Mixture of Sandy Soil and Arvo-Humus as Improved Media for Geranium Plants

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ABSTRACT

Arvo-Humus is a commercial product made of conifer bark, to which macro- and micro-nutrients were added during processing. Increments ranging from 20% to 80% of Avro-Humus were mixed with sand to achieve a better growing media for geranium plants. Although the most effective increment was 40%, yet economically, a mixture of 20% Arvo-Humus and 80% sand could be recommended, since the beneficial effect of the two treatments on plant height, leaf diameter and fresh weight of tops was almost the same.

INTRODUCTION

The sandy soil used in most of the local nurseries, as growing media, is not satisfactory for the production of high quality ornamental plants.

The incorporation of organic material with sandy soil provides media with better physical conditions, yet because of their low level of nutrients, these mixes are not the ideal media for the propagation of ornamental plants. The John Innes composts were some of the first attempts for solving this problem. Research at California University (7) showed that loam-based composts could vary from very poor to excellent, depending on the properties of the soil used in their formulation. As a result, they recommended the U.C. composts which were based on the standard components of a non-calcareous fine sand and fine peat moss. Many workers (7) have shown that peat was deficient in practically every nutrient required for growth and a complete range of nutrients must be added to it. The rates of application vary according to species and age of plants grown. Seeding and propagation require only a low level of supplementation, while higher amounts are required for growing purposes. Peat has a very high capacity to absorb nutrient elements from solution and hold them in an exchange form for plant use (2,8). Shreded bark, sawdust, and woodshavings of redwood, fir, or pine, as by-products of lumber mills, can serve in soil mixes. These materials serve much the same purpose as peat moss except that their rate of decomposition is slower (4). Lawrence and Newell (5) found that the addition of a certain amount of fertilizer was essential for optimum growth. The presence of superphosphate was essential for the proper development of the young plants and a small amount of calcium was equally essential. Nitrogen should be provided as a steady supply over an extended period. The beneficial effect of micro-nutrients was emphasized by Chew *et al.* (3).

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MATERIALS AND METHODS

This work was conducted under greenhouse conditions, at the Agricultural Experiment Station of the Faculty of Agriculture, University of Alfateh, at Tripoli. The seeds of *Pelargonium zonale*, variety, 'Care Free Deep Salmon' were sown in trays containing 1:1 peat and sand mixture. Fourty two days after seeding, the seedlings were transplanted into 15 cm clay pots containing different media of sand and Arvo-Humus (by volume) as follows:

1. Sand 100% (Control)
2. Sand 80% + Arvo-Humus (A.H.) 20%
3. Sand 60% + Arvo-Humus 40%
4. Sand 40% + Arvo-Humus 60%
5. Sand 20% + Arvo-Humus 80%

The total number of plants used was 225. The layout of the experiment was a randomized complete block design with three replicates and five treatments.

The analysis of the sandy soil used was: 65% sand, 17% silt, 18% clay, and 7.44% $CaCO_3$ (6). The humus used in the mixtures was Arvo-Humus which contains (1) N 4.0%, K 4.0%, P 4.0%, Fe 0.5%, Ca 0.8%, Bor 0.001%, Cu 0.0013%, Mn 0.0067% and Mg 0.049%.

The aim of this work was to test the value of Arvo-Humus incorporated with sand to form a soil mixture for the production of geranium plants of high commercial and ornamental value. Data were recorded 112 days after seed sowing. The characteristics studied were plant height, number of leaves, leaf diameter, and fresh weight of tops. All data were subjected to the analysis of variance method.

RESULTS AND DISCUSSION

Plant height

As shown in Table 1, the addition of 20–60% of Arvo-Humus to the sandy soil, had significantly increased the average plant height. The tallest plants (8.60 cm) were those grown in the soil mix containing 40% Arvo-Humus. The addition of 80% Arvo-Humus to the sandy soil had no significant effect on plant height. There were no significant differences among the Arvo-Humus treatments except those of number 3 and 5 for which highly significant results were recorded. The lowest (5.26 cm) average plant height was that of 80% A.H.

Number of leaves

Increasing the percentage of Arvo-Humus from zero to 20% did not show any significant effect on the number of leaves per plant. But when the Arvo-Humus portion was raised to 40 to 60% of the mixture the increase of the number of leaves was significant. It was also found that increasing the percentage of Arvo-Humus to 80% of the mixture had no significant effect on the number of leaves. All Arvo-Humus treatments gave comparable effects. The largest (7.60) and lowest (5.48) average number of leaves belonged to treatments 4 and 5, respectively.

Leaf diameter

As shown in Table 1, the incorporation of 20, 40 or 60% Arvo-Humus with the sandy soil had significantly increased the average leaf diameter, especially at 40% A.H. for which the average value of leaf diameter was 6.35 cm. On the other hand, no significant increase resulted from the addition of 80% Arvo-Humus to the soil mix, as compared with the control.

Table 1 The effect of Arvo-Humus on the average values of plant height, number of leaves, leaf diameter, and fresh weight of tops of *Pelargonium zonale*.

Soil mixture	Plant height cm	Number of leaves	Leaf diameter cm	Fresh weight of tops g
1. Sand 100% (control)	4.51	4.55	4.27	3.88
2. Sand 80% + A.H. 20%	7.33	6.51	6.13	7.34
3. Sand 60% + A.H. 40%	8.60	7.28	6.35	8.37
4. Sand 40% + A.H. 60%	7.51	7.60	6.09	6.43
5. Sand 20% + A.H. 80%	5.26	5.48	4.20	5.33
LSD (0.05)	2.27	2.39	1.28	1.80
LSD (0.01)	3.30	3.48	1.86	2.61

Fresh weight of tops

The fresh weight of tops of geranium plants was an important characteristic that reflects the general effect of Arvo-Humus on the vegetative growth. The data presented in Table 1 showed that Arvo-Humus had significantly increased the average fresh weight of tops when added to the soil mix in percentages of 20, 40 or 60%. Their respective values were 7.34, 8.37, and 6.43 g as compared to the control (3.88 g). However, when the percentage of Arvo-Humus was raised to 80% of the mixture, no significant increase was observed in the fresh weight of tops.

Generally, it was noted that adding 20% Arvo-Humus in the soil mix caused a significant increase in plant height, a highly significant increase in leaf diameter and fresh weight of tops, while it has no effect on the number of leaves. Raising the percentage of Arvo-Humus in the mixture from 20 to 40% showed better results in all characteristics studied. The number of leaves was significantly increased. The other three characteristics plant height, leaf diameter and fresh weight of tops, had shown highly significant increase. The existence of 60% Arvo-Humus in the mixture had caused just a significant increase in the four characteristics studied. The beneficial effect might be due to the fact that Arvo-Humus contains plenty of humus, which improved the texture and the water and nutrient holding capacity of the mixture (1,3). Also, it contains well balanced macro- and micronutrients, which are essential for plant growth (2,4). Increasing the percentage of Arvo-Humus to 80% showed no significant increase in any of the studied characteristics. This could be due to the decrease of soil aeration, the increase of moisture percentage above the optimum requirements of the plant, and/or the injurious effects of excess nutrient elements in the soil mix.

It might be concluded that the most effective increment was 40% of Arvo-Humus in the sandy soil mixture, since it caused a highly significant increase in plant height, leaf diameter, and fresh weight of tops. However, when the economical point of view is considered, the addition of only 20% of Arvo-Humus might be preferred since the effect of the two treatments (20% and 40% Arvo-Humus) was almost the same on the studied characteristics which affect greatly the commercial value of geranium plants.

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استعمال الرمل والارفوهيومس Arvo–Humus كمخلوط محسن لانتاج نبـــاتـــات الجيـــرانيـــوم

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مستخلـــــص

استعمل فى هذا البحث مخلوط من الارفوهيومس Arvo Humus والرمـــــل بنسب مختلفة كمخلوط محسن لانتاج نباتات الجيرانيوم *Pelargonium zonale* ويمكن تخليص نتائج تلخيص نتائج هذا البحث الآتى : ـ

١) ان اضافة ٢٠ ٪ من A–H الى التربة الرملية يؤدى الى زيادة مؤكدة فى ارتفاع النبات ، وزيادة مؤكدة جدا فى قطر الورقة والوزن الرطب للمجموع الخضرى ٠ ولم يكن لاضافة هذه النسبة من A·H تأثيرا على عدد الأوراق ٠

٢) أدى رفع نسبة A–H فى مخلوط التربة الى ٤٠ ٪ الى زيادة مؤكدة فى عدد الأوراق وزيـــادة مؤكدة جدا فى ارتفاع النبات وقطر الورقة والوزن الرطب للمجموع الخضرى ٠

٣) عندما وصلت نسبة A–H فى المخلوط الى ٦٠ ٪ كانت الزيادة مؤكدة فى الصفات الأربعة محـــل الدراسة ٠ وقد يرجع تأثير A–H على تحسين الصفات المدروسة الى احتوائه على نسبة عالية من المواد الدبالية التى يؤدى وجودها الى تحسين خواص المخلوط وزيادة قدرته على الاحتفاظ بالرطوبة والعناصـــر الغذائية ٠ وكذلك فان A–H يحتوى على مجموعة العناصر الكبرى والصغرى اللازمة لنمو النبات ٠

٤) أدى الاستمرار فى رفع نسبة A–H فى المخلوط الى ٨٠ ٪ الى عدم وجود زيادة مؤكدة فى أى صفة من الصفات المدروسة عن نباتات المقارنة المزروعة فى التربة الرملية ٠

وعلى ما سبق من نتائج يتضح ان اضافة A–H الى التربة الرملية بنسبة ٤٠ ٪ يؤدى الى تحسين الصفات التجارية لنبات الجيرانيوم ، ولكن اذا وضع العامل الاقتصادى فى الاعتبار فانه يفضل اضافة ٢٠ ٪ فقط من A–H حيث ان تأثير المعاملتين (٢٠ ٪ و ٤٠ ٪) على الصفات المدروسة كان متقاربا ٠