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# The effect of growth medium of peanut shelles compost and nutrient solution on the growth of Dracaena

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## ABSTRACT

*This research was conducted to evaluate the possibility using peanut shelles compost as appropriate medium in the cultivation of ornamental plants by a completely randomized design in three repetitions in ornamental plants and flowers research station, Lahijan, Iran. A 2:1 ratio of peat to perlite and peat was used as control treatment and peat was replaced by 15, 30, 45, 60 and 100 % v/v of peanut shelles compost in two methods: 1. treatments with nutritional solution and 2. treatments without nutritional solution. Growth indexes include height, crown diameter, fresh and dry weights of leaf were measured in dracaena plant. Nutrients concentration of nitrogen, phosphorus, potassium and calcium in the dracaena leaf were also measured. Results showed that nutritional solution had a considerable effect on plant growth in all treatments than without nutritional solution. Peanut shelles compost had more affects on growth properties like height and dry weight of leaf in compared to control. The lowest growth was related to 100% treatment of peanut shelles and control. In result, peanut shelles compost increases the growth of plant but their effect on plant growth is promoted when accompanied with nutritional solution.*

**Keywords:** Cultivation bed, Lahijan, Nutrient, Peat, Perlite.

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## INTRODUCTION

Today, most plants with ornamental leaves are cultivated in soilless media which peat is as basic medium [1], but the use of peas is doubtful due to ecological damages to environmental and economic advantageous for ornamental plants producers. These factors caused those researchers think to beds with high quality and cheap instead of peat [2]. Million tons of different agriculture and industrial wastes being produced annually across the country that can has role on preparing organic materials but unfortunately major part is burned or leaved somewhere and leads to

environment pollution [3,4]. With increasing awareness of environmental dangerous of wastes, in addition to need to sanitary landfill or recycle them and also in order to decrease useof non-renewable sources like peat, further use of composted biosolids has been suggested in farming [5,6].

Some studies showed that the peat can be replaced by organic wastes such as municipal wastes, sewage sludge, livestock manure, paper, waste of pruning and fungi beds and other organic waste after composting [7]. Investigations on *Ficus benjamina* variety Starlight in a growth medium contains one part peat and one olive waste (as volume) showed that the highest height of plant has obtained during 10 month growth [8]. Papafotiou et al. [6] used olive wastes compost as alternative of peat to cultivate some ornamental plants and suggested that this compost can be replaced amounted 25%, 75% and 75% v/v instead of peat for cultivating *Ficus benjamina*, *Cordyline* and *Syngonium podophyllum*, respectively. Peanut shelles as remained wastes of cultivating peanut has considerable volume which its compost can be used as available sources of ornamental plants medium. Cultivated area of peanut in Iran is about 3218 hectares which 2718 hectares is located in Guilan province. About 1980-3500 kg/ha pods is harvested and 89327.6 tones pods is produced in Guilan. Between 35-40% of every kg yield of peanut is shelles wastes, therefore, it is estimated to produce about 3388-3873 tons peanut shelles wastes in Iran in every year [9]. Thus, there is a high extent import of peanut in Iran.

Dracaena belongs to *Agavaceae* family that has 40 species and in natural habitats (tropical area of Asia and Africa) grows as tree. Some their species as trade form are suitable for culturing in inside environments (greenhouses and homes) [10] and is one of pot plants with ornamental leaves in Iran and the world. Since peat sources are inappropriate and limited in Iran and abroad peat is imported by high costs, in this research, the possibility using cellulose waste compost of peanuts (shelles) was evaluated in substituting with peat in the growth medium of Dracaena.

## MATERIALS AND METHODS

To investigate the possibility use of agricultural waste to peanut shelles compost as the growth medium of ornamental plants as an alternative of peat, a study was conducted at ornamental plants and flower research center, Lahijan, Iran. Dracaena marginata was selected as the test plant that is a perennial plant with evergreen leaves, shiny and smooth and often at the end up have a cluster makeup. A height of 2.5 to 4.5 meter and is used to grow straight and right. Green leaves with red dominant color in the periphery have the Ivory-colored stripes at central parts. This species have the lower chlorophyll than typical green species. For this aim, peanut shelles compost was produced and passed through the sieve 20 mm. Some chemical characteristics including total nitrogen (2.76%), phosphorus (0.67%), potassium (1.48%), organic carbon (27.1%), C/N ratio (9.8), EC (4.30 dS/m) and pH (5.06) in 1:5 extract peanut shelles to water were measured. Six treatments and three replicates per treatment in a completely randomized design were implemented as follows:

1. Control: Basic medium of dracaena ornamental plant was a 2:1 v/v ratio peat to perlite without nutritional solution.
2. Control: Basic medium of dracaena ornamental plant was a 2:1 v/v ratio peat to perlite with nutritional solution.

3. The treatments of peanut shelles compost: peat was replaced by 0, 30, 15, 45, 60 and 100% v/v of peanut shelles compost in media without nutritional solution.
4. The treatments of peanut shelles compost: peat was replaced by 0, 30, 15, 45, 60 and 100% v/v of peanut shelles compost in media with nutritional solution.

The applied peat was provided from the German SAB company that was purchased as a ready. After preparing media, the rooted cutting of dracaena *marginata* was transferred to 4 liters pots. Plant height and crown diameter were measured once every 14 days. Dry weight of leaves and fresh weight of leaves was evaluated at the end of experiment.

Total nitrogen by Kjeldal method [11,12], phosphorus by spectrophotometry method, potassium by flame photometry method and calcium by atomic absorption method was measured in leaf extraction. The experiment was a completely randomized design in three replications and MSTATC software was used for variance analysis of data by Least Significant Difference (LSD) test.

## RESULTS

Results of Table 1 showed that the effect of nutritional solution on the growth of plant was more as compared without nutritional solution in all treatments. The highest height of plant (26.0 cm) obtained in 15% treatment of peanut shelles compost with nutritional solution which had not significant difference with 30% treatment of peanut shelles compost (25.5 cm) and control (25.2 cm) with nutritional solution. Likewise, it had a significant difference with control (13.0 cm) without nutritional solution. The lowest height was related to 100% treatment of peanut shelles compost. The largest crown diameter (2.65 cm) is related to 30% treatment of peanut shelles compost with nutritional solution that had a significant difference than in the control without nutritional solution, but not significant than control with nutritional solution. All treatments of peanut shelles compost were caused to increase the crown diameter in compared to control.

**Table 1. The effect of Treatments on the growth of plants**

| Treatments | | Plant Height (cm) | Crown Diameter (cm) | Fresh Weight of Leaf (g) | Dry Weight of Leaf (g) |
|---|---|---|---|---|---|
| 2 Peat + 1 Perlite | Without NS* | 13.0 f** | 0.67 e | 44.4 cd | 5.50 cd |
| | With NS | 25.2 a | 2.00 bcd | 49.9 c | 6.11 bcd |
| 1.7 Peat + 0.3 Compost + 1 Perlite | Without NS | 21.2 bc | 2.11 bcd | 55.6 bc | 6.71 abcd |
| | With NS | 26.0 a | 2.55 abc | 70.3 ab | 8.13 abc |
| 1.4 Peat + 0.6 Compost + 1 Perlite | Without NS | 19.8 cde | 2.08 bcd | 68.7 ab | 8.37 ab |
| | With NS | 25.5 a | 2.65 ab | 58.4 bc | 8.18 abc |
| 1.1 Peat + 0.9 Compost + 1 Perlite | Without NS | 17.5 de | 1.35 de | 53.4 bc | 7.21 abc |
| | With NS | 23.7 ab | 3.14 a | 81.3 a | 9.37 a |
| 0.8 Peat + 1.2 Compost + 1 Perlite | Without NS | 17.2 e | 2.03 bcd | 47.7 cd | 6.98 abcd |
| | With NS | 20.1 cd | 1.96 bcd | 54.0 bc | 6.91 abcd |
| 2 Compost + 1 Perlite | Without NS | 10.8 f | 1.65 cd | 31.9 d | 4.38 d |
| | With NS | 12.7 f | 1.51 de | 47.4 cd | 7.16 abc |

**NS: Nutritional Solution*
***LSD (least significant difference) shows the significant difference ($\rho$ = 0.05) among the different treatments.*
*Values followed by the same letters in each column are not significantly different at the 0.05 level (least significant difference).*

The greatest fresh weight of leaf (81.3 g) was related to 45% treatment of peanut shelles compost with nutritional solution which had a difference with 30% and 60% treatments, but the highest dry weight of leaf (8.37 g) was related to 30% treatment of peanut shelles compost without nutritional solution. The lowest dry weight of leaf (4.37 g) was related to 100% treatment of peanut shelles compost without nutritional solution which had not significant difference than in the control.

Table 2 shows the impacts of treatments on the nutrients concentration in the dracaena leaves. The results showed that the highest nitrogen of leaf (2.74%) was related to 15% treatment of peanut shelles compost with nutritional solution which had significant difference with 0, 30, 45, 60 and 100% treatments in both nutritional conditions. The lowest nitrogen obtained in 30% compost treatment without nutritional solution. Control treatment had a more concentration of phosphorus (2.13%) than 15, 30, 45 and 60% treatments of peanut shelles compost in both nutritional conditions but there was any difference with control treatment by nutritional solution.

The lowest extent of phosphorus concentration was related to 45% treatment of peanut shelles compost without nutritional solution. Results showed that the impact of peanut shelles compost on the potassium concentration was not significant in nutritional solution, but the use of nutritional solution caused to increase in K than without nutritional solution. The highest K concentration is related to 30% compost treatment with nutritional solution. Impact of peanut shelles compost was significant on leaf calcium. The highest calcium extent by 8.74% was related to 30% treatment of peanut shelles compost with nutritional solution showed a significant difference with other treatments.

**Table 1. The effect of Treatments on the nutrients concentration of leaves**

| Treatments | | Total Nitrogen | Phosphorus | Potassium | Calcium |
|---|---|---|---|---|---|
| 2 Peat + 1 Perlite | Without NS | 1.70 bc | 2.13 a | 1.80 d | 6.58 bcde |
| | With NS | 1.97 abc | 1.10 b | 3.33 ab | 6.21 bcde |
| 1.7 Peat + 0.3 Compost + 1 Perlite | Without NS | 2.18 ab | 1.13 b | 1.73 d | 5.71 ef |
| | With NS | 2.74 a | 0.91 bc | 3.41 ab | 6.86 b |
| 1.4 Peat + 0.6 Compost + 1 Perlite | Without NS | 1.04 c | 0.52 d | 1.53 d | 5.83 dfe |
| | With NS | 1.69 bc | 0.47 de | 3.68 a | 8.74 a |
| 1.1 Peat + 0.9 Compost + 1 Perlite | Without NS | 1.17 c | 0.07 f | 2.14 cd | 5.17 f |
| | With NS | 1.38 bc | 0.12 ef | 2.67 bc | 5.14 f |
| 0.8 Peat + 1.2 Compost + 1 Perlite | Without NS | 1.36 bc | 0.10 ef | 1.76 d | 6.67 bcd |
| | With NS | 1.75 bc | 0.56 cd | 3.16 ab | 5.90 cdef |
| 2 Compost + 1 Perlite | Without NS | 1.50 bc | 0.10 ef | 2.18 cd | 6.38 bcde |
| | With NS | 1.20 c | 2.23 a | 2.90 b | 6.76 bc |

## DISCUSSION

The use of nutritional solution in the growth media caused to increase the growth indexes of plant than without nutritional solution. Assessing growth indexes includes height, crown diameter; fresh and dry weight of leaf showed that dracaena growth in 15, 30, 45 and 60% compost were more than control and 100% of peanut shelles compost. Adding compost was caused to increase in the growth indexes. It seems that part of impacts of peanut shelles compost is due to presence of humic materials so that Chen et al. [8] claimed that part of compost impact on the *Ficus benjamina* growth can be due to same role of growth regulators in plant.

Investigations on *Ficus benjamina* variety Starlight in a growth medium contains one part peat and one olive waste (as volume) showed that the highest height of plant has obtained during 10 month growth [8]. Papafotiou et al. [6] used olive wastes compost as alternative of peat to cultivate some ornamental plants and suggested that this compost can be replaced amounted 25%, 75% and 75% v/v instead of peat for cultivating *Ficus benjamina*, *Cordyline* and *Syngonium podophyllum*, respectively.

The growth of plant decreased significantly in the 100% treatment of peanut shelles compost due to high pores and decrease in water holding capacity. Pool and Conover [12] also found above issue when were grown dracaena in the organic beds with high pores and low water holding capacity. The growth of dracaena in the control bed was low so that indexes such as leaf numbers and dry weight of stem and leaf in this treatment had no significant difference with 100% treatment of peanut shelles compost. The large C/N ratio in control bed and decrease in needed nitrogen for plant decreased the growth indexes as compared with 15, 30, 45 and 60% treatments of peanut shelles compost. Gayasinghe et al. [7] used manure compost (CMC) and synthetic compounds (SA) as a alternative for peat in the cultivating *tagetes paluta* which increase of plant height, number of flower in each plant, dry and fresh weight of stem, root length, dry and fresh weight of root obtained in the combination of 40% SA and 60% v/v CMC.

The nutrients concentration in dracaena leaf was in the presented range by Denis et al. [13] which represents favorability of nutrients range for growth. Lack of significant change of potassium in treatments of peanut shelles compost without nutritional solution can be due to more yield of leaf dry matter in these treatments in compared to control. In fact, potassium has been uptake but the more yield and the dilution effect has been caused to observe no difference with control. By the way, concentrations variations in the most cases don't follow from the values of these elements in cultivation beds. Regards that nutrients concentration in the plant organs are imposed of different factors such as plant growth, ionic competition and deposition, so, sometimes it is impossible to use nutrients concentration in plant as reliable parameter in assessing plant growth. Impact of nutrients dilution in resulting further yield is also sometimes led to confusion.

## CONCLUSION

In general, peanut shelles compost increased the growth of dracaena as compared to control but the higher levels of peanut shelles compost not to be suggested. It is suggested that more assessments being done about culturing peanut shelles compost in term of reaching best size of compost particles for more favorable activity of micro-organisms in the plant beds.

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