Effect of garbage on performance of rosewood *(Dalbergia latifolia*) seedlings in the nursery

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Accepted : February, 2009

SUMMARY

The present series of investigations were conducted at Kerala Agricultural University, Vellanikkara, Thrissur to evaluate the effect of potting media containing municipal garbage on the growth and vigour of rosewood (*Dalbergia latifolia* Roxb.), a multi purpose tree species in the nursery. The treatments T_1 (soil), T_2 (soil: sand) and T_3 (soil: sand: cowdung) recorded 100 per cent initial survival rate. In most of the treatments containing municipal garbage, initial establishment were found to be good. Growth and vigour in terms of shoot growth parameters were found to be most promising when the seedlings were grown in potting media containing 4 weeks decomposed municipal garbage and soil: sand: cowdung. Physiological growth parameters did not show any systematic pattern. No uniform trend could be observed with regard to chlorophyll content also. Seedlings grown in potting media containing soil: sand: cowdung recorded maximum content of nitrogen, phosphorous and potassium in the tissues. Media containing 4 weeks decomposed municipal garbage also recorded high content of tissue nitrogen and phosphorous. It was observed that at the end of the study period, percentage of nutrient elements in different potting media slightly increased compared to the initial content.

Key words : Rosewood, Municipal garbage, Chlorophyll, Decomposition, Nutrient content

In India, about 40% of the plant nutrients are consumed by rice crop. Rice (*Oryza sativa* L.) plays a very important role in providing nutrition to human race. The traits like yield and its components are governed by polygens with complex gene action and hence, understanding the nature and magnitude of gene action help the breeder in selection of an appropriable breeding method. For impartment in such an important crop, the most important prerequisite is the selection of suitable parents, which could combine well and produce describable hybrids and segregants. In the presents study, an attempt has been made to estimate the heterosis in F_1 hybrids, using line x tester mating designs.

MATERIALS AND METHODS

The present study was conducted at College of Forestry, Kerala Agricultural University, Vellanikkara (Thrissur district of Kerala state). Uniform healthy seedlings of *Dalbergia latifolia* were planted using different potting media *viz*., soil (T_1), soil : sand (T_2), soil : sand : cowdung (T_3), soil : fresh municipal garbage (T_4), soil : 2 weeks decomposed garbage (T_5), soil : 4 weeks decomposed garbage (T_6), soil : sand : fresh municipal garbage (T_7), soil : sand: 2 weeks decomposed garbage (T_8), soil : sand : 4 weeks decomposed garbage (T_9), fresh municipal garbage (T_{10}), 2 weeks decomposed municipal garbage (T_{11}), 4 weeks decomposed municipal garbage (T_{12}).

The present studies were conducted for a period of six months. Initially the seeds were sown in nursery beds. Uniform vigorous seedlings of 2-3 weeks old were planted in 200 guage polythene covers of 30-40 cm size filled with different treatment media. The components were mixed on v/v basis. Experiment was laid out in CRD with four replications. A total number of 1200 seedlings were maintained in the field as a part of study.

The initial establishment after one week and final survival rate after six months, shoot growth parameters (height, girth, total biomass production), root growth parameters (length, number and biomass production), leaf growth parameters, physiological observations like chlorophyll content, leaf area, relative growth rate, specific leaf area, leaf weight ratio, leaf area ratio etc., were recorded. Nutrient status of the seedlings during the study period and final nutrient content of nitrogen, phosphorous and potassium in the media were also estimated. The data were analyzed statistically.

RESULTS AND DISCUSSION

Results obtained are summarized in Table 1, 2, 3, 4, 5 and 6. Analysis of variance revealed that garbage had significant effect on growth attributed of seedlings.

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Survival rate of Dalbergia seedlings in different potting media containing garbage:

Municipal garbage when used as a component of potting media significantly influenced the survival rate of seedlings as is evidenced from the data furnished in Table1. The effect on survival was more pronounced when fresh garbage alone was used as the potting media. In the present study no survival was noticed when fresh garbage alone was used for raising seedlings. It could be seen from the table that survival rate of rose wood seedlings was substantially influenced by the potting media.

Table 1 : Effect of potting media on survival rate of seedlings

Treatment No.	Treatment details	Survival percentage	
		Initial	Final
T_1	Soil	100	99
T_2	Soil : sand	100	98
T_3	Soil : sand : cowdung (1:1:1)	100	96
T_4	Soil : fresh garbage (1:1)	75	50
T_5	Soil :2 weeks decomposed garbage (1:1)	91	84
T_6	Soil :4 weeks decomposed garbage (1:1)	90	84
T_7	Soil : sand : Fresh garbage(1:1:1)	97	90
T_8	Soil:sand:2 weeks decomposed garbage (1:1:1)	86	76
T_9	Soil:sand:4 weeks decomposed garbage (1:1:1)	98	91
T_{10}	Fresh garbage	3	0
T_{11}	2 weeks decomposed garbage	98	94
T_{12}	4 weeks decomposed garbage	96	85

Treatments T_1 (soil), T_2 (soil: sand) and T_3 (soil: sand: cowdung) recorded 100 per cent initial survival rate. In most of the treatments containing municipal garbage, initial establishment was found to be good. In the case of treatments T_9 (soil: sand: 4 weeks decomposed garbage), and T_{12} (4weeks decomposed garbage), very high survival rate of 91 and 85 per cent, respectively were recorded at the end of the study period, after six months.

It could be stated that the survival rate was directly proportional to the period of decomposition of garbage. Elliot *et al.* (1981) reported that all the organic wastes cannot be applied directly as such into the soil because of their wide C : N ratio. They are known to reduce the availability of important mineral nutrients to growing plants through immobilization into organic forms and also produce phytotoxic substances during their decomposition. Many earlier workers have noticed high rate of mortality and incidence of *Rhizoctonia* and *Phytophthora* attack when fresh garbage is used as component of potting media. But when the fresh garbage decomposed for six months was used, the mortality was significantly reduced. In the present study also the complete mortality of seedlings when fresh garbage alone was used could be probably due to low availability of nutrients in the media and also infection of microorganism present in the garbage.

***Growth and vigour of seedlings as affected by different potting media containing garbage*:**

Statistical analysis of the data with regard to various shoot growth parameters of seedlings indicate that overall shoot growth performance of the seedlings were significantly influenced by most of the treatments.

Table 2 : Effect of potting media on growth attributes of seedlings

Treatment No.	Treatment details	Months					
		Height (cm)	Collar diameter (mm)	Shoot weight (g)	Root weight (g)	Root length (cm)	Root number
T_1	Soil	35.67^{cde}	4.16^{b}	4.60^{bc}	3.71^{f}	22.70	34.50^{bc}
T_2	Soil:sand	33.03^{de}	4.21^{ab}	4.52^{bc}	5.18^{e}	23.43	35.00^{bc}
T_3	Soil:sand:cowdung (1:1:1)	43.42^{ab}	4.74^{a}	6.45^{a}	7.72^{a}	28.53	34.50^{bc}
T_4	Soil:fresh garbage (1:1)	21.23^{f}	2.58^{c}	3.52^{c}	2.76^{g}	29.66	31.75^{c}
T_5	Soil:2 weeks decomposed garbage (1:1)	29.45^{e}	3.99^{b}	4.52^{bc}	6.53^{bc}	25.00	36.75^{ab}
T_6	Soil:4 weeks decomposed garbage (1:1)	46.22^{a}	4.71^{a}	5.45^{ab}	7.72^{a}	29.88	34.00^{bc}
T_7	Soil: sand:Fresh garbage (1:1:1)	33.33^{de}	4.28^{ab}	4.83^{b}	5.22^{e}	31.50	32.25^{bc}
T_8	Soil:sand:2 weeks decomposed garbage (1:1:1)	37.83^{bcd}	4.31^{ab}	4.72^{bc}	5.97^{d}	21.38	39.50^{a}
T_9	Soil:sand:4 weeks decomposed garbage (1:1:1)	40.70^{abc}	4.21^{ab}	5.21^{b}	6.78^{b}	26.58	36.50^{ab}
T_{11}	2 weeks decomposed garbage	36.08^{cde}	3.94^{b}	4.75^{bc}	6.12^{cd}	30.55	35.50^{abc}
T_{12}	4 weeks decomposed garbage	39.88^{abcd}	4.72^{a}	5.75^{ab}	7.28^{a}	29.93	34.50^{bc}
	Prob	0.0000	0.0001	0.0015	0.0000	NS	0.0281
	S.E. $\pm$	2.24	0.15	0.39	0.17	2.43	1.38

Figures with the same alphabets do not differ significantly

According to Hernandez (1999), shoot growth parameters like height, collar diameter, shoot fresh weight and shoot dry weight have to be considered as important criteria for measuring the vigour of seedlings. The data furnished in Table 2 showed that the seedlings grown in treatments T_6 (soil: 4 weeks decomposed garbage) and T_3 (soil: sand: cowdung) recorded the maximum height of 46.22 cm and 43.42 cm, respectively at the end of the study period. Maximum height increment also was recorded by these treatments. These treatments were followed by treatment T_9 (soil:sand:4 weeks decomposed garbage) where the height was 40.70cm. Thus a positive correlation could be observed between the period of decomposition of garbage and height growth. This could be because of improved nutrient status and water retention capacity of the media.

During the first two months treatments did not exert any significant influence on collar girth. From the third month onwards, T_3 (soil: sand: cowdung) recorded the maximum collar girth till the end of the study period. Treatments T_3 (soil: sand: cowdung) and T_6 (soil: 4 weeks decomposed garbage) were at par during most of the period of observation. Maximum increment of 3.33 mm in collar girth was recorded by treatments T_3 (soil: sand: cowdung) and T_6 (soil: 4 weeks decomposed garbage). At the end of the study period, treatment T_3 (soil: sand: cowdung) recorded the maximum collar diameter of 4.74 mm which was at par with T_{12} (4 weeks decomposed garbage) and T_6 (soil: 4 weeks decomposed garbage). Similar results were also observed in teak and mangium in a study conducted by Adersh (2001). He has also reported that addition of cow dung can improve soil physical properties and also nutrient availability and this may be the probable reason for the better growth of seedlings in potting media containing cow dung.

A gradual increase in biomass production was shown by seedlings grown in different potting media from beginning to end of the study period. At the end of the study period, maximum shoot dry weight was recorded by the treatment T_3 (soil: sand: cowdung-6.45g). This was followed by T_{12} (4 weeks decomposed garbage-5.75g) and T_6 (soil: 4 weeks decomposed garbage-5.45g). Biomass production is a function of photosynthetically active radiation resulting greater shoot weight of sugar maple seedlings when grown in green house medium (Ward *et al*., 1981). Effective utilization of solar energy and also the availability of ample supply of nutrients especially nitrogen may be the reason for the better performance of the seedlings grown in treatments T_3 (soil: sand: cowdung), T_6 (soil: 4 weeks decomposed garbage) and T_{12} (4 weeks decomposed garbage). Maximum increment in shoot dry weight was obtained by treatment T_{12} (4 weeks decomposed garbage-5.51 g), followed by treatment T_6 (soil: 4 weeks decomposed garbage-5.07 g) and T_9 (soil: Sand: 4 weeks decomposed garbage-4.99g).

At the end of the study period, though not significant statistically, seedlings grown in potting media containing 4 weeks decomposed garbage recorded maximum root length (29.93 cm), followed by T_6 (soil: 4 weeks decomposed garbage-29.88 cm). It could be seen from the table that during most of the periods of observation, treatment T_9 (soil: sand: 4 weeks decomposed garbage) was highly promising with regard to the number of roots produced. A marked stimulation of root length and root fresh weight were reported at 5 per cent concentration, when solid waste was used at varying concentrations of 25,15 and 5 per cent of the potting media for raising tree crops (Radha and Panigrahi, 1998). Ritchie (1982) has stated that carbohydrates and growth regulators in single or in combination produced by the shoots are necessary for growth. There was a positive relationship between stored carbohydrates or photosynthates present in the stem and development of healthy root system (Davis *et al*., 1990). This statement is true with regard to the present study also. The treatments that were proved better with regard to root weight were performing better with regard to shoot weight also. Gopikumar and Minichandran (2003) have reported that treatments containing partially decomposed garbage were performing better compared to other treatments with regard to root growth parameters and physiological attributes in the case of *Ailanthus* seedlings.

With regard to root dry weight, treatment T_3 (soil: sand: cowdung), T_6 (soil: 4 weeks decomposed garbage) and T_{12} (4 weeks decomposed garbage) were found to be the most promising. At the end of the study period, maximum increment (7.60g) in root dry weight was obtained by treatment T_3 (soil: sand: cowdung). This was closely followed by treatment T_6 (soil: 4 weeks of decomposed garbage) which recorded an increment of 7.21g compared to the beginning of the study period. The treatments that were proved better with regard to root weight were performing better with regard to shoot weight also. Gopikumar and Minichandran (2002) have reported that treatments containing partially decomposed garbage were performing better with regard to root growth parameters and physiological growth attributes in the case of *Ailanthus triphysa* seedlings.

***Physiological growth attributes of seedlings as affected by different potting media containing garbage*:**

In the present study, leaf area, leaf area ratio, specific leaf area, specific leaf weight, relation growth

Table 3 : Effect of potting media on physiological attributes of seedlings

Treatment no.	Treatment details	RGR ($g.day^{-1}$)	LA (cm^2)	SLA ($cm^2.g^{-1}$)	SLW ($g.cm^{-2}$)	LAR ($g.g^{-1}$)	LWR ($g.g^{-1}$)
T_1	Soil	0.008	357.7^{d}	105.58^{cd}	0.009^{e}	88.06^{bc}	0.37^{a}
T_2	Soil:sand (1:1)	0.004	340.33^{d}	97.37^{cd}	0.011^{de}	82.06^{c}	0.38^{a}
T_3	Soil:sand:cowdung (1:1:1)	0.010	704.73^{b}	198.02^{b}	0.005^{f}	109.13^{b}	0.26^{b}
T_4	Soil:fresh garbage (1:1)	0.004	115.50^{ef}	69.31^{e}	0.016^{cd}	39.49^{d}	0.29^{ab}
T_5	Soil:2 weeks decomposed garbage (1:1)	0.007	79.02^{f}	33.89^{f}	0.030^{b}	18.15^{e}	0.39^{a}
T_6	Soil:4 weeks decomposed garbage (1:1)	0.006	522.19^{c}	128.12^{c}	0.008^{e}	94.15^{bc}	0.37^{a}
T_7	Soil: sand:Fresh garbage (1:1)	0.003	62.50^{f}	17.40^{g}	0.061^{a}	12.33^{f}	0.40^{a}
T_8	Soil:sand:2 weeks decomposed garbage (1:1:1)	0.004	818.38^{a}	307.69^{a}	0.004^{f}	169.77^{a}	0.38^{a}
T_9	Soil:sand:4 weeks decomposed garbage (1:1:1)	0.008	385.8^{d}	106.49^{cd}	0.010^{e}	77.48^{c}	0.37^{a}
T_{11}	2 weeks decomposed garbage	0.003	196.20^{e}	56.34^{e}	0.018^{b}	41.41^{d}	0.37^{a}
T_{12}	4 weeks decomposed garbage	0.005	901.15^{a}	375.84^{a}	0.004^{f}	39.49d	0.29^{ab}
	Prob	NS	0.0000	0.00	0.00	0.0000	0.0000
	S.E. $\pm$	0.02	34.74	0.01	0.01	0.01	0.01

Figures with the same alphabets do not differ significantly NS- Non significance
RGR-Relative growth rate, LA-Leaf area, SLA-Specific leaf area, SLW-Specific leaf weight, LAR-Leaf area ratio, LWR-Leaf weight ratio

rate, chlorophyll content etc. were considered as important criteria for measuring the growth and vigour of seedlings. Till the fourth month, maximum leaf area was recorded by the treatment T_3 (soil: sand: cowdung) (Table 3). From fourth month onwards, treatment T_{12} (4 weeks decomposed garbage) was having maximum leaf area and this trend continued till the end of the study. Wireland (1985) has noticed that plants with high rate of leaf growth probably had a high photosynthetic efficiency and growth potential. Khalilian and Sullivan (1997) have reported that addition of composted garbage improve nutrient availability. This could be one of the reasons for better performance of the seedlings grown in potting media with decomposed garbage. All the treatments except T_3 (soil:sand: cowdung) and T_{11} (2 weeks decomposed garbage) recorded a decrease in leaf area during the sixth month of observation. The decreasing trend in leaf area could be due to various environmental factors.

Leaf area ratio was maximum for treatment T_8 (soil : sand : 2 weeks decomposed garbage). Generally for all the treatments, a decreasing trend in leaf area ratio was observed during the second and third months of observation. Other physiological growth attributed like specific leaf area, specific leaf weight, leaf weight ratio and relative growth rate did not follow any systematic pattern with regard to different treatments (Table 3). Similar trends were also reported by Gopikumar and Minichandran (2003) in the case of teak seedlings when solid waste was used as a component of potting media.

No uniform trend could be observed on the effect of

Table 4 : Effect of potting media on chlorophyll content ($mg\ g^{-1}$)of seedlings at monthly intervals

Treatment No.	Treatment details	Chlorophyll content ($mg\ g^{-1}$) at monthly intervals					
		1	2	3	4	5	6
T_1	Soil	2.22^{bcd}	1.99^{de}	1.98^{bc}	2.80^{ab}	2.82^{b}	2.96^{ab}
T_2	Soil:sand (1:1)	2.59^{a}	1.87^{de}	2.12^{b}	2.06^{cde}	2.03^{cde}	1.97^{bc}
T_3	Soil:sand:cowdung (1:1:1)	2.50^{ab}	2.16^{cde}	1.92^{bc}	1.94^{cde}	2.07^{cde}	2.17^{bc}
T_4	Soil:fresh garbage (1:1)	1.22^{g}	3.36^{a}	2.76^{a}	3.24^{a}	3.33^{a}	3.54^{a}
T_5	Soil:2 weeks decomposed garbage (1:1)	1.50^{f}	1.82^{e}	2.27^{b}	1.99^{cde}	2.09^{cde}	2.92^{ab}
T_6	Soil:4 weeks decomposed garbage (1:1)	2.19^{cd}	2.10^{cde}	1.84^{bc}	1.92^{cde}	1.99^{cdef}	2.06^{bc}
T_7	Soil: sand:Fresh garbage (1:1)	1.28^{fg}	2.55^{bc}	1.88^{bc}	1.45^{e}	1.43^{f}	1.53^{c}
T_8	Soil:sand:2 weeks decomposed garbage (1:1:1)	1.84^{e}	2.38^{bcd}	2.18^{b}	1.64^{de}	1.64^{ef}	1.52^{c}
T_9	Soil:sand:4 weeks decomposed garbage (1:1:1)	2.41^{de}	2.08^{cde}	2.01^{bc}	2.46^{bc}	2.45^{bc}	2.52^{abc}
T_{11}	2 weeks decomposed garbage	1.98^{de}	2.74^{b}	2.16^{b}	1.70^{de}	1.70^{def}	1.59^{c}
T_{12}	4 weeks decomposed garbage	2.04^{de}	1.99^{de}	1.60^{c}	2.30^{bcd}	2.30^{bcd}	2.59^{abc}
	Prob	0.0123	0.0000	0.0002	0.0000	0.0005	0.003
	S.E.$\pm$	0.10	0.11	0.07	0.34	0.14	0.34

treatments on the total chlorophyll content of seedlings (Table 4). Maximum total chlorophyll content was recorded by treatment T_4(soil:fresh garbage-3.54 mg g^{-1}) at the end of the study period. This increase is from the initial content of 1.22 mg g^{-1}. Treatment T_8 (sol:sand:2 weeks decomposed garbage) recorded minimum content of 1.52 mg g^{-1} of total chlorophyll at the end of the study and was at par with T_7 (soil : sand : fresh garbage) and T_{11}(2 weeks decomposed municipal garbage) which recorded 1.53 mg g^{-1} and 1.59 mg g^{-1}, respectively.

Data pertaining to the nutrient content of seedlings reveal that maximum content of nitrogen (3.74%) at the end of the study period was recorded by treatment T_3 (soil: sand: cowdung) and was followed by treatment T_{12} (4 weeks decomposed garbage) which recorded 3.63 per cent (Table 5). Similar observations were reported by Adersh (2001). In the case of teak and mangium seedlings, shoot growth of plants is reported to be highly influenced by nitrogen. In the present investigation also, the seedlings which showed high tissue nitrogen concentration showed better performance with regard to shoot growth attributes *viz.*, height, collar diameter, fresh and dry weights of shoots. Maximum concentration of potassium and phosphorous was also recorded by seedlings grown in treatment T_3(soil: sand: cowdung). Scientific studies reveal that composting of garbage and other waste materials will improve nutrient availability. Jeyabaskaran (1995) has reported that in the case of sunflower and soybean, content of nitrogen, phosphorous, potassium and sulphur increased with sludge application in the potting medium. This trend was pronounced in the present study also. Increased concentration of nutrients in the seedlings

Table 5 : Effect of potting media on nutrient status (per cent) of seedlings

Treatment No.	Treatment details	N%	P%	K%
T_1	Soil	2.85^{g}	0.20^{h}	0.62^{b}
T_2	Soil:sand (1:1)	2.88^{g}	0.16^{h}	0.58^{c}
T_3	Soil:sand:cowdung (1:1:1)	3.74^{a}	0.37^{a}	0.76^{a}
T_4	Soil:fresh garbage (1:1)	2.84^{g}	0.23^{f}	0.70^{a}
T_5	Soil:2 weeks decomposed garbage (1:1)	3.15^{e}	0.24^{e}	0.41^{c}
T_6	Soil:4 weeks decomposed garbage (1:1)	3.18^{d}	0.23^{f}	0.39^{dc}
T_7	Soil: sand:Fresh garbage (1:1)	2.72^{h}	0.23^{f}	0.39^{dc}
T_8	Soil:sand:2 weeks decomposed garbage (1:1:1)	3.12^{d}	0.26^{c}	0.39^{dc}
T_9	Soil:sand:4 weeks decomposed garbage (1:1:1)	3.54^{c}	0.25^{d}	0.43^{d}
T_{11}	2 weeks decomposed garbage	3.12^{d}	0.26^{c}	0.62^{b}
T_{12}	4 weeks decomposed garbage	3.63^{b}	0.36^{b}	0.53^{c}
	Prob	0.00	0.00	0.00
	S.E.±	0.05	0.01	0.01

Figures with the same alphabets do not differ significantly

Table 6 : Nutrient status of different potting media at the beginning and end of the study period

Treatment No.	Treatment details	N%		P%		K%	
		Initial	Final	Initial	Final	Initial	Final
T_1	Soil	0.28^{bc}	0.66^{abc}	0.06^{bc}	0.27^{bc}	0.16^{cd}	0.21^{h}
T_2	Soi:sand (1:1)	0.23^{e}	0.63^{bc}	0.04^{d}	0.22^{f}	0.15^{de}	0.20^{h}
T_3	Soil:sand:cowdung (1:1)	0.32^{a}	0.72^{a}	0.09^{a}	0.35^{a}	0.19^{a}	0.47^{a}
T_4	Soil:fresh garbage (1:1)	0.26^{d}	0.55^{c}	0.04^{cd}	0.22^{f}	0.18^{ab}	0.30^{d}
T_5	Soil:2 weeks decomposed garbage (1:1)	0.29^{bc}	0.70^{ab}	0.04^{cd}	0.28^{c}	0.15^{e}	0.38^{b}
T_6	Soil:4 weeks decomposed garbage (1:1)	0.27^{d}	0.65^{abc}	0.06^{b}	0.33^{b}	0.17^{bcd}	0.38^{b}
T_7	Soil:sand:fresh municipal garbage (1:1:1)	0.24^{d}	0.63^{d}	0.04^{cd}	0.24^{e}	0.14^{ef}	0.28^{ef}
T_8	Soil:sand :2 weeks decomposed municipal garbage (1:1:1)	0.26^{d}	0.68^{ab}	0.04^{cd}	0.28^{c}	0.18^{abc}	0.24^{g}
T_9	Soil:sand:4 weeks decomposed municipal garbage (1:1:1)	0.25^{d}	0.65^{ab}	0.03^{d}	0.25^{de}	0.18^{abc}	0.30^{de}
T_{11}	2 weeks decomposed municipal garbage	0.27^{cd}	0.66^{ab}	0.07^{b}	0.26^{cd}	0.13^{f}	0.32^{c}
T_{12}	4 weeks decomposed municipal garbage	0.29^{bc}	0.73^{a}	0.06^{bc}	0.34^{ab}	0.18^{abc}	0.27^{f}
	Prob	0.0000	0.0000	0.0000	0.0000	0.0000	0.0400
	S.E.±	0.01	0.01	0.00	0.01	0.01	0.03

Figures with the same alphabets do not differ significantly

grown in potting medium containing cowdung and decomposed garbage may be due to increased availability in those medium.

Nutrient content of the potting media:

Analysis of the nutrient content of nitrogen, phosphorous and potassium in the various potting media used for the study showed that percentage of these nutrient elements were slightly increased at the end of the study period compared to the beginning of the study (Table 6). This trend was more pronounced in potting media containing soil: sand: cowdung (T_3) and four weeks decomposed garbage (T_{12}). The increased concentration may be due to faster nutrient release from cowdung and decomposition of garbage. Rao and Shantharam (1995) have observed that application of garbage to soil improved soil physical, chemical and biological properties. Pascal (1999) has compared the efficiency of fresh and composted garbage for the improvement of soil quality and observed that the improvement was more evident in soils amended with composted garbage residues, in relation to those amended with fresh residues. In the present study, minimum nitrogen and phosphorus content was recorded by treatment T_4 (soil:fresh garbage) and minimum potassium content by treatment T_2 (soil:sand). In general, treatments containing garbage and cowdung recorded a slightly higher values of nitrogen, phosphorous, potassium content at the end of the study period as has been reported by many other workers.

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