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RESPONSE OF *ANTIDESMA BUNIUS* TREE SEEDLINGS TO SOME AGRICULTURAL TREATMENTS

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ABSTRACT

The present study was carried out at the Nursery of Ornamental plants, Fac. of Agric., Minia Univ., during the two seasons of 2018 and 2019 to study how to improve the growth of *Antidesma bunius* seedlings grown in sandy soils by adding compost at 25, 50 and 100 g/container and control as main plot (A) and fertilizing plants with bio. and/or mineral NPK fertilization treatments as sub plots (B).

All treatments of compost and fertilizing plants with bio. and/or mineral NPK had positive effects on plant growth. The best growth of seedling was obtained by adding compost at 100 g/container in combination with 75 % NPK + E.M. or 100 % NPK.

Keywords: organic and bio-fertilization, *Antidesma bunius* and E.M.

INTRODUCTION

The Bignay (*Antidesma bunius* (L.) Spreng.) tree belongs to the phyllanthaceae family. It is native and common in the wild from the lower Himalayas in India, Ceylon, and southeast Asia (but not Malaya) to the Philippines and northern Australia. It is an abundant and invasive species in the Philippines; occasionally cultivated in Malaya; grown in every village in Indonesia where the fruits are marketed in clusters (Morton, 1987).

Ripe fruits are eaten fresh or cooked. Acid green fruits are used as flavoring in fish soup dishes. The fruits are also made into jam, preserves or are used in combination with other fruits, because of their high pectin content to make jelly. The fruits are also utilised in the production of syrup, soft drinks, wine, liqueur and brandy or are used in sauces for fish dishes. The pulp can be used for desserts like cakes, bavarois or ice cream. The young, tender leaves are eaten with rice in Indonesia and the Philippines. The leaves are often combined with other vegetables as flavouring. The leafy shoots are used for tea in China (Samappito, 2008).

Organic manures can serve as alternative to mineral fertilizers for improving soil structure and microbial biomass (Mansour, 2002; Suresh *et al*., 2004; Ahmed *et al*., 2006; Roberts, 2006; Dauda *et al*., 2008; Kitczak and Czyz, 2014 and Soliman, 2019).

Many authors concluded that used mineral fertilizers improved all vegetative and chemical components of plants such as Tripathi *et al*. (2012) on poplar, Abdullahi *et al*. (2013), Hussein *et al.* (2014) on jojoba, Singh (2015) on *Leuceana leucacephala* and Patel and Suresh (2018) on *Swietenia macrophylla*.

Inoculation plants with biofertilizers treatments increased plants growth and chemical parameters as emphasized by Sakr (2005) on *Cassia acutifolia*, Ouahmane *et al.* (2009) on *Pinus halepensis*, Abdou and Ashour (2012) on jojoba seedlings and Soliman (2019) on *Moringa peregrina*.

Therefore, the goal of this work was to investigate the effect of compost and bio. and/or mineral NPK treatments on growth and chemical constituents of Bignay (*Antidesma bunius*, (L). *Spreng*) seedlings.

MATERIALS AND METHODS

The present study was carried out for two seasons (2018 and 2019) at the Nursery of Ornamental plants, Fac. of Agric., Minia Univ.

The seeds of Bignay were obtained from El-Nabatat Island, Aswan Govrnorate, and sown in first day in March for both seasons in containers (25x25x35 cm), each filled with 20 kg of sandy calcareous soil plus adding the three levels of compost (25, 50 and 100 g/container and control as main plot [A]). Each container contains three seeds and seedlings were thinned to one seedling/container after four weeks from sowing date (28th March). Physical and chemical properties of the used soil are shown in Table (a).

The used compost called compost El-Neel. The physical and chemical properties of the used compost are shown in Table (b).

Table (a): Physical and chemical properties of the used soil before planting of Bignay during 2018 and 2019 seasons.

Character	Value		Character		Value	
	2018	2019			2018	2019
Sand %	88.09	89.38	Total N %		0.03	0.02
Silt %	8.34	7.63	Available P %		3.56	3.61
Clay %	3.72	3.03	Extr. K (mg/100 g soil)		0.94	0.99
Texture	Sandy	Sandy	Fe		1.15	1.21
$CaCO_3$ %	14.49	14.94	DTPA	Cu	0.38	0.44
pH (1: 2.5)	8.21	8.23	Ext. ppm	Zn	0.36	0.33
Organic matter %	0.04	0.03		Mn	0.74	0.72
E. C. (m mhos / cm)	1.11	1.10				

Table (b): Physical and chemical properties of the used compost:

Properties	Value	Properties	Value
Dry weight of 1 m^3	450 kg	NaCl (%)	1.1-1.75
Fresh weight of 1 m^3	650-700 kg	Total P (%)	0.5-0.75
Moisture (%)	25-30	Total K (%)	0.8-1.0
pH 1:10	7.5-8	Fe (ppm)	150-200
E.C. (m mhose/cm)	2-4	Mn (ppm)	25.56
Total N (%)	1-1.4	Cu (ppm)	75-150
Org. matter (%)	32-34	Zn (ppm)	150-225
Org. carbon (%)	18.5-19.7		
C/N ratio	18.5-14.1		

The sub plots (B) were as follows: b_1, control; b_2, 100 % of mineral NPK as ammonium sulphate (20.5 % N), calcium superphosphate (15.5 % P_2O_5) and potassium sulphate (48 % K_2O) as recommended dose (Abdou *et al*., 2016); b_3, 75 % NPK; b_4, 75 % NPK + Minia Azotein (M.A. biofertilizer); b_5, biofertilizers (Minia Azotein + Phosphorein); b_6, 75 % NPK + Effective microorganisms (E.M.) and b_7, biofertilizers (Effective microorganisms + Phosphorein).

Fresh and active biofertilizers, Minia Azotein and effective microorganisms E.M. (containing N-fixing bacteria) and Phosphorein (containing phosphate dissolving bacteria) were obtained from the Laboratory of Biofertilizers, Department of Genetic, Fac. of Agric., Minia University. Biofertilizers were applied three times to the soil beside the plants at the rate of 50 cm^3/hill (1 ml=107 cells of bacteria). The first dose, for both M.A., E.M. and Phosphorein was added 33 days from sowing date (2nd April) and repeated 60 days thereafter (2nd June and 2nd August) and then plants irrigated immediately.

Mineral NPK was used as 6 g/container ammonium sulphate (20.5 % N) (equal 300 kg/fed.), 3 g/container calcium superphosphate (15.5 % P_2O_5) (equal 150 kg/fed.) and 1.5 g/container potassium sulphate (48 % K_2O) (equal 75 kg/fed.) for the treatment of 100 % mineral NPK. While, 75 % mineral NPK was represented by 4.5, 2.25 and 1.125 g/container.

The amounts of NK were divided to three equal batches and added after 7 days from each biofertilizer treatments (9 April, 9 June and 9 August). All amounts of P were added during preparing the soil to sown the seeds for each season. The following data were recorded at the harvesting time:

Vegetative growth parameters:

(1) Plant height (cm),
(2) Stem diameter (cm),
(3) Number of branches/plant,
(4) Leaf area (cm^2),
(5) Aerial parts fresh weight (g) and
(6) Aerial parts dry weight (g).

Chemical composition

1- Chlorophyll a, b and carotenoids (mg/g. fresh leaves).

2- Elements percentages (N, P and K).

The photosynthetic pigments namely, chlorophyll a, b and carotenoids were determined according to Moran (1982). Nitrogen % was determined by using the modified micro-khjeldahl method as described by Wilde *et al*. (1985). Phosphorus % was determined according to the method of Chapman and Pratt (1975), while Potassium % was estimated using flame-photometry method according to Cottenie *et al*. (1982).

Statistical analysis

The obtained data were tabulated and statistically analyzed according to MSTAT-C (1986) and the L.S.D. test at 5 % was followed to compare between the means.

RESULTS AND DISCUSSIONS

A- Vegetative growth parameters

Data presented in Tables (1, 2 and 3) revealed that supplying the growing media of *Antidesma bunius* with the three levels of compost (25, 50 and 100 g/container) resulted in a significant increase in the plant growth parameters namely, plant height, stem diameter, number of branches/plant, leaf area and weights of fresh and dry of aerial parts of *Antidesma bunius* seedlings over the control in both growth seasons.

Also, these six characters were significantly increased due to the use of all bio. and/or mineral NPK fertilization treatments facing of the control treatment. Among the six fertilization treatments, the treatment of 75 % NPK + Effective microorganisms followed by 100% NPK produced significantly the highest values in this concern.

The interaction between compost and bio. and/or NPK fertilization treatments was significant for all six studied parameters in both seasons as clearly shown in Tables (1, 2 and 3). The highest values were obtained due to supplying plants with high level of compost (100 g/container) in combination with 75% NPK + Effective microorganisms or 100 % NPK.

The superiority of compost, especially 100 g/plant may be attributed to the mode of action of organic manure on the physical, chemical and biological soil characters, leading to increase the plant height (Follet *et al*. 1981 and Saha *et al*., 1995), organic manures can use as alternative to mineral fertilizers for enhancing soil structure and microbial biomass. Similar results were obtained by several authors (Mansour, 2002; Suresh *et al*., 2004; Ahmed *et al*., 2006; Roberts, 2006; Dauda *et al*., 2008; Kitczak and Czyz, 2014 and Soliman, 2019).

The superiority of reduced dose (75%) plus Effective microorganisms or full dose of mineral NPK (100%) may be attributed to inoculation by biofertilizer which increases soil available nitrogen, plant hormones consequently increase formation of metabolites which encourage the plant growth (Spernat, 1990). Moreover, positive role of NPK on plant physiological processes (Devlin, 1972). Many researchers emphasized that using mineral fertilizers improved all vegetative and chemical components of plants such as Tripathi *et al*. (2012), Abdullahi *et al*. (2013), Hussein *et al.* (2014), Singh (2015), Patel and Suresh (2018) and Agera *et al*. (2019).

Biofertilizers treatments increased plants growth and chemical parameters as highlighted by Sakr (2005), Ouahmane *et al.* (2009), Abdou and Ashour (2012) and Soliman (2019).

These results of pigments and elements percentages may be attributed to the increase in nutrient elements, N, P, K and Mg which came as a result from adding compost and deanalyzed such organic matters that reflected on the pigments content (Wroblewsha *et al.,* 2009 and Ahmedloo *et al.*, 2012) and elements percentages (Anamayi *et al*., 2016 and Soliman, 2019).

Data also indicated that all used six treatments of fertilization significantly increased chlorophyll a, b and carotenoids content and elements of N, P and K % as compared to control treatment in both seasons. The best results were obtained by supplying plants with 75% NPK + E.M. or 100 % NPK as shown in Tables (4, 5 and 6).

These positive effects on bio. and/or mineral NPK fertilization on pigments and NPK percentages may be due to the role of N, P, K and the effect of E.M. which produced cytokinins, enzymes such producing more photosynthetic pigments and delayed of leaf senescence.

The interaction between main and sub plots (A×B) treatments was significant for pigments and N, P and K in both seasons. The best interaction treatments were 100 g/container compost and adding 75% NPK + E.M. or 100 % NPK.

B- Chemical constituents

Data presented in Tables (4, 5 and 6) indicated that using compost at 25, 50 and 100 g/container significantly increased the three photosynthetic pigments content (i.e. chlorophyll a, b and carotenoids) and the percentage of N, P and K comparing to control plants during both seasons. Supplying plants with high level of compost (100 g/plant) resulted in the highest content and percentages of pigments and elements, respectively.

Table (1): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on plant height (cm) and stem diameter (cm) of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels, g/container (A)									
	control	25(g)	50(g)	100(g)	Mean (B)	control	25(g)	50(g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
Plant height (cm)										
Control	61	73	83	93	78	65	78	90	99	83
100 % NPK	77	92	107	117	98	79	94	108	118	100
75 % NPK	72	86	98	108	91	74	89	102	112	94
75 % NPK + M.A.	74	89	102	112	94	76	91	105	115	97
M.A. + Phos.	65	78	90	99	83	69	82	96	104	88
75 % NPK + E.M.	79	95	109	120	101	77	95	109	121	101
E.M. + Phos.	70	84	96	106	89	73	88	101	110	93
Mean (A)	71	85	98	108		73	88	102	111	
L.S.D. at 5 %	A: 8.0		B: 2.5		AB: 5.0	A: 9.0		B: 2.0		AB: 4.0
Stem diameter (cm)										
Control	1.10	1.32	1.49	1.67	1.40	1.20	1.44	1.66	1.83	1.53
100 % NPK	1.38	1.65	1.93	2.11	1.77	1.46	1.73	1.99	2.18	1.84
75 % NPK	1.29	1.55	1.77	1.95	1.64	1.36	1.64	1.88	2.07	1.74
75 % NPK + M.A.	1.33	1.61	1.83	2.02	1.70	1.40	1.65	1.94	2.12	1.78
M.A. + Phos.	1.17	1.41	1.62	1.79	1.50	1.27	1.51	1.77	1.92	1.62
75 % NPK + E.M.	1.48	1.71	1.97	2.16	1.83	1.42	1.75	2.01	2.23	1.85
E.M. + Phos.	1.26	1.52	1.73	1.91	1.61	1.35	1.63	1.86	2.03	1.72
Mean (A)	1.29	1.54	1.76	1.94		1.35	1.62	1.87	2.05	
L.S.D. at 5 %	A: 0.14		B: 0.03		AB: 0.06	A: 0.16		B: 0.04		AB: 0.08

Table (2): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on branches/plant and leaf area (cm^2) of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels, g/container (A)									
	control	25 (g)	50 (g)	100 (g)	Mean (B)	control	25 (g)	50 (g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
	Number of branches/plant									
Control	1.01	1.13	1.19	1.28	1.15	1.03	1.16	1.22	1.30	1.18
100 % NPK	1.15	1.27	1.43	1.63	1.37	1.18	1.29	1.44	1.67	1.39
75 % NPK	1.12	1.24	1.36	1.48	1.30	1.14	1.26	1.38	1.46	1.31
75 % NPK + M.A.	1.14	1.25	1.40	1.60	1.35	1.17	1.27	1.42	1.54	1.35
M.A. + Phos.	1.02	1.17	1.26	1.39	1.21	1.04	1.20	1.28	1.39	1.23
75 % NPK + E.M.	1.18	1.34	1.51	1.67	1.43	1.21	1.31	1.51	1.71	1.43
E.M. + Phos.	1.09	1.23	1.35	1.41	1.27	1.11	1.22	1.37	1.43	1.28
Mean (A)	1.10	1.23	1.36	1.49		1.13	1.24	1.37	1.50	
L.S.D. at 5 %	A: 0.09		B: 0.03		AB: 0.06	A: 0.11		B: 0.04		AB: 0.08
	Leaf area (cm^2)									
Control	45	51	56	60	53	49	55	60	64	57
100 % NPK	58	67	72	77	69	63	65	70	75	68
75 % NPK	53	58	63	68	61	58	63	68	71	65
75 % NPK + M.A.	56	63	67	72	65	60	61	66	70	64
M.A. + Phos.	51	56	61	66	59	55	60	65	69	62
75 % NPK + E.M.	60	68	73	78	70	64	69	71	77	70
E.M. + Phos.	54	59	64	69	62	59	64	70	73	67
Mean (A)	54	60	65	70		58	62	67	71	
L.S.D. at 5 %	A: 2.0		B: 1.5		AB: 3.0	A: 4.0		B: 2.0		AB: 4.0

Table (3): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on aerial part fresh weight and dry weights (g) stem diameter (cm) of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels, g/container (A)									
	control	25 (g)	50 (g)	100 (g)	Mean (B)	control	25(g)	50(g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
Aerial part fresh weight (g)										
Control	375.8	449.7	512.0	571.2	477.2	407.4	488.5	563.6	619.6	519.8
100 % NPK	478.0	570.9	664.2	726.2	609.8	498.2	592.5	681.1	744.4	629.1
75 % NPK	446.1	532.9	607.2	669.2	563.9	465.5	560.7	642.0	705.4	593.4
75 % NPK + M.A.	458.6	551.4	647.9	694.0	588.0	479.1	572.8	661.6	721.8	608.8
M.A. + Phos.	406.3	484.2	557.6	613.6	515.4	434.5	516.1	604.8	644.4	550.0
75 % NPK + E.M.	500.5	594.0	681.4	750.0	631.5	489.5	603.8	692.5	768.8	638.7
E.M. + Phos.	433.7	520.7	594.8	657.1	551.6	459.3	554.5	636.0	692.6	585.6
Mean (A)	442.7	529.1	609.3	668.8		461.9	555.6	640.2	699.6	
L.S.D. at 5 %	A: 15.2		B: 22.5		AB: 45.0	A: 20.0		B: 15.2		AB: 30.4
Aerial part dry weight (g)										
Control	185.4	221.5	252.0	281.8	235.2	202.1	240.5	276.0	306.2	256.2
100 % NPK	234.0	279.6	325.2	355.6	298.6	245.7	292.7	335.6	367.1	310.3
75 % NPK	218.6	261.8	298.0	328.4	276.7	230.4	276.1	316.8	346.3	292.4
75 % NPK + M.A.	224.5	270.1	313.0	340.2	287.0	236.7	282.0	329.1	357.0	301.2
M.A. + Phos.	198.3	237.4	273.5	300.5	252.4	214.3	252.8	297.5	315.7	270.1
75 % NPK + E.M.	241.9	289.8	332.1	366.0	307.5	243.7	298.4	340.3	376.6	314.8
E.M. + Phos.	212.7	254.9	292.2	322.6	270.6	226.1	273.9	311.8	339.1	287.7
Mean (A)	216.5	259.3	298.0	327.9		228.4	273.8	315.3	344.0	
L.S.D. at 5 %	A: 22.5		B: 9.5		AB: 19.0	A:25.0		B: 8.5		AB: 17.0

Table (4): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on chlorophyll a and b content (mg/g. F.W.) of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels (A)									
	control	25(g)	50 g)	100 (g)	Mean (B)	control	25(g)	50(g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
	Chlorophyll (a) content									
Control	2.828	2.871	2.912	2.975	2.896	2.894	2.938	2.979	3.044	2.964
100 % NPK	2.879	2.951	3.050	3.261	3.035	2.947	3.020	3.121	3.337	3.106
75 % NPK	2.861	2.937	2.987	3.115	2.975	2.928	3.005	3.057	3.187	3.044
75 % NPK + M.A.	2.868	2.948	3.045	3.196	3.014	2.935	3.017	3.116	3.270	3.084
M.A. + Phos.	2.835	2.882	2.969	2.979	2.916	2.901	2.949	3.038	3.049	2.984
75 % NPK + E.M.	2.876	2.974	3.107	3.291	3.062	2.943	3.043	3.179	3.368	3.133
E.M. + Phos.	2.847	2.887	2.976	3.082	2.948	2.913	2.955	3.046	3.154	3.017
Mean (A)	2.856	2.922	3.006	3.128		2.923	2.990	3.077	3.201	
L.S.D. at 5 %	A:0.061		B:0.038		AB:0.076	A:0.065		B:0.040		AB:0.080
	Chlorophyll (b) content									
Control	0.933	0.947	0.961	0.982	0.956	0.955	0.970	0.983	1.005	0.978
100 % NPK	0.950	0.974	1.007	1.076	1.002	0.973	0.997	1.030	1.101	1.025
75 % NPK	0.944	0.969	0.986	1.028	0.982	0.966	0.992	1.009	1.052	1.005
75 % NPK + M.A.	0.946	0.973	1.005	1.055	0.995	0.969	0.996	1.028	1.079	1.018
M.A. + Phos.	0.936	0.951	0.980	0.983	0.962	0.957	0.973	1.003	1.006	0.985
75 % NPK + E.M.	0.949	0.981	1.025	1.086	1.010	0.971	1.004	1.049	1.111	1.034
E.M. + Phos.	0.940	0.953	0.982	1.017	0.973	0.961	0.975	1.005	1.041	0.996
Mean (A)	0.943	0.964	0.992	1.032		0.965	0.987	1.015	1.056	
L.S.D. at 5 %	A:0.018		B:0.011		AB:0.022	A:0.021		B:0.013		AB:0.026

Table (5): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on carotenoids content (mg/g. F.W.) and nitrogen percentage of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels (A)									
	control	25(g)	50 (g)	100 (g)	Mean (B)	control	25(g)	50(g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
	Carotenoids content									
Control	1.120	1.136	1.153	1.178	1.147	1.146	1.163	1.180	1.206	1.174
100 % NPK	1.140	1.169	1.208	1.291	1.202	1.165	1.196	1.236	1.321	1.230
75 % NPK	1.133	1.163	1.183	1.234	1.178	1.159	1.190	1.211	1.262	1.206
75 % NPK + M.A.	1.135	1.168	1.206	1.266	1.194	1.161	1.195	1.234	1.295	1.221
M.A. + Phos.	1.123	1.141	1.176	1.180	1.155	1.148	1.168	1.204	1.208	1.182
75 % NPK + E.M.	1.139	1.177	1.230	1.303	1.212	1.164	1.205	1.259	1.333	1.240
E.M. + Phos.	1.128	1.144	1.179	1.220	1.168	1.153	1.170	1.207	1.249	1.195
Mean (A)	1.131	1.157	1.191	1.239		1.157	1.184	1.219	1.268	
L.S.D. at 5 %	A:0.025		B:0.014		AB:0.028	A:0.027		B:0.015		AB:0.030
	Nitrogen percentage (in fresh leaves)									
Control	2.211	2.449	2.755	2.983	2.600	2.277	2.522	2.838	3.072	2.677
100 % NPK	2.549	2.843	3.089	3.222	2.926	2.625	2.928	3.182	3.319	3.014
75 % NPK	2.387	2.814	3.064	3.184	2.862	2.459	2.898	3.156	3.280	2.948
75 % NPK + M.A.	2.433	2.833	3.073	3.218	2.889	2.506	2.918	3.165	3.315	2.976
M.A. + Phos.	2.307	2.631	2.871	3.027	2.709	2.376	2.710	2.957	3.118	2.790
75 % NPK + E.M.	2.476	2.913	3.120	3.249	2.940	2.550	3.000	3.214	3.346	3.028
E.M. + Phos.	2.350	2.686	2.988	3.115	2.785	2.421	2.767	3.078	3.208	2.868
Mean (A)	2.388	2.738	2.994	3.143		2.459	2.821	3.084	3.237	
L.S.D. at 5 %	A: 0.022		B: 0.014		AB: 0.028	A: 0.026		B:0.015		AB:0.030

Table (6): Effect of compost levels, mineral NPK and/or biofertilization, as well as, their combination treatments on phosphorus and potassium percentage of *Antidesma bunius* seedlings during the first and second seasons.

Mineral NPK and/or biofertilization treatments (B)	Compost levels (A)									
	control	25(g)	50 (g)	100 (g)	Mean (B)	control	25(g)	50(g)	100 (g)	Mean (B)
	The 1st season (2018)					The 2nd season (2019)				
	Phosphorus percentage (in fresh leaves)									
Control	0.237	0.314	0.345	0.385	0.320	0.244	0.323	0.355	0.397	0.330
100 % NPK	0.322	0.366	0.401	0.429	0.379	0.332	0.377	0.413	0.441	0.391
75 % NPK	0.285	0.355	0.395	0.418	0.363	0.294	0.366	0.406	0.430	0.374
75 % NPK + M.A.	0.311	0.363	0.400	0.419	0.373	0.320	0.374	0.412	0.432	0.384
M.A. + Phos.	0.250	0.326	0.374	0.390	0.335	0.258	0.335	0.386	0.402	0.345
75 % NPK + E.M.	0.316	0.383	0.415	0.439	0.388	0.326	0.394	0.427	0.452	0.400
E.M. + Phos.	0.269	0.343	0.389	0.413	0.353	0.277	0.353	0.401	0.425	0.364
Mean (A)	0.284	0.350	0.388	0.413		0.293	0.360	0.400	0.426	
L.S.D. at 5 %	A: 0.020		B: 0.009		AB: 0.018	A: 0.022		B: 0.010		AB: 0.020
	Potassium percentage (in fresh leaves)									
Control	1.548	1.714	1.929	2.088	1.820	1.594	1.765	1.987	2.150	1.874
100 % NPK	1.784	1.990	2.162	2.255	2.048	1.838	2.050	2.227	2.323	2.109
75 % NPK	1.671	1.970	2.145	2.229	2.004	1.721	2.029	2.209	2.296	2.064
75 % NPK + M.A.	1.703	1.983	2.151	2.253	2.022	1.754	2.043	2.216	2.316	2.082
M.A. + Phos.	1.615	1.842	2.010	2.119	1.896	1.663	1.897	2.070	2.183	1.953
75 % NPK + E.M.	1.733	2.039	2.184	2.274	2.058	1.785	2.100	2.250	2.342	2.119
E.M. + Phos.	1.645	1.880	2.092	2.181	1.949	1.695	1.937	2.155	2.246	2.008
Mean (A)	1.671	1.917	2.096	2.200		1.721	1.974	2.159	2.265	
L.S.D. at 5 %	A:0.019		B:0.010		AB:0.020	A:0.021		B:0.011		AB:0.022

REFERENCES

Abdou, M.A.H. and Ashour, R.M. (2012): Physiological studies on jojoba plants. Minia Inter. Conf. for Agric. and Irrig. In the Nile Basin Countries. 26th-29th March 2012, El-Minia, Egypt.

Abdou, M.A.H.; El-Sayed, A.A.; Taha, R.A. and Mosaad, S.E.A. (2016): Response of *Moringa oleifera* to organic biofertilizers and mineral NPK fertilization. Scientific J. Flowers & Ornamental Plants, 3(1):19-29.

Abdullahi, I.N.; Ochi, K. and Gwaram, A.B. (2013): Plant population and fertilizer application effects on biomass productivity of *Moringa oleifera* in North-Central Nigeria. Peak J. of Agri. Sci. Vol.1 (6), 94-100, November, 2013.

Agera, S.I.N.; Amonum, J.I. and Kuje, E.D. (2019): Effect of varying levels of fertilizer and organic manure on growth of *Khaya senegalensis* seedlings in Benue State, North Central Nigeria. Res. J. Agri. and Forestry Sci., Vol. 7(2), 1-9, April (2019).

Ahmed, A.A.; Ali, A.F. and Taha, R.A. (2006): A comparative study between two poplar species grown in sandy calcareous soils using certain compost levels. Minia J. Agric. Res. & Develop. 26 (4): 663 – 681.

Ahmedloo, F.; Tabari, M.; Yousefzadeh, H.; Kooch, Y. and Rahmani, A. (2012): Effects of soil nutrient on seedling performance of *Arizona cypress* and medite cypress. Ann. Biolog. Res., 3 (3): 1369 – 1380.

Anamayi, S.E.; Oladele O.N.; Suleiman R.A.; Oloyede E.O. and Yahaya, U. (2016): Effects of cow dung and N.P.K fertilizer at different levels on the growth performance and nutrient composition of *Moringa oleifera*. Annals of Experimental Biology, 4 (1):35-39.

Chapman, H.D. and Pratt, P.F. (1975): Methods of analysis for Soil, Plant and water. Calif. Univ. Division of Agric. Sci. 172 – 17.

Cottenie, A.; Verloo, M.; Velghe, M. and Camerlynck, R. (1982): Chemical Analysis of Plant and Soil. Laboratory of Analytical and Ayro Chemistry. State Univ. Ghent, Belgium.

Dauda, S.N.; Ajayi, F.A. and Ndor, E. (2008): Growth and yield of watermelon (*Citrullus lanatus*) as affected by Poultry manure application. J. Agric. Soc. Sci., 4: 121-211.

Devlin, R.M. (1972): Plant Physiology. Third Edition, Van Nostrand Company, New York, U.S.A.

Follet, R.H.; Murphy, L.S. and Donahue, R.I. (1981): Fertilizers and Soil Amendments. Prentice Hall. Inc., Englewood Cliffs, N.J. USA.

Hussein, M.M.; Mehanna, H.M.; Zaki, S. and Hady, N.F. (2014): Influences of salt stress and foliar fertilizers on growth, chlorophylls and carotenoids of jojoba plants. Middle East J. Agric. Res., 3(2): 221-226.

Kitczak, T. and Czyz, H. (2014): Response of the selected varieties of common osier (*Salix viminalis*) to organic and mineral fertilization in light soil. Agricultural Engineering 4(152): 135-142.

Mansour, H.A. (2002): Influence of soil amendments and NPK fertilization on the growth and chemical composition of *Senna sulfurea* plants grown in sandy soil. Annals of Agric. Sci., Moshtohor, 40(3): 1779 – 1796.

Moran, R. (1982): Formula determination of chlorophylls pigments extracted with N-N dimethyl-formamide. Plant Physiological., 69: 1376-1381.

Morton, J. (1987): Bignay. p. 210–212. In: Fruits of warm climates. Julia F. Morton, Miami, FL.

MSTAT–C (1986): A microcomputer program for the design management and analysis of Agronomic Research Experiments (version 4.0), Michigan State Univ., U.S.A.

Ouahmane, L.; Revel, J.C.; Hafidi, M. and Thioulouse, J. (2009): Response of *Pinus halepensis* growth, soil microbial catabolic functions and phosphate-solubilizing bacteria after rock phosphate amendment and ectomycorrhizal inoculation. Plant Soil, 320: 169-179.

Patel, N.V. and Suresh, K.K. (2018): Effect of fertilizers on quality seedling production in *Swietenia macrophylla*, King. International J. of Chemical Studies 2018; 6(3): 2655-2660.

Roberts, B.R. (2006): Compost – containing substrates and their effect on post-transplant growth of containerized tree seedlings. Arboriculture & Urban Forest., 32 (6): 289 – 296.

Saha, N.; Das, A.C. and Mukherjee, D. (1995): Effect of decomposition of organic matter on activities of microorganisms and availability of nitrogen, phosphorus and sulphur in soil. J. Ind. Soc. of Soil Sci., 43: 210 – 215.

Sakr, W.R. (2005): Effect of organic and biofertilization on growth and active constituents production of senna plants. Ph.D. Diss., Fac. of Agric. Cairo Univ.

Samappito S. (2008): An analysis on organic acids contents in ripe fruits of fifteen Mao Luang (*Antidesma bunius*) cultivars, harvested from dipterocarp forest of Phupan Valley in northeast Thailand. Pak J. Biol Sci. 11(7):974–981.

Singh, A. (2015): Influence of NPK fertilization on growth performance of *Leucaena leucocephala* planted on Mine Spoil. Int. J. Environ. Bioener., 10 (1): 41-46.

Soliman, Sh.H.H. (2019): Effect of some agricultural treatments on *Moringa peregrina* plant. Ph. D. Thesis, Fac. of Agric., Minia Univ.

Spernat, M. (1990): Nitrogen fixing organisms, P.S. Chapman and Hall London.

Suresh, K.D.; Sneh, G.; Krishn, K.K. and Mool, C.M. (2004): Microbial biomass carbon and microbial activities of soils receiving chemical fertilizers and organic amendments. Arch. Agron. Soil Sci., 50: 641-647.

Tripathi, A.M.; Trnka, M.; Fischer, M.; Fajman, M. and Zalud, Z. (2012): Estimation of above ground woody biomass of SRC hybrid poplar clone J-105 in different fertilizer treatments in Czech-Moravian Highland. Conference: Mendel Net 2012, Brno (CZ), 2012-11-21 / 2012-11-22.

Wilde, S.A.; Corey, R.P.; Lyer, J.C. and Voigt, G.K. (1985): Soil and Plant Analysis for Tree Culture. Oxford IBH. Publishing Co. New Delhi, India.

Wroblewska, H.; Kozik, E. and Czajka, M. (2009): Content of macro and micro components in willow (*Salix purpurea,* L.) grown in substrates with composts of post-use wood waste. Folia Forestalia Polonica Series B, Issue 40, 23 – 30, 2009.

إستجابة شتلات أشجار الأنتيديزما لبعض المعاملات الزراعية

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أجري هذا البحث في مشتل نباتات الزينة بكلية الزراعة – جامعة المنيا موسمي 2018 و2019 لدراسة كيفية تحسين النمو لنباتات الأنتيديزما النامية في أرض رملية بواسطة إضافة الكمبوست (25 و 50 و 100 جم/صفيحة وكذلك الكنترول) كعامل رئيسي، ثم التسميد الحيوي أو المعدني كعامل ثانوي.

أدت جميع معاملات الكمبوست والتسميد الحيوي أو المعدني أو بكلاهما إلي تأثير إيجابي علي نمو النباتات خلال موسمي النمو. أفضل نمو للنباتات نتج عن إضافة 100 جم كمبوست/صفيحة، ثم تلاها التسميد بـ 75% ن فو بو المعدني + الميكروبات الدقيقة النشطة أو 100% ن فو بو المعدني.