Peat and Sand Mixes as Plant Growing Media

M. ZAKI MAHDI AND SAMIR SALLAM[1]

ABSTRACT

Sandy soils of Libya are not adequate for the production of high quality ornamental plants. Adding peat moss in different percentages provided better growing media. The recommended mixtures for the plant crops tested were:

I. Coleus hybridus and Jerbera jamesonii
   Peat moss 50% + Sand 50%
II. Dahlia variabilis
   Peat moss 75% + Sand 25%

INTRODUCTION

The high cost and ever increasing scarcity of good soil, when it is available, besides the importance of moisture economy practices in Libya, has prompted the search for some artificial media for producing the best crops available, utilizing coarse sand as a base with peat moss. The use of peat as a source of organic matter for improving the physical conditions of mineral soils is becoming of increasing importance. Peat greatly increases the water-holding capacity of the soil with which it is mixed and thereby increases available moisture supply. Laurie (3) stated that peat, which is somewhat comparable to a sponge, can more rapidly transfer internal moisture by capillarity to the surface where evaporation is most rapid. Sand is needed in potting compost to impart correct physical conditions and good drainage (5). In a mixture of equal parts of sand and peat moss, the maximum moisture-holding capacity is about 48% (2). Mixtures of peat with soil in equal proportions by volume absorbed from 40 to 50% more moisture than the untreated soil in the case of clay loam and as much as 80% in the case of pure quartz sand (3).

Another beneficial characteristic of peat is its ability to reduce the evaporation rate of soil. The mixture of peat and sand retained more moisture than sand alone. Long (4) stated that on a volume bases, peat moss contained over twice as much as air and three times as much moisture as sand, and the production of fine types of root systems is associated with the increase of moisture in the rooting medium, Boodley (1), experimented with African violets, Begonia semperflorens, Chrysanthemums, Geraniums, Impatiens, and Petunias which were grown in different media. He found that no single growing media was best for all the crops grown. Petunias produced excellent growth in any of the media where at least 50% peat moss was used.

[1] *Department of Plant Production, Faculty of Agriculture University of Alfateh, Libya.*

MATERIALS AND METHODS

This experiment was carried out, under greenhouse conditions, at the Agricultural Research Station of The Faculty of Agriculture, Alfateh University, in Tripoli, Libya. Five different soil mixes were used to grow three plant crops. The soil mixes used were:

1.	German peat moss	100%	——	
2.	German peat moss	75%	Coarse grain sand	25%
3.	German peat moss	50%	Coarse grain sand	50%
4.	German peat moss	25%	Coarse grain sand	75%
5.	——		Coarse grain sand	100%

The following plant crops were grown in 15 cm. clay pots:

1. *Coleus hybridus*
2. *Gerbera jamesonii*
3. *Dahlia variabilis*

All plants were grown in a greenhouse, at a minimum temperature of 25°C under reduced light intensity conditions.

Seeds of *Coleus hybridus* were sawn on March 15, 1975 and potted on May 15, 1975. The seeds of *Gerbera jamesonii* and *Dahlia variabilis* were sawn on May 15, 1975 and were potted on June 15, 1975. Germination media was composed of equal parts by volume of coarse sand and peat moss. Seedlings were transplanted into 15-cm clay pots filled with the different soil mixes on the above mentioned dates. Data on Jerbera and Dahlia were recorded after 125 days from seeding, while those of Coleus was taken after 150 days.

Watering and fertilization

Since it was known that the water holding capacity of the mixes used would vary a great deal, it was decided that a uniform quantity of water would be added to each pot. The fact that some pots would be over watered and others not watered enough was considered, but the addition of a uniform quantity of water per pot was felt to be of greater importance. One hundred and fifty millileters of water were added to each pot every other day.

Since all the mixtures contained little or no nutrients, it was necessary to add fertilizers during the experiment. This was done by spraying with 2% of the foliar fertilizer 'Bayfolan'. Feeding began ten days after potting, and was repeated every ten days, for the duration of the experiment. Each of the five treatments was composed of three replicates arranged at random, and each plot was composed of 15 plants. The total number of plants in each treatment was 45 plants.

RESULTS AND DISCUSSION

The results of this study can be discussed on individual crop basis:

I. Coleus hybridus

Seeds of *Coleus hybridus* were sown on March 15, 1975. After 60 days seedlings were transplanted in 15–cm clay pots filled with the various soil mixtures previously described. The plants were grown until August 13, at which time data on plant height, num-

Table 1 Effect of peat and sandy soil mixes on the height, number of leaves, and fresh weights of tops and roots of Coleus hybridus plants.

Soil mixes	Average plant height, in cm.	Average number of leaves	Mean fresh weight, in gm.	
			Top	Root
1. Peat moss 100%	22.96	48.45	94.17	19.53
2. Peat moss 75% + sand 25%	22.58	51.33	91.43	19.10
3. Peat moss 50% + sand 50%	18.70	49.57	78.78	14.55
4. Peat moss 25% + sand 75%	16.97	43.00	53.60	11.60
5. Sand 100%	8.41	29.22	25.00	5.55
L.S.D. 0.05	2.97	9.32	20.48	7.25

ber of leaves, and fresh weights of tops and roots were recorded. Table 1 shows the data for the different soil mixes. Each figure for plant height and number of leaves is the average of 45 plants, while the figure for fresh weight is the average of 15 plants. The results showed that increasing the percentage of peat in the soil mixtures caused an increase in plant height, number of leaves, and fresh weight of both tops and roots. Soil mix '4' containing 25% peat moss, resulted in a significant increase in plant height in comparison with treatment '5', containing 100% sand. It is interesting to note that increasing the percentage of peat from 0 to 25% resulted in doubling of the plant height. The number of leaves per plant was significantly increased by increasing the proportion of peat in the soil mixes. Increasing the peat from 0 to 25%, resulted in an increase of about 48% of the number of leaves per plant, and in doubling of the fresh weight of tops. It was also noticed that increasing the percentage of peat from 25% to 50% did not increase significantly either the plant height or the number of leaves, but did increase significantly the fresh weight of tops, which could be attributed to an increase in the leaf size which is an important characteristic for Coleus. To reach a significant increase in the fresh weight of the root system, the soil should contain 50% peat. This conclusion is mostly based on the nature of the roots of Coleus, which is very fine and fibrous. Such roots reacts favourably in rich organic mixtures and need increased moisture (2,3,4). Taking into consideration the economic aspect, the best growth of Coleus could be achieved by using a media containing peat and sand at a ratio of 1:1.

II. Gerbera jamesonii

The seeds of *Gerbera jamesonii* were sown on May 15, 1975 and were potted on June 15, 1975 in the different soil mixes. The effect of the different levels of peat in soil mixes on the growth of Gerbera was recorded on August 18, 1975 and data are shown in Table 2. The plant height was increased significantly when 25% or more of peat was added to the sandy soil. It was also noted that increasing the peat content to more than 50% did not cause any additional increase in plant height. The number of leaves per plant was also increased when peat was incorporated in the soil mixes. But it was evident that to reach a significant increase, the peat should be raised to at least 75% in the soil mix. The fresh weights of tops and roots were increased significantly when the soil mixes contained 50% of peat. The fresh weights of tops and roots of the plants grown in 100% peat increased significantly over those grown in media containing 50% or

Table 2 Effect of peat and sand soil mixes on the height, number of leaves, and fresh weights of tops and roots of Gerbera jamesonii.

Soil Mixes	Plant height, cm	Number of leaves	Mean fresh weight, gm	
			Top	Root
1. Peat moss 100%	4.11	4.37	5.25	2.87
2. Peat moss 75% + sand 25%	4.11	4.67	3.07	1.77
3. Peat moss 50% + sand 50%	3.88	3.60	1.77	1.68
4. Peat moss 25% + sand 75%	3.43	3.73	1.07	0.63
5. Sand 100%	1.33	2.87	0.20	0.20
L.S.D. 0.05	0.49	0.89	1.18	0.93

75% peat. But looking to the plant growth as a whole, and also to the cost of peat, it was concluded that the media containing equal amounts of peat and sand, should be adequate.

III. Dahlia variabilis

Seeds of *Dahlia variabilis* were sawn on May 15, 1975, seedlings were transplanted to pots filled with different soil mixes on June 15, 1975 and data were recorded on August 18. The information obtained regarding the response of Dahlia to different amounts of peat in soil mixes is illustrated in Table 3. Significant increases in plant height were recorded for every increase in the peat content. But it should be noted that increasing the content of peat to 100% caused a drastic decrease in plant height, in comparison with treatments containing 50% and 75% of peat. The adverse influence of using media with 100% peat could be due to the nature of Dahlia's root system in addition to the rapid rate of evaporation. This conclusion agrees with Laurie (3), who stated that peat moss, which is somewhat comparable to a sponge, can more rapidly transfer internal moisture by capillarity to the surface where evaporation is most rapid. Besides, high quality plants require a sufficient supply of moisture in order that the roots may develop extensively to make use of the nutrients and moisture within the soil (2,3,4,5). The effect of peat incorporation in the soil on the number of leaves per plant followed the same pattern shown with the results on the plant height. Every increase in the amount of peat was reflected by significant increase in the number of leaves as compared with the media void of peat. The largest number of leaves was obtained when

Table 3 Effect of peat and sandy soil mixes on the height, number of leaves, and internode thickness of Dahlia variabilis.

Soil mixes	Plant height cm	Number of leaves	Internode thickness, cm
1. Peat moss 100%	18.43	12.97	0.98
2. Peat moss 75% + sand 25%	27.92	16.37	0.97
3. Peat moss 50% + sand 50%	23.69	13.09	0.68
4. Peat moss 25% + sand 75%	15.03	10.98	0.48
5. Sand 100%	9.49	8.71	0.33
L.S.D. 0.05	3.17	2.11	0.22

the soil mix contained 75% peat. It was felt that the study on Dahlia should include the thickness of the stems, because of the lodging habit of this plant caused by the big size and heavy weight of its flowers. The thicker the stem, the less is the possibility of lodging. The stem thickness was measured at the sixth internode of the main stem. The data showed that the peat content of soil should be raised to 50% in order to achieve significant increases in stem thickness as compared with those grown in soil containing no peat. Comparing the soil mixes containing different amounts of peat, it was noted that the optimum results were achieved with the soil mix containing 75% peat.

From the above discussion, it could be concluded that high quality plants of *Dahlia variabilis* need a soil mix containing 75% of peat moss.

General conclusion

1. All plant crops tested showed poor performance when grown in sandy media containing no peat.
2. The tested crops differed in their requirements of peat percentage in the soil mixture for the production of high quality plants (1).
3. Recommended media for the plant crops tested are:
   a) *Coleus hybridus* Peat moss 50% + Sand 50%.
   b) *Gerbera jamesonii* Peat moss 50% + Sand 50%.
   c) *Dahlia variabilis* Peat moss 75% + Sand 25%.

LITERATURE CITED

1. Boodley, J. W. 1960. Progress report on growing pot and bedding plants in artificial media. New York State Flower Growers, 170:1–4.
2. Hartmann, H. T., and D. E. Kester. 1968 Plant Propagation, Prentice-Hall, Inc., Englewood Cliff, New Jersey.
3. Laurie, A., and V. H. Ries. 1950. Floriculture, Fundamentals and Practices. McGraw-Hill Co., Inc. New York.
4. Long, J. C., The influence of rooting media on the character of roots produced by cuttings, Proc. Amer. Soc. Hort. Sci. 29:352–355, 1933.
5. Wells, J. S. 1974. Plant Propagation Practices, McMillan Co., Inc., New York.