadth by different potting media at different DAP. The broader leaf in T_6 treatment might be associated with availability of essential nutrients especially nitrogen released from rich husk and cowdung.

Plants per Pot

A noticeable variation was found in number of plant per pot by different potting media (Fig.5). Among the potting media, the maximum plants per pot (7.40) were produced in T_6 which was statistically similar with that of T_4 and T_7. Whereas, the minimum plants per pot was obtained from T_3 followed by T_2 and T_1. Similar trend was also observed in number of plants per pot by different potting media at different DAP. It might be due to organic manure such as rich husk and cowdung maintain the desirable water holding capacity, aeration by preventing the crusting and compaction of the potted soil and also released available nutrients which enhanced the production of new plantlets from the mother bulb.

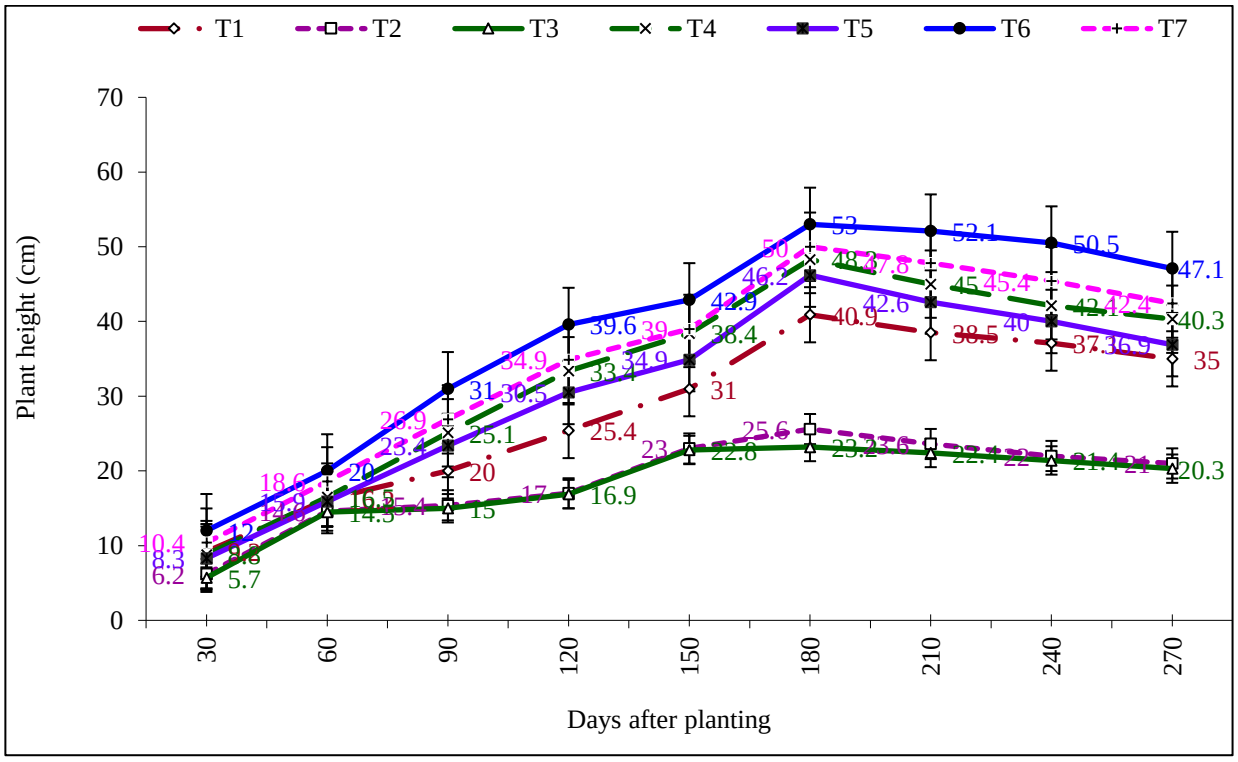

Fig. 3: Effect of potting media on plant height of hippeastrum at different days after planting (DAP).

Here

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4= 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

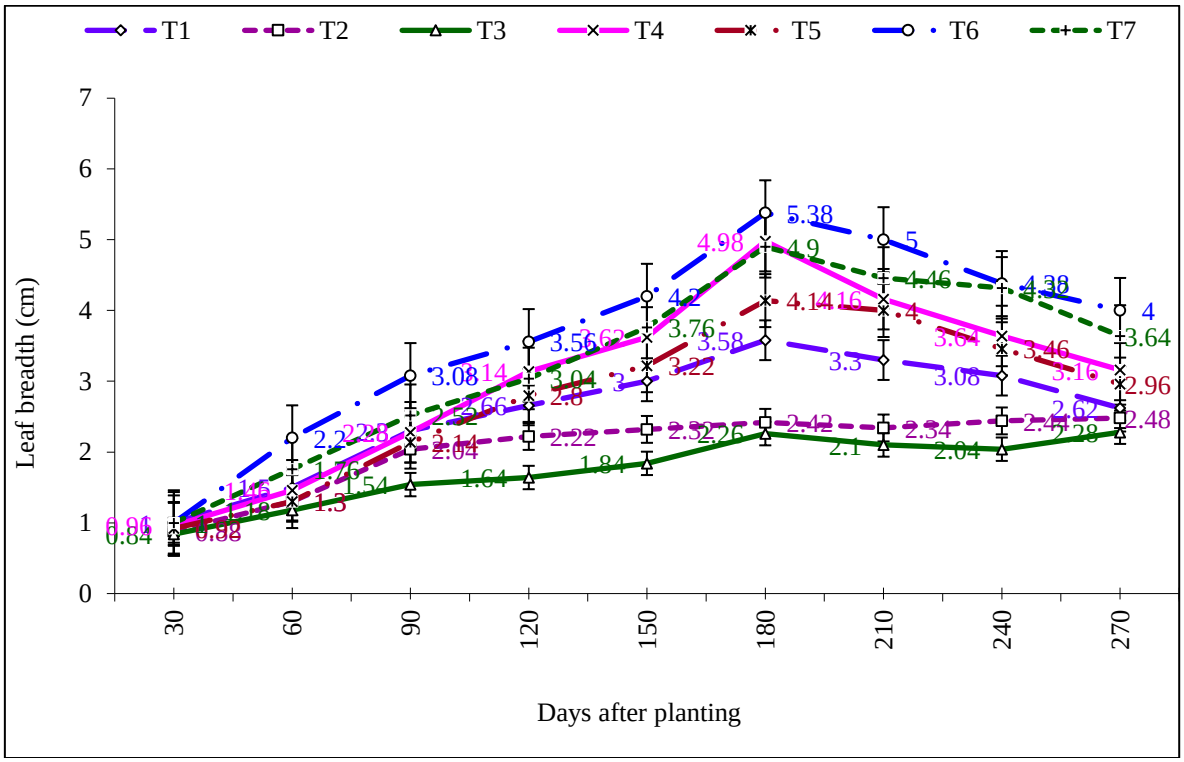

Fig. 4: Effect of potting media on leaf breadth of hippeastrum at different days after planting (DAP).

Here,

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4= 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

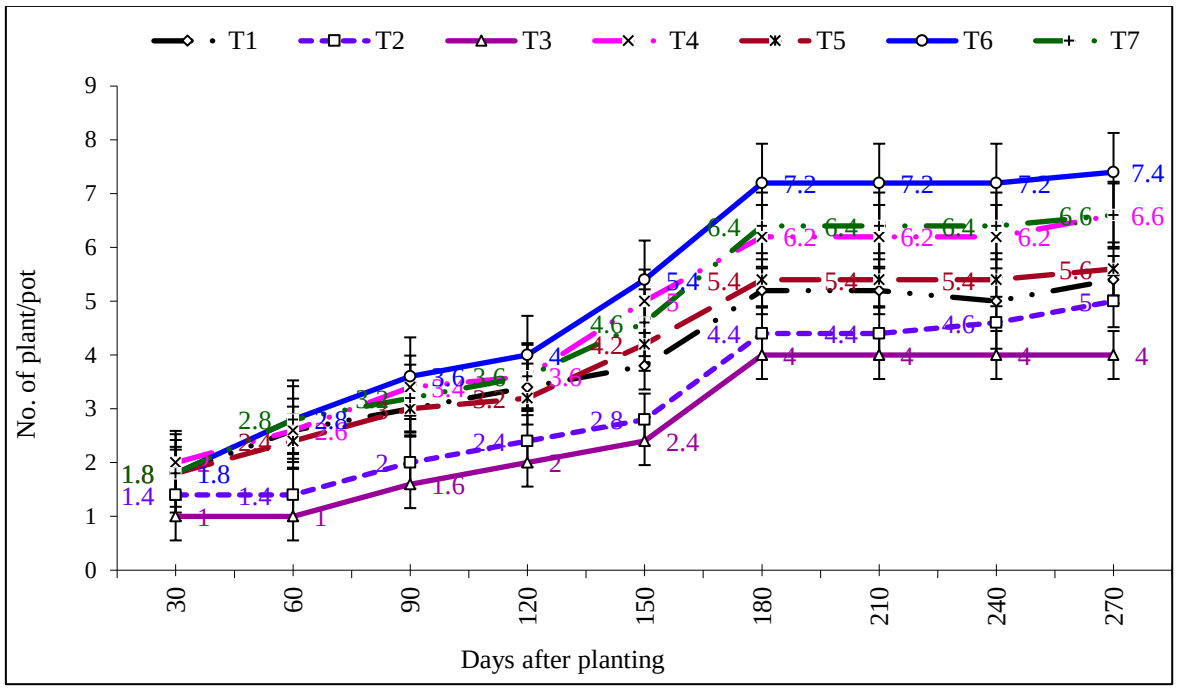

Fig. 5: Effect of potting media on plants per pot of hippeastrum at different days after planting (DAP).

Here,

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4= 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

Days to Flower Scape Emergence

Days required to flower scape emergence varied from 234.4 DAP to 249.0 DAP which was influenced by different potting media (Table 1). From the table, it can be revealed that days required to flower scape emergence was the earliest (234.4 days) in T_7 which was closely followed by T_1. On the other hand, T_5 was found late (249.0 days) for flower scape emergence which was statistically similar to T_6. No flower scape was visualized in T_2 and T_3 potting media during the study period. It might be due to slow decomposition of rich husk and coirdust in T_2 and T_3which ultimately affected the reproductive phase of the potted plant.

Days to Flower Bud Appearance

Highly significant variation was observed in days required to flower bud appearance by different potting media (Table 1). However, the earliest flower bud (260.8 days) was produced by T_7 which were closely followed by T_1 and T_4 while the late (277.2 days) was occurred in T_5. Flower bud was not produced in T_2 and T_3 potting media during the study period. This might be happen due to lack of available nutrients during the vegetative phase of the plant to reach the reproductive phase in time which were the ultimate result of slow decomposition of rich husk and coirdust in the potting media.

Days to First Flower Open

A marked variation was found in days required to first flower open which influenced by different potting media (Table 2). The earliest first flower open (268.8 days) was recorded in T_7 which was statistically similar with that of T_1, T_6 and T_4. The plant grown in T_5 displayed late flowering (283.6 days) for first flower open while no flowers was observed in T_2 and T_3 media. This might be due to slow decomposition of rice husk and coirdust in T_2 and T_3 media respectively that results in less available nutrients to the plants than that of other treatments. On the other hand, T_7 treatment provided sufficient food materials to the plant during the vegetative phase to enter into reproductive phase which enhanced the flowering of the plant.

Flowers per Scape

A significant variation was observed in number of flower per scape which was influenced by different potting media (Table 2). The maximum number of flower per scape (3.8) was obtained from T_6 which was closely followed by T_7. Whereas, the plants grown in T_5 produced the minimum number of flower per scape (2.0) that was followed by T_1 and T_4. This might be due to fact that T_6 released all the available nutrient that help to produced more number of leaves with maximum leaf area compared to other treatments, which might have resulted in production and accumulation of more photosynthates that were diverted to the sink (flower), resulting in more number of flowers per scape.

Table 1: Effect of potting media on some morphological characteristics of hippeastrum

Potting media	Days to flower scape emergence	Days to flower bud appearance
T_1 = 100% soil	238.2 cd	264.2 bc
T_2 = 100% rice husk	0.00 e	.00 d
T_3 = 100% coir dust	0.00 e	.00 d
T_4 = 50% soil + 50% cowdung	242.8 bc	267.2 bc
T_5 = 50% soil + 50% coir dust	249.0 a	277.2 a
T_6 = 50% rice husk + 50% cowdung	246.0 ab	268.4 b
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coirdust	234.4 d	260.8 c
Level of significance	**	**
CV(%)	1.29	1.44

Means having same letter(s) in a column are not significantly different from each other

Table 2: Effect of potting media on flowering of Hippeastrum

Potting media	Days to first flower open	Flowers per scape
T_1 = 100% soil	272.6 b	2.40 c
T_2 = 100% rice husk	0.00 c	0.00 d
T_3 = 100% coir dust	0.00 c	0.00 d
T_4 = 50% soil + 50% cowdung	274.6 b	2.80 bc
T_5 = 50% soil + 50% coir dust	283.6 a	2.00 c
T_6 = 50% rice husk + 50% cowdung	273.4 b	3.80 a
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coirdust	268.8 b	3.60 ab
Level of significance	**	**
CV(%)	1.34	17.66

Means having same letter(s) in a column are not significantly different from each other

Flower Length

Flower length of hippeastrum was also varied significantly by different potting media (Fig. 6).The longest flower (14.2 cm) was obtained from plants grown in T_6 which was statistically identical to T_7. The plants grown in T_1 and T_5 exhibited the shortest flower (12.0 cm) in the experiment. This was in line with the findings of Younis *et al.* (2008) in dahlia.

Flower Diameter

Different potting media showed significant influence in diameter of flower (Fig. 6). From the figure, it can be revealed that the widest flower (13.7 cm) was produced by the plants grown in T_6 which was statistically similar with T_7. On the other hand, the narrowest flower (11.50 cm) was obtained from plants grown in T_1 and T_5. This was due to the fact that in T_6 and T_7 treatments the excess food reserves diverted to only a fewer sinks (flowers) and hence bigger flowers were produced. This result agrees with the finding of Younis *et al.* (2008). They stated that maximum values for height of plant, length of side branches, number of flowers, blooming period, and size of flowers of dahlia were obtained when leaf manure was used.

Flower Scape Length

An appreciable variation was found in length of flower scape of hippeastrum at full bloom which was significantly influenced by different potting media (Fig. 7). However, the longest flower scape (44.40 cm) was measured in T_6 while the plants grown in T_1 and T_5 produced the shortest flower scape (28.00 cm) at full bloom. This might be due to sufficient nitrogen released from T_6 which significantly increased the length of flower scape than other treatment from mother bulb of hippeastrum. The present findings more or less agreed with Bhattacharjee *et al.* (1981). They reported that the increasing levels of N delayed flowering and greatly increased flower spike length, bulb weight, size and number of bulblets/plant.

Flower Scape Diameter

Like length of flower scape, similar trend was also observed in diameter of flower scape of hippeastrum which was affected by different potting media (Fig. 7). However, the widest flower scape (27.30 mm) was obtained in T_6 and the narrowest flower scape (20.88 mm) was recorded in T_1 and T_5. In T_6 treatment, essential plant nutrients were more than other treatments which enhanced the plant growth by accumulating more photosynthates that ultimately accelerated the production of bigger flower scape. This result partially agreed with the findings of Younis *et al.* (2008) in dahlia and Bhattacharjee *et al.* (1981) in tuberose.

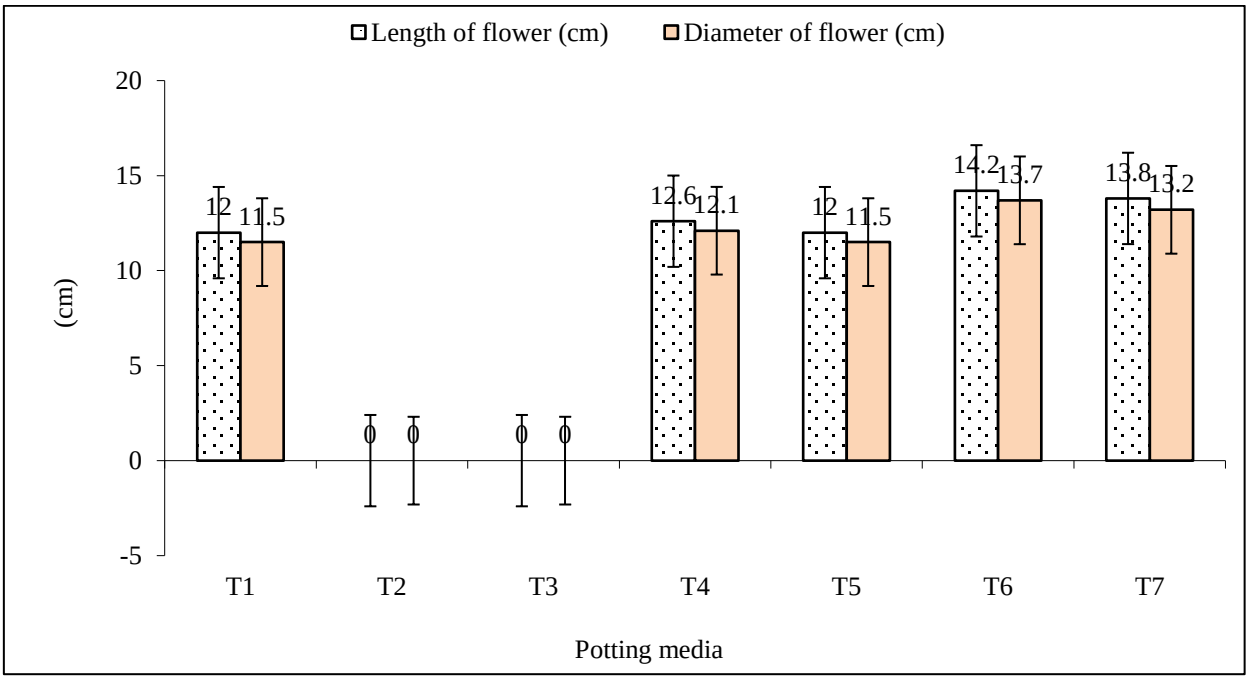

Fig. 6: Effect of different potting media on flower length and diameter of hippeastrum.

Here,

T1 = 100% Sandy loam soil
T2 = 100% Rice husk
T3 = 100% Coir dust
T4= 50% soil + 50% cowdung (V/V)
T5 = 50% soil + 50% coirdust (V/V)
T6 = 50% rice husk + 50% cowdung (V/V)
T7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

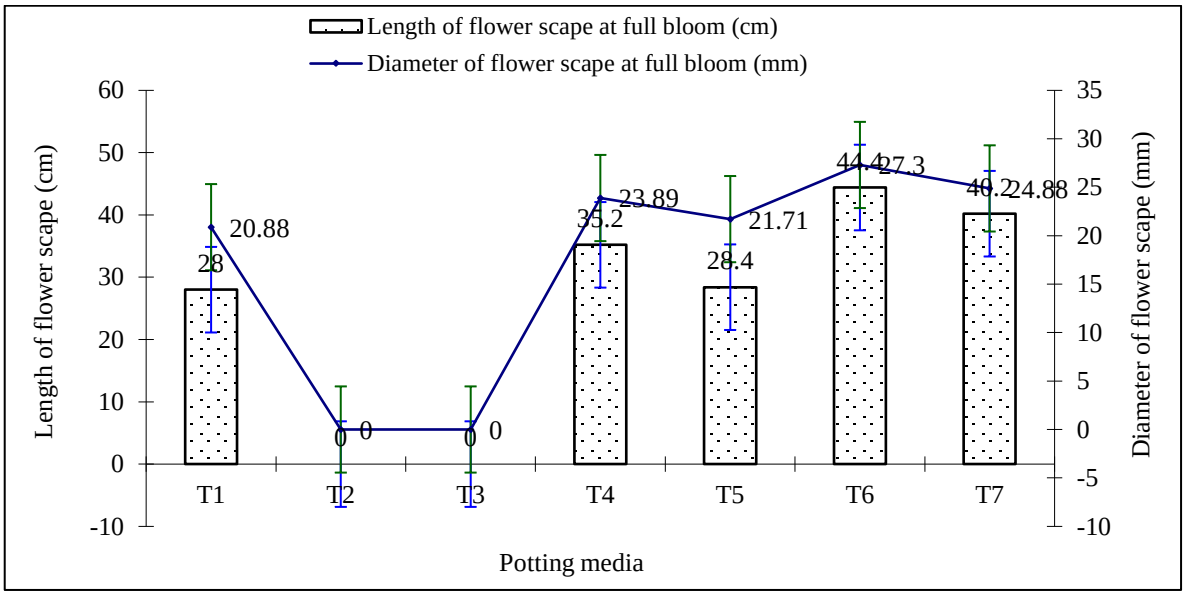

Fig. 7: Effect of different potting media on flower scape length and diameter of hippeastrum at full bloom.

Here,

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4 = 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

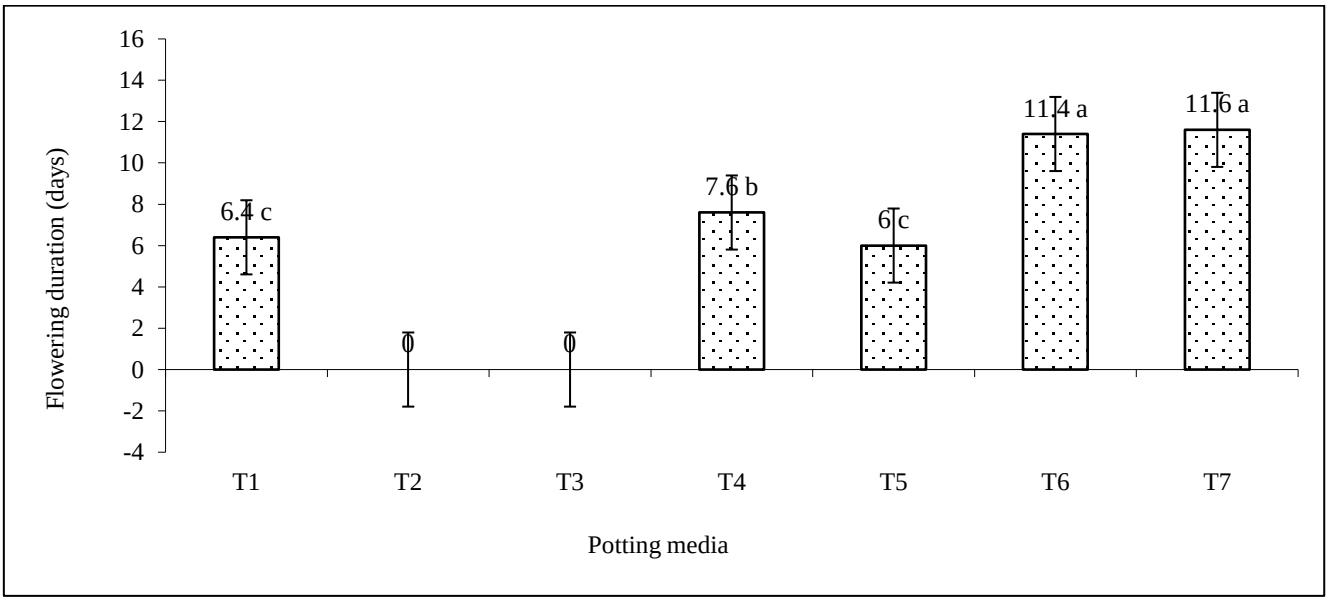

Fig. 8: Effect of different potting media on flowering duration (days) of hippeastrum.

Here,

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4 = 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

Flowering Duration

A marked variation was observed in flowering duration of Hippeastrum which was significantly influenced by different potting media (Fig. 8 and Plate 3). The flowers grown in T_7 and T_6 last for maximum period (11.6 days) while the minimum days (6.00 days) was found in plants grown in T_5 and T_1. The increased flowering duration could be attributed to the conducive conditions in the substrates and higher nutrient uptake and utilization by the plants grown in T_6 and T_7 treatments. The similar findings were also observed by Venezia (1997) in gerbera.

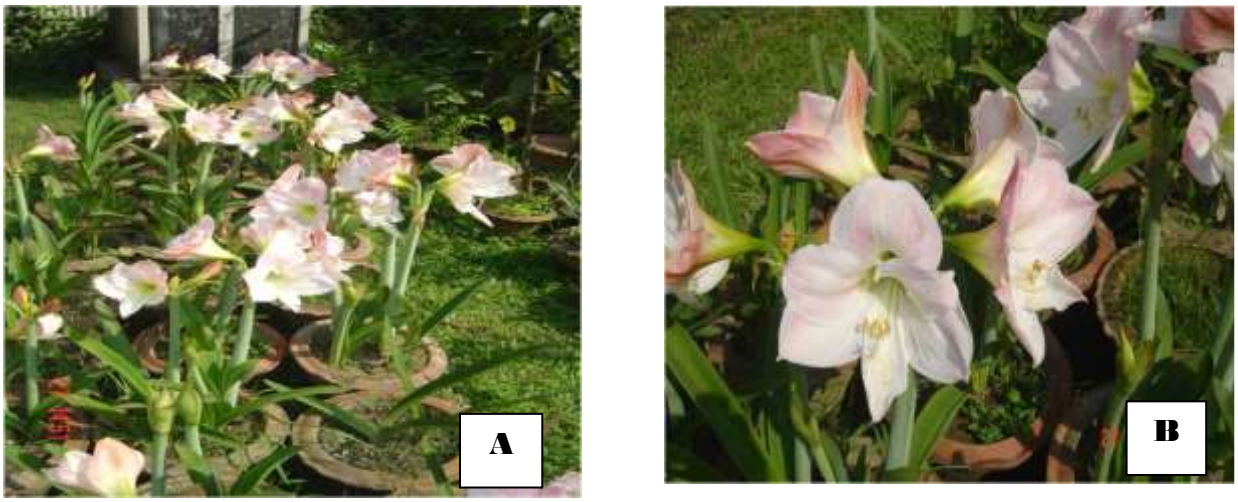

Plate 3: General view of plants that produced flowers in different potting media (A & B).

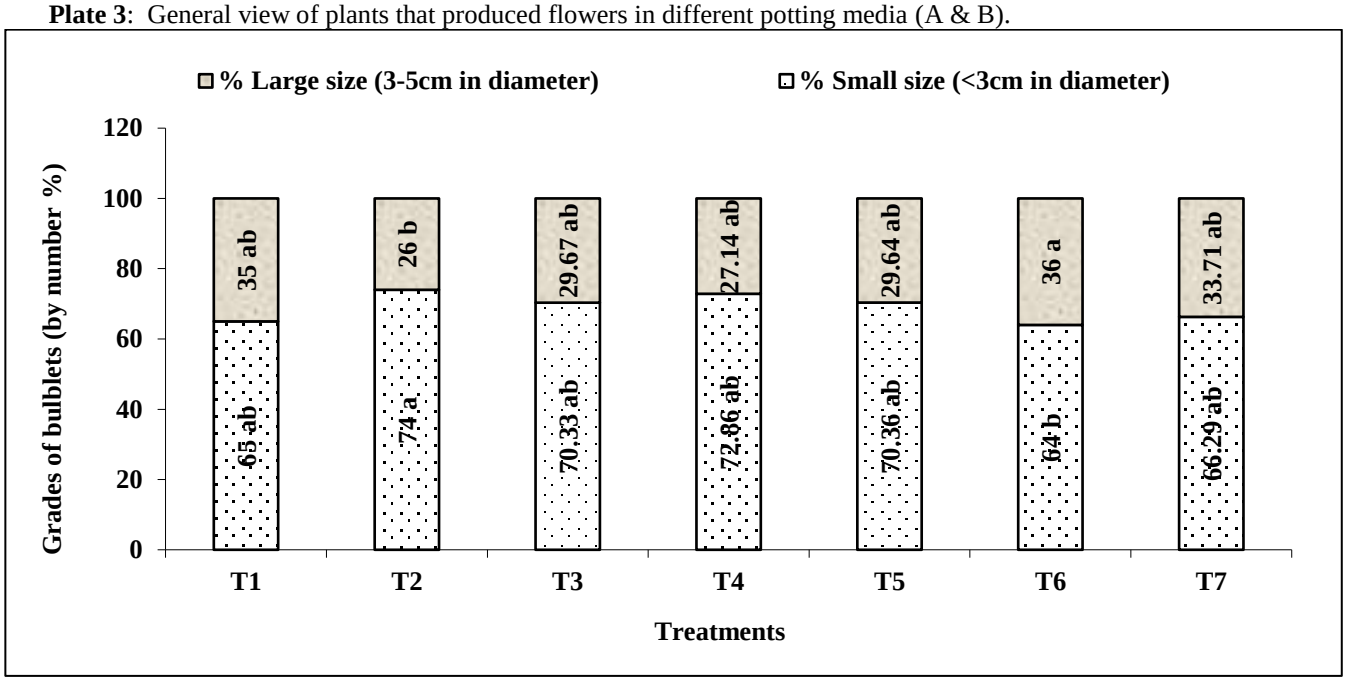

Fig. 9: Percentage of different grades of bulblets by different potting media.

Here,

T_1 = 100% Sandy loam soil
T_2 = 100% Rice husk
T_3 = 100% Coir dust
T_4 = 50% soil + 50% cowdung (V/V)
T_5 = 50% soil + 50% coirdust (V/V)
T_6 = 50% rice husk + 50% cowdung (V/V)
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coir dust (V/V)

Grades of Bulb-lets

Significant variations were observed on percentage of different grades of bulblets among different potting media by number (Fig. 9). The highest percentage (36 %) of large grade bulblets (3-5 cm) was recorded in T_6 due to more available plant nutrients were present than other treatments. But it was statistically similar to all other treatments except T_2. The lowest (26 %) was produced by T_2 that contained rice husk only. Similarly, the highest percentage (74 %) of small grades bulblets (<3 cm) were produced by T_2 which was statistically similar to all other treatments except T_6. The lowest percentage (64%) of small grades bulblets were produced by T_6 treatment.

Bulb-lets per Pot

Number of bulb-lets per pot was influenced significantly by different potting media (Table 3). From the table it can be revealed that the maximum number of bulb-lets per pot (7.4) was obtained from T_6 which was statistically identical to T_4 and T_7. This might be due to that the longest root was recorded by the treatment T_6 and number of roots was also good in this treatment which was able to uptake necessary nutrients. On the other hand, the plants grown in 100% soil (T_1) had the minimum number of bulb-lets (3.0) which was statistically similar to T_3. T_1 showed poor performance regarding bulblets production due to lowest amount of N, P, K and organic carbon present in the potting media which suppressed bulblets production. This result is in partial agreement with Hong-SaeJin *et al.* (2001) who reported that

mulching cultivation with sawdust and reflective film stimulated foliage growth, root growth and bulb production of oriental hybrids lilies in alpine area.

Bulb-lets Weight (g/pot)

A highly significant variation was found in weight of bulb-lets per pot which was influenced by different potting media (Table 3). However, the highest yield of bulb-lets per pot (252.5 g) was noted in T_6 while the plants grown in T_1 gave the lowest yield of bulblets (39.5 g). The maximum yield was obtained from T_6 due to the highest number of bulblets produced by T_6 than other media.

Bulb Diameter

An appreciable variation was recorded in circumference of mother bulb which was significantly influenced by different potting media (Table 3). The heaviest bulb (76.0 mm) was obtained from T_6 which was followed by T_7. Whereas, the lowest value for mother bulb diameter (55.0 mm) was recorded from T_3 which was statistically identical to T_2. Chemical analysis of potting media showed that nitrogen, phosphorus, potassium, organic carbon, calcium, magnesium etc. was higher in T_6 media than other treatments which favoured the production of more photosynthates by the plants that were diverted to the sink (mother bulb), resulting in bigger size of mother bulb. This was in line with the findings of Younis *et al.*, (2008).

Bulb Weight (g/pot)

Weight of mother bulb per pot varied significantly by different potting media (Table 3). From the table, it revealed that the heaviest bulb (218.4 g) was produced by T_6 media. This may be due to available plant nutrients that released from rich husk and cowdung in T_6 media helped in root development and increased the efficiency of manufacturing carbohydrate and also helped to form heavier bulb. On the other hand, the plants grown in T_3 had the lowest value (68.16 g) for mother bulb weight per pot. In T_3 treatment the rate of mineralization of nutrients from coirdust was exceptionally slow due to presence of lignin, cellulose, regin etc. which resist decomposition. So the weight of mother bulb was minimum in T_3 due to lack of sufficient nutrients in the media. Alam and Brahma (2001) and Anwar *et al.* (1998) reported similar results who obtained heavier bulbs using different fertilizers.

Bulb Yield per Pot

Highly significant variation was observed in bulb yield per pot which was influenced by different potting media (Table 3 and Plate 4). However, the maximum weight of bulbs per pot (470.9 g) was obtained from T_6 while the plants grown in T_3 produced the minimum weight of bulbs (114.4 g). The higher yield of bulb with T_6 treatment might be associated with a greater size and weight of bulbs produced by this treatment due to the availability of essential nutrients released from rice husk and cowdung.

Table 3: Effect of potting media on bulb production of hippeastrum

Potting media	Bulblets /pot	Bulblets weight (g/pot)	Mother bulb diameter (mm)	Mother bulb weight (g/pot)	Bulb yield (g/pot)
T_1 = 100% soil	3.00 e	39.50 f	65.00 cd	115.6 e	155.1 e
T_2 = 100% rice husk	4.60 cd	53.66 d	60.00 de	75.62 f	129.3 f
T_3 = 100% coir dust	4.00 de	46.24 e	55.00 e	68.16 g	114.4 g
T_4 = 50% soil + 50% cowdung	6.60 ab	119.9 b	68.00 bc	192.0 c	311.9 c
T_5 = 50% soil + 50% coir dust	5.60 bc	95.92 c	63.60 cd	185.0 d	280.9 d
T_6 = 50% rice husk + 50% cowdung	7.40 a	252.5 a	76.00 a	218.4 a	470.9 a
T_7 = 25% soil + 25% cowdung + 25% rice husk + 25% coirdust	6.00 abc	121.7 b	72.20 ab	203.3 b	324.9 b
Level of significance	**	**	**	**	**
CV(%)	11.32	1.77	3.75	1.50	1.35

Means having same letter(s) in a column are not significantly different from each other

Plate 4: Harvested bulbs from different potting media.

Conclusion

From this experiment it was revealed that all the parameters studied were significantly influenced by different potting media. Plant characteristics like number of leaf at different DAP, leaf length and breadth at different DAP, and plant number at different DAP were found to be the highest in potting media T_6 while T_7 showed earliness in days to flower scape emergence and flower bud appearance. On the other hand, flower characteristics like days to first and second pair of flowers open, days to first and second pair of flowers senescence were observed early in T_5 (50% soil + 50% coirdust) media whereas flower size (length x diameter), flower scape size (length x diameter), and decorative life were found the maximum in potting media T_6 (50% rice husk + 50% cowdung). The potting media T_2 (100% rice husk) and T_3 (100% coir dust) did not produce any flower during the study period. Bulb characteristics like number of bulblets/pot, weight of bulblets/pot, diameter and weight of mother bulbs and total yield of bulbs per pot were also affected by different potting media. However, T_6 (50% rice husk + 50% cowdung) potting media were found the best for all the parameters regarding growth, flower and bulb characteristics of hippeastrum.

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Appendix 1: Initial nutrient status and chemical properties of different potting media

Potting media	Nitro-gen (%)	Phospho-rus (ppm)	Potassium (meq/ 100 g dry soil)	Sodium (meq/ 100 g dry soil)	Calcium (meq/ 100 g dry soil)	Magne-sium (meq/100 g dry soil)	Sulpher (meq/ 100 g dry soil)	Organic carbon (%)
T_1	0.02	2.73 ppm	0.88	2.02	2.84	9.09	2.7	0.74
T_2	0.27	0.04 %	0.73 %	0.08 %	0.12 %	0.08 %	0.08 %	20.92
T_3	0.33	0.13 %	0.51 %	0.06 %	0.06 %	0.07 %	0.03 %	21.88
T_4	0.68	5.37 ppm	1.13	3.98	5.60	18.10	5.34	14.41
T_5	0.35	5.33 ppm	1.02	3.95	5.53	18.07	5.27	11.31
T_6	0.81	0.13 %	0.73 %	0.10 %	0.16 %	0.11 %	0.13 %	14.50
T_7	0.49	10.53 ppm	1.53	7.83	11.00	36.07	10.50	12.91

Here,

T_1 = 100% soil

T_2 = 100% rice husk

T_3 = 100% coir dust

T_4 = 50% soil + 50% cowdung (V/V)

T_5 = 50% soil + 50% coir dust (V/V)

T_6 = 50% rice husk + 50% cowdung (V/V) and

T_7 = 25% soil + 25% cowdung + 25% rice husk + 5% coir dust (V/V).