IJBPAS, May, 2014, 3(5): 679-685

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

THE POSSIBILITY USING BAGGASE AS A GROWTH MEDIUM OF LILIUM

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ABSTRACT

There is a high potential in producing about 2 million tons baggase at Iran's sugarcane factories. Now, this organic by-product is used in producing paper and livestock food, but at this study, the possibility using baggase as the growth medium of ornamental plants is evaluated. An experiment based on randomized completely design was conducted to investigate the impact of baggase compost as the growth medium of Lilium. Seven growth media including control (50% perlite + 50% sand (v/v)),baggase, vermicompost; and its mixture with perlite and coccopeat, every treatment at 3 replicates and 21 pots were used for experiment. The plants were harvested after 5 months and the plant height, stem diameter, flower bud number; fresh and dry shoot weight and flower life cycle were measured at every treatment. The sub samples of dry leaves (at 70°C for 48 h) were ground and then dry-ashed in a furnace at 550°C and then extracted with 2M HCl. The concentrations of K were measured in the extracts by flame photometry. Total kjeldahl nitrogen (TKN) of leaves was estimated by using a microkjeldahl method. Reslts showed the use of 100% baggase increased the fresh and dry weight of shoot than in the control, significantly. Using 100% vermicompost increased both dry and fresh shoot weight, but the increase in dry weight was less than 100% baggase. A better response of growth obtained in treatment of baggase and perlite as compared with treatment of vermicompost and perlite. The greatest flower life cycle was related to 100% baggase and baggase mixed with perlite and coccopeat, so the lowest flower longevity was observed in 100% vermicompost.

Keywords: Cane, Compost, Ornamental, Pot Experiment, Sugarcane

INTRODUCTION

Thousands tons of different agriculture 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 **[1]**. The reuse of these wastes in agriculture is an appropriate environmentally way. A benefit usage can be use in the cultivation of ornamental plants. The application of peat as a growth medium of ornamental plant 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]**. With increasing awareness of environmental dangerous of wastes, in addition to need to ary landfill or recycle nd also in order to decrease usethem a of non-renewable sources like peat, further use of composted biosolids has been suggested in farming **[3, 4]**. 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 **[5]**. The bark of broad leaf and conifer trees, sewage sludge, sawdust, mushroom compost, municipal wastes compost are the materials that can be used as planting beds **[7, 8, 9]**.

Approximately 30% w/w of sugarcane is converted to an organic waste "baggase" after sugar production process. There is a high potential in producing about 2 million tons baggase at Iran's sugarcane factories. Now, this organic by-product is used in producing paper and livestock food, but at this study, the possibility using baggase as the growth medium of ornamental plants is evaluated.

MATERIALS AND METHODS

An experiment based on randomized completely design was conducted to investigate the impact of baggase compost as the growth medium of Lilium. Seven growth media was used include:

1. **Control: 50% perlite + 50% sand (v/v)**
2. **100% baggase (v/v)**
3. **100% vermicompost (v/v)**
4. **50% baggase + 50% perlite (v/v)**
5. **50% baggase + 50% coccopeat (v/v)**
6. **50% baggase + 50% vermicompost (v/v)**
7. **50% vermicompost + 50% perlite (v/v)**

Seven treatments, every treatment at 3 replicates and 21 pots were used for experiment. All agricultural operations and performances were in an indoor environment of a green house, with fixed amount of light, temperature and moisture all at equilibrium for the treatment of plants. The "Tresor" degree from the Lilly hybrid, the *Longiflorum x Asiatic*, is what produces the orange flowers, was used as a test plant.

Premature bulbs from this flower, with the diameter of approximately 18 to 20 cm were collated. The experiment duration was 5 months to appear the buds. Perlite with a diameter of 1 to 2 mm (fine) was used and sands of the river have been washed to be free from any mud. In the beginning, FC (field capacity) of pots was measured to determine irrigation water requirement per pot in each time period, that this rate was 250 ml. Periodic watering was performed 2 times per week.

To find the time it takes for the plant to blossom, the number of days is counted from the first day that the plant's bulb is planted till the moment of observing signs of sprouts. The plant's life cycle was measured by counting the number of days from when cut flowers were placed in water till 50% of the flower petals were fallen. The plants were harvested after 5 months and the plant height, stem diameter, flower bud number; fresh and dry shoot weight were measured at every treatment. The sub samples of dry leaves (at 70°C for 48 h) were ground and then dry-ashed in a furnace at 550°C and then extracted with 2M HCl. The concentrations of K were measured in the extracts by flame photometry. Total kjeldahl nitrogen (TKN) of leaves was estimated by using a microkjeldahl method **[9]**. The pH and EC were determined on a water extract from compost using compost to water ratio of 1:5 by weight. 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 AND DISCUSSION

Table 1 shows the ANOVA results of the treatments effect on plant growth and nutrient concentration in leaves. The results showed the effect of treatments on the growth indices of plant and N and K concentration is significant at 1% level. Only the effect of treatment on time taken to blossom is significant at 5% level.

Table 2 shows the effect of treatments on growth indices of plant. The use of 100% baggase increased the fresh and dry weight of shoot than in the control, significantly. Using 100% vermicompost increased both dry and fresh shoot weight, but the increase in dry weight was less than 100% baggase. It seems that baggase have an appropriate porosity, C/N ratio and allowed salinity to support plant growth. The greatest dry weight of shoot obtained at baggase and coccopeat, but the mixed vermicompost and perlite caused to least fresh and dry shoot weight. The highest height of plant was observed in 100% baggase, while the lowest height with the lowest stem diameter was seen in 100% vermicompost. The parts of compost impacts can be due to humic materials. Chen *et al*., **[10]** also stated that the part of the effects of compost on growth of *Ficus benjamina* could be due to a similar role in plant growth regulators. Accordingly, the root growth of the plant has increased in the presence of compost in the growth medium and improvement of bed physical conditions.

A better response of growth obtained in treatment of baggase and perlite as compared with treatment of vermicompost and perlite. Vermicompost individually had not an appropriate impact on the growth of plant than in the baggase. This can be due to the salinity made by vermicompost. Shadanpour *et al*., **[11]** used vermicompost as the growth medium of marigold and concluded that it increased the growth indices but the larger amount of vermicompost decreased growth due to increase in bed salinity. Alidoust *et al*., **[12]** investigated the possibility using peanut shelles compost as an alternative of peat on the growth of dracaena. Their results showed that the use of this organic waste increases heightand dry weight of plant, but using 100% peanut shelles compost decreased growth indices due to high pores and decrease in water holding capacity and also salinity. Pool and Conover **[13]** also found above issue when dracaena were grown in the organic beds with high pores and low water holding capacity.

When baggase was added to vermicompost, the height, stem diameter, time taken to blossom, bud number and flower longevity increased than in the 100% vermicompost. Therefore, it seems baggase has decreased unsuitable impact of vermicompost on plant. Peyvast *et al*., **[14]** investigated effect of soil and vermicompost composition in the growth bed of Marigold (*Petroselinum crispum*) at different rations. Their results showed that the addition of soil to vermicompost increased plant height. Walker and Bernal **[15]** reported that application of compost and organic fertilizer dramatically increased growth of best branch.

The greatest flower life cycle was related to 100% baggase and baggase mixed with perlite and coccopeat, so the lowest flower longevity was observed in 100% vermicompost. This can be due to the higher concentration of potassium at plant tissue in 100% baggase and baggase mixed with perlite and coccopeat than 100% vermicompost. Thus, because of dilution effect, K concentration in baggase treatments is very higher than vermicompost treatment. The results of this study were consistent with the results of Alidust **[12]**. Potassium has an important role in flower quality particularly post harvest time and flower longevity.

CONCLUSION

In general, the results showed that baggase compost increases the growth indices of Lilium plant. Vermicompost individually cannot be appropriate bed, but their impact promotes when it is mixed by baggase. Results denotes to ability of baggase as an alternative of peat and other commercial beds in cultivating ornamental plants.

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Table 1: The ANOVA Results of the Treatments Effect on Growth of Plant and Nutrient Concentration in Leaves

Variation Resources	Freedom Degree	Mean Squared								
		Fresh weight of shoot	Dry weight of shoot	Growth height	Stem diameter	Time taken to blossom	Bud number	life cycle	N-leaves concentration	K-leaves concentration
treatment	6	8036**	82.7**	617.2**	4613**	6.1*	5.6**	80.2**	0.62**	2.0**
Error	12	396.6	6.5	46.4	2.0	2.8	0.83	1.4	0.03	0.09

NOTE: **,*: Significant at 1 and 5% Level, Respectively

Table 2: The Effect of Treatment on the Growth Indices of Plant

Treatment	Fresh weight of shoot	Dry weight of shoot	Growth height	Stem diameter	Time taken to blossom	Bud number
Control: 50% perlite + 50% sand	84.6 d	6.8 ef	76.0 efg	12.2 ab	27.0 cd	4.66 ab
100% baggase	164.0 abc	18.1 ab	97.6 abc	10.8 abc	29.3 ab	5.66 ab
100% vermicompost	160.3 bc	11.1 cde	44.0 g	8.9 de	25.0 d	4.00 b
50% baggase + 50% perlite	189.6 ab	21.3 a	91.6 abcd	12.3 ab	27.0 bcd	5.00 ab
50% baggase + 50% coccopeat	184.6 ab	18.7 ab	87.6 abcd	13.0 ab	28.0 bcd	5.66 ab
50% baggase + 50% vermicompost	133.0 c	8.7 def	87.6 bcde	11.3 bcd	27.3 bcd	5.00 ab
50% vermicompost + 50% perlite	34.0 e	6.4 f	102.0 a	11.8 abc	28.3 abc	5.33 ab

Table 3: The Effect of Treatments on Flower Life Cycle and N and K Concentration of Leaves

Treatment	Flower life cycle	N-leaves concentration	K-leaves concentration
Control: 50% perlite + 50% sand	18.0 b	3.75 ab	1.67 f
100% baggase	21.0 a	3.13 cde	2.86 abc
100% vermicompost	13.0 c	3.99 a	2.30 e
50% baggase + 50% perlite	21.6 a	3.14 cde	2.38 e
50% baggase + 50% coccopeat	21.3 a	3.17 fg	2.51 cde
50% baggase + 50% vermicompost	17.0 b	2.93 gh	3.07 a
50% vermicompost + 50% perlite	17.0 b	3.52 cde	2.91 ab