EFFECT OF TIMBER TREES RESIDUES AND ITS COMPOST APPLICATION ON GROWTH OF SOME LOCAL TREES GROWN IN EGYPT

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ABSTRACT

The main objective of this study was to find out the best way for using disposal wood wastes in organic manure (compost) for increasing the economical return. Two experiments were designed to study the effect of different soil treatments containing timer trees residues as wastes of sawdust, leaves and bark directly in cultivation (Experiment No.1), as well as using wastes with addition of nitrogen and using compost of different wastes (Experiment No.2). The results of the first experiment revealed that the utilization of eucalypt leaves after mixing with either sand or clay as a source of medium soil without any treatment is recommended for Eucalyptus camaldulensis, Casuarina cunninghamiana and Acacia saligna plantations. On the other hand, the results of the second experiment showed that the utilization of a compost of sawdust, bark and leaves after mixing with sandy and clay soil is recommended for the same species plantation as a growing medium than that of sawdust, bark and leaves supplied directly with nitrogen (ammonium sulfate).

INTRODUCTION

Many Egyptian companies use imported hardwood logs for different wood products. High amounts of wood residues are considered as wooden wastes after the processing industry. Composting is a process, in which organic wastes are converted into organic fertilizers by means of the biological activity under controlled conditions (Anid 1981; kowald *et al.*, 1982; Weber *et al.*, 1987and Rutkowska *et al.*, 2000). Not all composts are like and each must be tested under production conditions in nurseries before it can become an accepted medium in the propagation of seedlings (Schueler *et al.*, 1989; Vogtmann *et al.*, 1989; Still *et al.*, 1972; Fischer *et al.*, 1988; Donald and Visser 1989, and Atanawsova *et al.*, 1990). The horticultural nurseries in newly reclaimed soils of Egypt are in need to organic matter for plant growth and forestation. Therefore, composting of local organic residues such as wood sawdust, bark and leaves is considered recycling of these wastes and residues, which has proved effective and cheap enough to warent extended use. This study focuses on using the timber trees residues as a growth media (raw woody sawdust, bark and leaves) after composting it on the growth parameters of eucalypt, casuarina and acacia seedlings.

MATERIAL AND METHODS

This work was carried out at the Experimental Station of the Faculty of Agriculture, Alexandria University during two successive seasons 1993- 1994 and 1994-1995. Two experiments were undertaken to investigate the effect of timber trees residues (sawdust, bark and eucalypt leaves) mixed with either clay or sand at ratio of 1:1 (v/v) as a growth media on height, number of leaves, dry weight of leaves, stem, roots and survival percentage of the following timber tree species: *Eucalyptus camaldulensis, Casuarina cunninghamiana and Acacia saligna.* Seven mixtures were used as a growing medium including: T_1 (clay soil), T_2 (sand and sawdust 1:1), T_3 (clay soil and sawdust 1:1), T_4 (sand and bark 1:1), T_5 (clay soil and bark 1:1) T_6 (sand and eucalypt leaves 1:1) and T_7 (clay soil and eucalypt leaves 1:1). The pots of 25 cm diameter and about 35 cm depth were used. Specific gravity was determined for the stem seedling in the first experiment only. About 5cm long at 10cm height above ground of stem woody seedling were taken for specific gravity determination using maximum moisture content method (Smith 1961).

To investigate the effect of different growing media including compost, the following compost technique was used: Three piles of compost were made from air dried sawdust, bark and eucalypt leaves, each pile was about 2m wide 2.25 m long at the base, 1.5 m high and 2.25 m at the top (Pioncelot, 1975). Ammonium sulfate was added at the rate of 50 kg /pile, calcium super phosphate was added at the rate of 2.5 kg/pile and water was added to raise moisture content to 50-60% by weight. Sawdust, bark and eucalypt leaves were spreaded in approximately 15 cm deep layer starting with rectangle 2mx 2.25m and wetted with a fine spray. Five kg. of ammonium sulfate and 0.25 kg. of calcium super phosphate were added to each layer. A few kilograms of garden soil were broadcasted to each layer of row materials of compost. The out sides of the piles were kept moist and were rewetted when piles were turned. At the end of composting, the dark (black – brown) color, earthy odor, and fluffy structure were observed.

Twenty mixtures were used as a growing media (Table,1). The polyethylene bags of 12 cm in diameter and 20cm in depth were used, Tap water was used for irrigation every 2-3 days, or whenever it was needed. Growth responses to treatments were determined by the following parameters: height of seedling (cm), survival percentage, number of leaves, dry weight of

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leaves (g) of *Eucalyptus camaldulensis* and *Acacia saligna*, dry weight of stems, and roots (g) for the three tree species.

Chemical analyses were determined in the digested material of eucalypt leaves, bark, sawdust and their composts. Organic carbon and total nitrogen were determined using the method of Black (1965). Phosphorus was determined by the vanadomolybdate yellow method (Jackson, 1958) Manganese, zinc and copper were analyzed by atomic absorption spectrophotometry. Statistical analysis was carried out using split plot design (main plot is species and sub-plot is treatments) and least significant differences (L.S.D) (Neter *et al.* 1990) to detect the significance of the differences among the means of treatments.

RESULTS AND DISCUSSIONS

First experiment:

The mean values of the growth parameters for *Eucalyplus camaldulensis, Casuarina cunninghamiana and Acacia saligna* seedlings as affected by different soil treatments are presented in Table (2). It is clear from the results that all soil treatments except T_6 (leaves and sand) and T_7 (leaves and clay soil) decreased seedling height, leaves number per seedling (L.N.), leaves dry weight (L.D.W.), stem and roots of *Eucalyptus camaldulensis*, *Acacia saligna* and seedling height, dry weight of stems and roots of *Casuarina cunninghamiana*. The highest mean values of growth parameters were noticed in case of T_6 (leaves and sand) for *Eucalypts camaldulensis* seedlings and T_7 (leaves and clay) for *Casuarinas cunning- hamiana* and *Acacia saligna* seedlings. The highest height of *Eucalypts* seedlings was 62.1 cm, leaves number was 28.10, dry weight of leaves was 3.81g, dry weight of stem was 3.92(g) and dry weight of roots was 7.45 g. The highest mean values of *Casuarina* seedlings were: height of seedlings 67.4 cm, dry weight of stem 7.84 g, and dry weight of roots 7.15g. The best height of seedlings of *Acacia saligna* was 57.5cm, number of leaves was 17.6, dry weight of leaves was 7.24 g, dry weight of stem was 5.0 g and dry weight of root was 3.18 g. The lowest growth parameters were noticed with the treatments of T_2, T_5 for *Eucalyptus camaldulensis* seedlings and T_2, T_4 for *Casuarina cunninghamiana* seedlings and T_2, T_3 for *Acacia saligna* seedlings.

Adding organic wastes without any treatments increased specific gravity over the other treatments although the differences were not significant. The interaction between spices and soil treatments was not significant for specific gravity.

In general, the best medium for *Eucalyptus camaldulensis* seedling was sand mixed with eucalypt leaves and for *Casuarina cunninghamiana* and *Acacia saligna* seedlings was clay soil mixed with eucalypt leaves.

It can be concluded that, utilization of eucalypt leaves as a source of soil media after being mixed with sandy or clay soil was recommended when compared to woody sawdust and bark residues for seedlings production.

Second experiment:

The mean values of growth parameters for *Eucalyptus camaldulensis*, *Casuarina cunninghamiana* and *Acacia saligna* seedlings were compared and the results were given in Table (3). The results indicated that, T_{15} (composted sawdust + sand) achieved the best values of *Eucalyptus camaldulensis* seedlings growth parameters. The mean value of seedling height was 45.3 cm, leaves number was 38, weight of leaves was 1.89 g, and 1.12 g for stem and 0.92 g for roots. On the other hand, the lowest parameters were noticed for the treatment T_4 (sawdust+ clay soil) and T_5 (bark + sand).

The lowest mean values were 9.3, and 10.9 cm for height, 7.2 and 11.0 for number of leaves, 0.54 and 6.4 g for dry weight of leaves, 0.23 and 0.25 g for dry weight of the stem and 0.07 and 0.12 g for dry weight of roots, respectively. Increasing rates of growth as a result of using composted materials mixed with soil was also noticed by many researchers (Soliva *et al.*, 1984; Bailly *et al.*, 1989; Gouin 1989; Zeng *et al.*, 1992 and Atiyeh *et al* 2002).

The best growth parameters of *Casuarina camaldulensis* seedling were the obtained with the treatment T_{16} (composted sawdust + clay soil) with averages of 48.3 cm for seedling height, 0.80 g for stem dry weight, 2.6 g for roots dry weight. On the other hand, the lowest growth parameters were noticed with the treatment (bark+sand). The lower rate of growth resulted of using bark compost in some ornamental plants was noticed also by some worker (Bailly *et al.*, 1989; Donald and Visser 1989 and Atanasova *et al.*, 1990). The best results of using composted sawdust may be due to that the decomposition of sawdust was more rapid than bark (Atanasova *et al.* 1990).

The best growth parameters of *Acacia saligna* seedling were noticed due to using different composted materials (T_{15}–T_{20}) but the best treatment was T_{16} (composted sawdust + clay). The height of seedlings was 66.3cm, leaves number was 29.2 and 6.41, 0.80 and 1.91 g for leaves dry weight, stem dry weight and roots dry weight, respectively. T_9 (sawdust +sand), T_{10} (sawdust + clay with adding nitrogen) gave the lowest values of the growth parameters. From the results, it is clear that soil treatments affected significantly the survival percentage but the values were equal except for sawdust and clay soil which significantly decreased the survival percent as compared to clay soil. On the other hand, the differences between trees were not significant in survival. The best survival was noticed in *Acacia saligna*, followed by *Casuarina cunninghamiana* and *Eucalyptus camaldulensis*.

The results in Table (3) showed the phosphorus, potassium manganese, zinc and copper in the

Table (1) Twenty media used as agowing medium for *Eucalyptus camaldulensis*, *Casuarina cunninghamiana* and *Acacia saligna* seedlings in the second experiment.

Treatments	Media	Ratio	Treatments	Media	Ratio
T_1	Clay soil	1_	T_{11}*	Bark + sand	1:1
T_2	Sand	1_	T_{12}*	Bark + clay soil	1:1
T_3	Sawdust+ sand	1:1	T_{13}*	Leaves + sand	1:1
T_4	Sawdust + clay soil	1:1	T_{14}*	Leaves + clay soil	1:1
T_5	Bark + sand	1:1	T_{15}	Composted sawdust + sand	1:1
T_6	Bark + clay soil	1:1	T_{16}	Composted sawdust + clay soil	1:1
T_7	Leaves + sand	1:1	T_{17}	Composted bark + sand	1:1
T_8	Leaves + clay soil	1:1	T_{18}	Composted bark + clay soil	1:1
T_9*	Sawdust + sand	1:1	T_{19}	Composted leaves + sand	1:1
T_{10}*	Sawdust + clay soil	1:1	T_{20}	Composted leaves + clay soil	1:1

* 10 kg of ammonium sulfate and 0.5 kg calcium superphosphate were added per m^3 sawdust, bark or eucalypt leaves.

Table (2) Effect of different soil treatments on height , cm (H) , leaves number (LN) leaves weight ,g (LDW) , stem dry weight, g (SDW), root dry weight, g (RDW) and survival percentage (S%) of *Eucalyptus camaldulensis* (E) , *Casuarinas cunninghamiana* (C) and *Acacia saligna* (A) . (First experiment).

Treatments	Height in cm (H)			Leaves number (LN)		Leaves dry weight in g. (W)		Stems dry weight in g. (SDW)			Roots dry weight in g. (RDW)			Mean survival of the treatment
	E	C	A	E	A	E	A	E	C	A	E	C	A	———
T_1	57.2^{b}	60.7^{b}	42.7^{b}	24.1^{b}	16.1^{a}	3.55^{b}	3.86^{b}	3.22^{b}	4.25^{b}	3.54^{b}	5.85^{b}	7.44^{b}	4.46^{a}	100.00^{a}
T_2	16.5^{f}	16.3^{g}	9.7^{d}	12.9^{e}	6.0^{de}	0.33^{de}	0.54^{e}	0.12	0.12^{f}	0.05^{d}	0.29^{f}	0.12^{g}	0.29^{g}	100.0^{ab}
T_3	39.7^{d}	37.1^{e}	9.5^{d}	23.4^{b}	5.5e	2.57^{c}	0.43^{d}	1.37^{d}	1.92^{d}	0.05^{d}	2.87^{d}	1.60^{d}	0.24^{d}	80.00^{d}
T_4	20.7^{g}	21.3^{f}	20.6^{d}	12.6^{e}	7.7^{de}	0.56^{d}	1.24^{d}	0.32^{d}	0.48^{e}	0.40^{d}	0.57^{e}	0.90^{f}	0.95^{d}	95.56^{a}
T_5	16.9^{f}	50.7^{d}	25.1^{c}	13.2^{c}	10.3^{b}	0.31^{e}	1.80^{b}	0.25^{e}	2.03^{d}	0.76^{d}	0.54^{e}	2.10^{d}	1.21^{c}	95.56^{a}
T_6	62.1^{a}	56.8^{c}	21.3^{d}	28.1^{a}	8.7^{bc}	3.81^{a}	1.59^{c}	3.92^{a}	2.96^{c}	0.44^{d}	7.45^{a}	3.64^{c}	1.10^{d}	100.00^{a}
T_7	51.7^{c}	67.4^{a}	57.5^{a}	22.8^{b}	17.6^{a}	2.68^{c}	7.24^{a}	2.61^{c}	7.84^{a}	5.00^{a}	4.95^{c}	7.15^{a}	3.18^{b}	100.00^{a}

-The mean values sharing the same letter in column are not significantly different according to L.S.D test at 5% level .

- T_1- T_7:- T_1: clay soil, T_2 : sawdust + sand , T_3: sawdust + clay soil, T_4 : bark + sand, T_5: bark + clay soil , T_6 : leaves and sand , T_7: leaves + clay soil.

Table (3) Effect of different soil treatments on height (cm) ,leaves number , leaves dry weight (g), stem dry weight (g), roots dry weight (g) and survival percentage of *Eucalyptus camaldulensis* (E) , *Casuarina cunninghamiana* (C) and *Acacia saligna* (A),(second experiment) .

Treatment	Height ,cm			Leaves number		Leaves dry weight , (g)		Stem dry weight gram			Root dry weight gram			Mean of survival treatments
	E	C	A	E	A	E	A	E	C	A	E	C	A	
T_1	22.3^{ij}	38.3^{cde}	54.2^{a}	28.9^{d}	21.9^{de}	1.29^{cdef}	3.48^{f}	0.50^{def}	0.35^{efg}	1.79^{a}	0.57^{fg}	0.20^{b}	1.01^{f}	91.11^{abc}
T_2	20.6^{jk}	27.3^{gh}	45.4^{f}	20.9^{g}	18.1^{f}	1.12^{defg}	2.67^{g}	0.42^{fg}	0.25^{gh}	0.75^{fg}	0.36^{g}	0.07^{f}	0.87^{fg}	93.33^{ab}
T_3	12.9^{lm}	17.7^{j}	40.6^{g}	12.5^{j}	15.4^{g}	0.98^{efgh}	2.12^{h}	0.28^{gh}	0.21^{i}	0.54^{g}	0.16^{h}	0.07^{f}	0.76^{j}	82.22^{d}
T_4	9.3^{m}	21.5^{i}	49.0^{e}	7.2^{k}	18.2^{f}	0.64^{gh}	2.88^{g}	0.23^{i}	0.26^{gh}	0.78^{f}	0.07^{g}	0.08^{ef}	0.80^{i}	91.11^{abc}
T_5	10.9^{mn}	18.3^{j}	23.8^{k}	11.0^{jk}	13.7^{gh}	0.64^{gh}	1.90^{hi}	0.25^{hi}	0.22^{i}	0.31^{jk}	0.12^{hi}	0.05^{j}	0.46^{l}	95.56^{a}
T_6	19.8^{kl}	25.8^{hi}	30.0^{j}	18.8^{i}	17.6^{f}	1.09^{defg}	2.94^{g}	0.53^{cde}	0.36^{efg}	0.45^{i}	0.34^{i}	0.09^{def}	0.51^{k}	91.11^{abc}
T_7	21.9^{ijk}	25.9^{hi}	23.2^{k}	23.2^{g}	14.9^{gh}	1.32^{cdef}	2.11^{h}	0.54^{cde}	0.28^{gh}	0.69^{g}	0.53^{b}	0.08^{ef}	0.47^{l}	84.44^{bc}
T_8	23.9^{ijk}	28.1^{g}	35.7^{i}	29.2^{d}	21.2^{e}	1.42^{bcde}	3.62^{ef}	0.44^{efg}	0.39^{ef}	0.74^{fg}	0.58^{f}	0.08^{ef}	0.84^{h}	91.11^{abc}
T_9	30.7^{efg}	31.5^{f}	12.5^{no}	35.9^{b}	6.0^{ij}	1.82^{abc}	1.41^{ijk}	0.60^{cd}	0.43^{e}	0.39^{ij}	0.74^{b}	0.12^{cde}	0.20^{o}	95.56^{a}
T_{10}	25.1^{gh}	28.2^{g}	18.4^{l}	30.0^{c}	10.2^{j}	1.36^{cdef}	1.61^{ijk}	0.57^{cde}	0.38^{ef}	0.27^{gh}	0.40^{h}	0.09^{def}	0.19^{o}	93.33^{ab}
T_{11}	26.3^{fg}	28.1^{g}	17.2^{l}	33.2^{c}	8.3^{ij}	1.46^{bcde}	1.49^{ijk}	0.51^{cde}	0.37^{ef}	0.46^{hi}	0.60^{c}	0.1^{cde}	0.24^{n}	88.89^{abc}
T_{12}	12.5^{lm}	22.4^{i}	17.0^{l}	15.0^{i}	8.3^{ij}	0.80^{fgh}	1.25^{jk}	0.28^{gh}	0.31^{fgh}	0.32^{jk}	0.31^{ij}	0.07^{f}	0.14^{p}	97.78^{a}
T_{13}	22.5^{ij}	29.0^{g}	24.6^{k}	28.7^{de}	13.3^{gh}	1.16^{defg}	1.82^{hij}	0.41^{fg}	0.40^{e}	0.41^{i}	0.38^{j}	0.10^{de}	0.41^{m}	93.33^{ab}
T_{14}	15.6^{l}	28.5^{g}	13.1^{no}	16.0^{i}	6.1^{ij}	0.99^{efgh}	1.03^{kl}	0.32^{fg}	0.37^{ef}	0.29^{gh}	0.19^{kl}	0.08^{ef}	0.20^{o}	91.11^{abc}
T_{15}	45.5^{b}	40.3^{bcd}	59.3^{b}	38.9^{b}	28.1^{b}	1.89^{ab}	6.01^{b}	1.12^{b}	0.65^{bcd}	2.38^{d}	0.92^{b}	0.15^{c}	1.77^{b}	93.33^{ab}
T_{16}	27.4^{ef}	48.3^{b}	66.3^{a}	26.3^{f}	29.2^{b}	1.62^{abcd}	6.41^{b}	0.52^{cdef}	0.80^{b}	2.60^{b}	0.60^{c}	0.27^{a}	1.91^{b}	84.33^{abc}
T_{17}	32.7^{c}	37.2^{def}	59.1^{b}	27.1^{ef}	23.8^{bc}	1.70^{abcd}	4.24^{d}	056^{cde}	0.60^{cd}	2.31^{e}	0.65^{c}	0.13^{d}	1.68^{b}	82.22^{d}
T_{18}	$35.0b$	39.3^{bcd}	42.9^{fg}	29.7^{d}	22.7^{cde}	1.82^{ab}	4.78^{c}	0.91^{b}	0.58^{cde}	1.97^{d}	0.66^{c}	0.19^{b}	1.26^{d}	995.56^{a}
T_{19}	30.8^{def}	36.3^{e}	46.1^{f}	28.5^{de}	22.9^{cde}	1.67^{abcd}	3.98^{de}	0.56^{cde}	0.56^{d}	1.96^{d}	0.56^{d}	0.13^{d}	1.10^{g}	97.78^{a}
T_{20}	29.0^{def}	41.9^{b}	51.3^{d}	25.7^{f}	25.4^{b}	1.49^{abcd}	5.32^{b}	0.53^{cde}	0.71^{b}	2.85^{a}	0.62^{c}	0.15^{c}	1.67^{c}	91.11^{abc}

- The mean values sharing the same letter in column are not significantly different according to L.S.D Test at 5% level.
- T_1–T_{20}: See Table (1) .

Table (4) Phosphorus, potassium, manganese, zinc and copper in the composted material and their mixture with sandy soil

Treatment	P%	K%	Micronutrients (mg/kg)		
			Mn	Zn	Cu
Composted sawdust	0.274	0.47	233.33	101.00	43.33
Composted bark	0.094	0.25	86.33	80.33	45.33
Composted leaves	0.244	0.39	176.67	101.67	43.33
Sawdust and sand	0.013	0.28	40.00	59.3	43.7
Bark and sand	0.46	0.24	40.00	39.00	36.3
Leaves and sand	0.081	0.31	60.00	71.30	71.00

composted material and their mixture with sandy soil. The results indicated that composted sawdust had the highest values of phosphorus (0.227%), potassium (0.47%) and some micronutrients as Mn (233.3 mg/kg) and zinc (101.0mg/kg), whereas the lowest contents of these elements were obtained from the bark composted. On the other hand, leaves waste increased Mn, Zn and Cu in the media. The increase of most nutrients of sawdust compost may be due to that, the decomposition of sawdust was more rapid than that of bark (Atanasova et al. 1990). Increasing the availability of most nutrients was also found by others (Hardy and Sivasithamparam 1989; Sikora and Enkiri 1999). The results also indicated that the lowest contents of some nutrients were noticed in composted bark, similar results were obtained by Bailly et al., (1989), Donald and Visser (1989) and Atanasova et al (1990).

From the obtained results, it can be concluded that the utilization of composted sawdust, composted bark and composted leaves after mixing with sand or clay for *Eucalyptus camaldulensis*, *Casuarina cunninghamiana* and *Acacia saligna* seedlings as a growth medium is recommended than sawdust, bark, leaves, either alone or mixed with nitrogen. On the other hand, utilization of leaves after mixing with sandy or clayey soil as a source of medium without any treatments for *Eucalyptus camaldulensis*, *Casuarina cunninghamiana* and *Acacia saligna* seedlings is recommended due to superiority than any other treatment.

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الملخص العربى

تأثير استخدام مخلفات الأشجار الخشبية ومكمورتها على نمو بعض الأشجار المحلية النامية في مصر

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درس استخدام مخلفات الأشجار الخشبية في الزراعة كوسيلة لإعادة استخدامها مرة أخرى بهدف إيجاد الطريقة المثلى للتخلص من هذه المخلفات حماية للبيئة عن طريق إجراء عملية الكمر لهذه المخلفات وهو ما يطلق عليه اسم الكومبوست. وقد أجري هذا البحث بمزرعة كلية الزراعة – جامعة الإسكندرية خلال موسمي النمو (١٩٩٣/ ١٩٩٤)، (١٩٩٤/١٩٩٥) حيث أشتمل على تجربتين:

أولاً: التجربة الأولى

درس تأثير معاملات التربة المختلفة والتي تتكون من مخلفات الأشجار الخشبية (النشارة والقلف و أوراق أشجار الكافور) عند خلطها مع التربة الطينية أو الرملية بنسبة ١:١ (حجما) على بعض صفات شتلات ثلاثة أنواع من الأشجار الخشبية وهي الكافور والكازوارينا والأكاسيا. وذلك خلال موسم النمو الأول (١٩٩٣/١٩٩٤) لتحديد مدى إمكانية استخدام هذه المخلفات مباشرة في الزراعة حيث أوضحت النتائج أنه كانت هناك فروق معنوية عالية بين الأنواع المختلفة في كل الصفات المدروسة ما عدا النسبة المئوية للحيوية أو البقاء.

وقد كان هناك نقص واضح في صفات النباتات نتيجة لتأثير وجود المخلفات ما عدا في حالة استخدام أوراق الكافور مع التربة الطينية والتي حدث فيها زيادة معنوية في ارتفاع النبات والوزن الجاف للأوراق والسيقان.

وبوجه عام كانت أفضل بيئة لنمو شتلات الكافور هي استخدام مخلفات أوراق الكافور مع التربة الطينية وعليه ينصح باستخدامها كبيئة لنمو الشتلات عند خلطها مع التربة الرملية أو الطينية عن استخدام النشارة أو القلف لإنتاج الشتلات.

ثانياً: التجربة الثانية

درس تأثير استخدام المخلفات على نمو شتلات الأنواع الشجرية السابق ذكرها حيث استخدمت المخلفات في حالتها الخام مباشرة في الزراعة وأيضا استخدمت بعد إضافة نيتروجين معدني لها (إسلفات الأمونيوم) وعند كمرها (compost) حيث تم عمل كومة بحجم ٥م^3 من المخلفات وإضافة نيتروجين مع كمية من التربة الطينية كمصدر للكائنات الحية مع رفع المحتوى الرطوبي إلى حوالي ٦٠% وتم خلط هذه المخلفات مع التربة الرملية أو مع التربة الطينية بنسبة ١:١ حجما.

وتتلخص أهم النتائج المتحصل عليها في الآتي:-

- كان استخدام النشارة وأوراق الكافور والقلف المكمور كبيئة للنمو أفضل عند خلطها بالتربة الرملية أو الطينية من استخدام هذه المخلفات بدون إجراء عملية كمر لها وكذلك أفضل من استخدامها في صورتها الخام مع إضافة النيتروجين المعدني وإن كان استخدام مخلفات أوراق الكافور أو أوراق الكافور مع النيتروجين المعدني موصي به لإنتاج الشتلات خصوصاً في التربة الرملية والتي تفوقت على الكنترول (التربة الرملية فقط).
- وجد أن أفضل بيئة لإنتاج شتلات الكازوارينا والأكاسيا كانت النشارة المكمورة مع التربة الطينية كما وجد أن النشارة المكمورة بها أعلى كمية من الفوسفور والبوتاسيوم وبعض العناصر المعدنية مثل المنجنيز والزنك والنحاس في بيئة النمو بينما أدت مخلفات القلف إلي خفض هذه العناصر.

مما سبق يمكن القول أن استخدام كل من النشارة والقلف والأوراق بعد كمرهم وخلطهم بالتربة الرملية أو الطينية يعتبر مصدر لبيئة نمو جيدة يوصي بها عن استخدام أي منها في صورتها الخام أو مع النيتروجين وعلى الجانب الآخر ينصح باستخدام أوراق الكافور بعد خلطها بالتربة الرملية أو الطينية بدون أي معاملات كبيئة للنمو وذلك لتفوقها على الكنترول (تربة طينية أو رملية فقط) لإنتاج شتلات الكافور والكازوارينا والأكاسيا.