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ROLE OF FILTER MUD, AMINO ACIDS, ACTIVE YEAST AND SEAWEED EXTRACT IN ENHANCING GROWTH AND SOME CHEMICAL CONSTITUENTS OF *KHAYA SENEGALENSIS* SEEDLINGS

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Key Words: *Khaya senegalensis*, filter mud, amino acids, active yeast and seaweed extract.

ABSTRACT

This research was carried out at the experimental Farm, Faculty of Agriculture, Al-Azhar University, Assiut, during the two successive seasons of 2018 and 2019 aiming to study the influence of filter mud as organic manure stimulant substances namely (amino acids {tryptophan + methionine}, active yeast and seaweed extract), as well as, their Interactions on plant growth traits and chemical constituents of Khaya (*Khaya senegalensis*) seedlings. The soil of Khaya seedlings was supplied with filter mud at 0, 18, 36 and 54 g/bag and the seedlings were sprayed with stimulant substances, whereas the treatments of these materials were: control, amino acids at 100 ppm, active yeast at 5 g/l, seaweed extract at 3 ml/l, amino acids + active yeast, seaweed + active yeast, amino acids + seaweed extract and amino acids + active yeast + seaweed extract. The obtained results indicated that applying filter mud at all levels led to a significant increase in vegetative growth traits (stem length, stem diameter, leaves dry weight / seedling and stem dry weight / seedling) as well as , the elements of N, P and K %, except for the low level of filter mud (18 g/bag), in some cases. the highest values of these parameter were detected when adding filter mud at the high level (54 g /bag). Foliar spray with the examined stimulant Substances, in many cases, either separately or mixed resulted a significant augment in the studied traits. Clearly, bitter results were noticed by treating the seedlings with the triple combined treatment (amino acids + active yeast + seaweed extract) and the double combined treatment (amino acids + seaweed extract). the most of combined treatments significantly increased the growth traits and N, P and K %. Obviously, the most effective combined treatments of examined characters, in many cases were detected from supplying the seedlings with the high level of filter mud (54 g/bag) followed by filter mud at the moderate one (36 g/ bag) in combination with the triple combined treatment (amino acids + active yeast + seaweed extract) and the double combined treatment (amino acids + seaweed extract).

INTRODUCTION

Khaya (*khaya senegalensis A. Juss*) belongs to family Meliaceae it is one of very important woody trees it is semi evergreen and native to tropical west Africa it grows well in upper Egypt as shade and avenye tree. The wood is hard, heavy and durable and it can be easily manufacture, varnished, and glued It is used in furniture , manufacture, musical instruments, lumber works, boxes, carts, plywood, veneers ships and boots **(Badarn *et al*. 1978 and El-Hadidy and Boluos, 1979).** Filter mud is one of organic fertilizers, it is a local organic manure and it is useful in stimulating the growth and productivity.

Organic agriculture is based on minimizing the application of external inputs and avoiding the use of synthetic fertilizers and pesticides **(Galal and Ali, 2004)**. Organic manures canable promoting microbial biomass **(Suresh *et a*l. 2004)**. Also, **Douda *et al*. (2008)** emphasized that organic manures can serve as alternative to mineral fertilizers for improving the soil structure.

Many researchers studied the positive effect of organic fertilization on plant growth and chemical constituents of some woody trees such as, **Ali *et al*.(2001) and El- Sayed and Abdou (2002)** on *khaya senegalensis*, **Ali *et al*. (2002), Ahmed *et al*. (2006) and Mahmoud (2014)** on *Populus sp*., **Wroblewska *et al*. (2009)** on *salix purpurea*, **William *et al*. (2012), Abou El- Makarem (2016) and Hussein (2019)** on Moringa, **Ali *et al*. (2019) and Abdullatif (2019)** on coriander, **Ali *et al*. (2020), Abd El- Raheem (2020)** on *Taxodium distichum* and **(Abdullatif 2019)** on coriander.

Amino acids as organic nitrogenous compounds are the building blocks in synthesis of protein. They can stimulate cell growth and protect the plants from ammonie toxicity **(Smith, 1982)**. The role of amino acids in enhancing the growth of some plants was examined by many authors such as, **Ali *et al*. (2006) and Yassen *et al*. (2010)** on anise, **Attoa *et al*.(2002)** on *Iberis amara*, **Abd El- Aziz *et al*. (2010)** on *Thuja orientalis*, **Ahmed *et al*. (2011)** on *Hibiscus sabdariffa*, **Abd El- Rahman *et al*. (2008)** on Fennel, **Al- Qubia (2012)** on *Helianthus annus* and Aly *et al*. (2014) on Kapok, **Ali *et al*. (2016) and Abd El- Rahman(2016)** on chamomile. As for the stimulating influence of amino acids on some chemical constituents of plants have to be discussed by many workers such as **Abd El- Aziz *et al*. (2010)** on *Thuja orientalis*, **Talaat (2005)** on *pelargonium gravedens*, **Yassen *et al*. (2010)** on anise, **Ali and Hassan (2013)** on *Tagetes erecta*, **Abd El- Rahman *et al* (2008)** on fennel, **Abd El- Rahman (2016)** on chamomile and **Abdullatif (2019)** on coriander.

The application of active yeast extract (*saccharomyces cerveace*) as bio-stimulant is important for horticultural plants to obtain high quality and quantity of products whereas yeast contains nutritional elements, organic compounds and natural hormones. The capability of active yeast on

improving the growth and some chemical constituents was declared by many investigators such as **(Ahmed *et al*. 1997) and Akl *et al*. (1997)** on grape vine, **Ahmed *et al*.(1998)** on *Hisbiscus Sabdariffa*, **Ali (2001)** on *calendula officinalis*, **Ahmed (2002)** on *Leucaena lcucocephala*, **Ahmed (2014)** on Kapok and **Ali *et al*.(2020)** on *Taxodium distichum.*

Seaweed extracts contain phytohormones (gibberellins, IAA and cytokinins) macro and Micronutrients as Will as, organic substances like vitamins, Amino acids and fatty acids **(Chapman and Chapman, 1980)** the addition of seaweed extract augment the uptake of nutrients from the soil **(Verkij, 1992 and Turan and Kose, 2004)** and Promotes the growth and yield **(Ramarao, 1991)**. Farthermore, **(Zhang 2000)** claimed that seaweed extract enhances tolerance to environmental stress. The enhancement in the growth and chemical constituents of some tress was insured by many authors such as **Hegab *et al*.(2005) and Hassan (2008)** on Balady Orange, **Gamal (2006) and Ahmed *et al*.(2008)** on washingtonia navel orange trees, **Ismail *et al* .(2011)** on Bitter orange seedlings, **Abdel - Aal *et al*.(2012)** on Balady Mandarin, **Haggag *et al*. (2014)** on olive seedlings, **A-Rawi *et al*. (2016)** on peach **El- Salhy *et al*. (2017)** on Balady Mandrin **Hamed (2017)** on anise, **Ali *et al.* (2018) and Farghly (2018)** on Kapok tree seedlings.

The objective of this investigation was examine the influence of filter mud as organic fertilizer and bio stimulant substances (amino acids [Tryptophan and methionine], active yeast and seaweed extract), as well as their interactions on plant growth and some chemical constituents of *khaya senegalnsis* seedlings to find out the most suitable treatment for enhancing these traits.

MATERIALS AND METHODS

The present study was conducted at the Experimental Farm, Fac. of Agric., Al-Azhar Univ., Assiut, during the successive seasons of 2018 and 2019 to determine the effect of filter mud as organic manure and stimulant substances, as well as, their interactions on plant growth and chemical constituents of Khaya (*Khaya Senegalensis*) seedlings. A split plot design with three replicates was used in this experiment. Organic fertilization treatments considered the main plots (A) while stimulant substance treatments were the sub-plots (B). Khaya (*Khaya Senegalensis)* seedlings were obtained from Hort. Res. Inst., Giza, Egypt.

One year old of Khaya seedlings, healthy and uniform, average seedling length was 24 – 26 cm. and 0.50 – 0.53 cm. diameter for both seasons, respectively. The seedlings were planted on March 7th for the two seasons in polyethylene bags (25*30 cm.).

Each bag was filled with 10 Kg of loamy soil and contained one seedling. Each replicate contained 5 seedlings. Chemical properties of the soil used were determined according to **Jackson (1973)** and are shown in table (1). Filter mud was obtained from Sugar and Integrated Industries

Company, Nag Hammadi, Egypt. Chemical properties of filter mud were determined according to **Black *et al.*, (1965)** and are shown in table (2). Filter mud levels were 0, 18, 36 and 54 g/bag and added with the soil before planting the seedlings. Stimulant substances treatments were control, amino acids (tryptophan and methionine) at 100 ppm, active yeast at 5 g/l, seaweed extract at 3 ml/l, amino acids + active yeast, seaweed extract + active yeast, amino acids + seaweed extract and amino acids + active yeast + seaweed extract. Algeser product contains seaweed extract, chemical properties of seaweed extract were shown in table (3). These substances were applied as foliar spray three times at two weeks interval starting April 27th of the two season, one day period was allowed between spraying these stimulant substances. All other agricultural practices were followed as usual. At the end of the experiment (the first week of November) for both seasons, the following data were recorded: stem length (cm.), stem diameter (cm.), leaves dry weight (g)/seedling, stemdry Also, the three examined elements (N, P and K) % were estimated in the dried leaves as follows: Nitrogen (%) was determined according to the method of modified micro Kjeldahl as described by **Wilde *et al*. (1985)**. Phosphorus (%) was estimated colorimetrically according to **Chapman and Pratt (1975)**. And Potassium (%) was determined by Flame photometer according to **Cottenie *et al*. (1982)**. The obtained data were tabulated and statistically analyzed according to **MSTATE-C (1986)** using L.S.D. at 5% to know the differences among all treatments according to **Mead et al. (1993).**

Table (1): The physical and chemical properties of the used Soil (Average for the two seasons).

Texture	PH (1:2.5)	E.C. (m.mohs /cm)	$CaCo_3$ %	O.M %	Total N %	Available	
						P ppm	K (mg/100g soil)
Loamy	7.5	2.03	2.25	0.54	0.10	0.15	3.1

Table (2): Chemical characteristics of filter mud applied in this experiment. (Average for the two seasons).

Content	Compost (plant residues)
Total nitrogen %	2.85
Total phosphorus %	2.3
Total potassium%	0.75
Zn ppm	110
Mn ppm	295
Fe ppm	4560
Cu ppm	193
E.C.(ds /m)	3.5
Organic matter %	35.0
C : N Ratio	8.3
Organic carbon %	23.6
PH	7.3

Table (3): Chemical properties of seaweed extract used in the present study.

Characteristics	Value
Moisture %	6.0
Organic matter %	45 – 60
Inorganic matter %	45 – 60
Carbohydrates %	35 – 50
Protein %	6 – 8
Mannitol %	4 – 7
Aliginic acid	10 – 20
Total N %	1 – 1.5
Total P %	0.02 – 0.09
Total K %	1 – 1.2
Ca %	0.2 – 1.5
Mg %	0.5 – 0.9
S %	3 – 9
Zn ppm	10 – 100
Mn ppm	5 – 12
Fe ppm	50 – 200
Cu ppm	1 – 6
B ppm	20 – 100
Mo ppm	1 – 5
IAA %	0.03
Cytokinine %	0.02
IBA %	0.01

RESULTS AND DISCUSSION

Stem length:

The presented data in table (4) revealed that supplying khaya seedlings with organic manure as filter mud at all levels led to a significant increase in stem length as compared to the check treatment during the two experimental seasons. Significant differences among all filter mud levels in both seasons were detected, except for between the high and moderate levels, during the two seasons. Therefore better results of stem length were obtained from using the moderate level (36 g/seedling) which increased it by 27.2% and by 28.5% over the check treatment, in the first and second seasons, respectively.

The increscent of stem length as a result of applying organic manure was also reported by **Ali *et al*. (2001) and El-Sayed and Abdou (2002)** on *khaya senegalansis* seedling **William *et al* (2012), Abou – El-Makarem (2016) and Hussien (2019)** on moringa and **Ali *et al*(2020) and Abd El-Raheem (2020)** on *Taxodium distichum* seedling.

In regard to stimulant substance treatments, data in table (4) cleared that all of them, except for amino acids treatment in both seasons caused a significant augment in stem length comparing to untreated ones. The use of triple combined treatment (amino acids + active yeast + seaweed extract) and double combined treatment (amino acids+ seaweed

extract) gave the longer stems reached 31.6%, 24.8%, 24.5% and 18.9% over no sprayed plants, during the two seasons, respectively.

Table (4): The influence of filter mud level, amino acids, active yeast and seaweed extract on stem length (cm.) of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	90.7	93.0	107.0	112.3	100.8
Amino acids 100 ppm	95.3	100.3	117.5	120.1	108.3
Active yeast 5 g/L	99.3	110.6	129.3	135.0	118.6
Seaweed extract 3ml/L	95.0	105.3	130.0	137.6	117.0
Amino acids + Active yeast	100.5	115.0	125.8	129.5	117.7
Seaweed extract+ Active yeast	96.3	118.5	131.0	133.0	119.7
Amino acids + Seaweed extract	105.0	120.3	132.5	144.9	125.7
Am. acids + Ac. yeast + Seaweed extract	114.0	126.0	140.0	150.7	132.7
Mean (A)	99.5	111.1	126.6	132.9	
L.S.D (0.05)	A= 7.1		B= 10.4		AB= 20.7
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	85.1	97.0	111.4	115.2	102.2
Amino acids100 ppm	86.0	94.3	115.3	127.0	105.7
Active yeast 5 g/L	96.0	106.4	125.0	130.5	114.5
Seaweed extract 3ml/L	95.5	108.0	120.0	133.0	114.1
Amino acids + Active yeast	105.0	110.7	122.5	136.7	118.7
Seaweed extract+ Active yeast	103.7	122.0	130.4	138.0	123.5
Amino acids + Seaweed extract	100.0	108.7	135.6	141.7	121.5
Am. acids + Ac. yeast + Seaweed extract	105.5	120.0	138.0	145.1	127.2
Mean (A)	97.1	108.4	124.8	133.4	
L.S.D (0.05)	A= 10.8		B= 9.5		AB= 19.0

The promoting effect of amino acids on stem length was also insured by **Attoa *et al* (2002)** on *Iberis amara*, **Abd El-Azziz *et al* .(2010)** on *Thuja orientalis*, **Al-Qubia (2012)** on *Helianthus annus* **Mustafa and Ebeid (2013)** on *Albizza lebbekand* and *Taxodium distichum* and, **Aly et al (2014)** on Kapok seedlings .

The stimulating effect of active yeast on stem length was also demonstrated by **Ahmed (2002)** on *Leucaena lencucephala*, **Ali (2001)** on *calendula officinalis*, **Al- Qubaie (2002)** on rue and **Ahmed (2014)** on Kapok seedlings.

The role of seaweed extract in increasing stem length was also revealed by **Haggag *et al*. (2014)** on olive seedlings, **Hassan (2015)** on dill, **Hamed (2017)** on anise, **Akila and Jeyadoss (2010)** on *Helianthus annus*, **Ali *et al*. (2018) and Farghaly (2018)** on Kapok.

As for the interaction, it was significant effect on stem length of khaya during the two growing seasons (table 4). It is obvious that the addition of most of combined treatments resulted a significant augment in stem length, in both seasons, as compared to untreated plants. The most effective treatments in increasing such parameter were detected when using filter mud at the high level (54 g/seedling) in combination with triple combined (amino acids + active yeast + seaweed extract) followed by amino acids + seaweed extract or seaweed + active yeast and the moderate level (36 g/seedling) with the same three previous combined treatments in comparisons with other combination treatments during the two growing seasons.

Stem diameter:

The given results in table (5) showed that receiving khaya seedlings filter mud at all levels, in both seasons except for the low level (18 g/seedling) in the second seasons led to a significant increase in stem diameter as compared to unfertilized ones. Such parameter was gradual significantly augmented with increasing filter mud level in both seasons, therefore, the thicker plants were obtained when treating khaya seedlings with filter mud at the high level (54 g/seedling) as ranged 24% and 18.8 % over the check treatment in the first and second seasons, respectively.

The capability of organic manure on augmenting stem diameter was also obtained by **Ali *et al*. (2001)** and **El-Sayed and Abdou (2002)** on *khaya senegalansis*, **Abou - El-Makarem (2016)** and **Hussein (2019)** on moringa and **Ali *et al* (2020)** and **Abd El-Raheem (2020**) on *Taxodium distichum* seedling .

Concerning stimulant substance treatments, the data postulated that foliar spray with the examined substances either double or triple combined treatments, in both seasons, resulted a significant increase in stem diameter comparing to no sprayed plants. The application of triple combined treatment (amino acids+ active yeast+ seaweed extract) and double combined treatment (amino acids+ seaweed extract) or (seaweed extract+ active yeast) registered better results of stem diameter, in both seasons. These above superior treatments increased such trait by 33.8, 28.3 and by 22.5 % in the first seasons and by 34.5, 30.2 and by 25 % in the second one over control for the two seasons, respectively.

The enhancement of stem diameter due to amino acids have been emphasized by **Abd El-Azziz *et al*. (2010)** on *Thuja orientalis*, **Aly *et al* (2014**) on Kapok seedlings, **Al-Qubia (2012)** on *Helianthus annus* and **Mustafa and Ebeid (2013**) on *Albizza lebbekand* and *Taxodium distichum* .

Table (5): The influence of filter mud levels, amino acids, active yeast and seaweed extract on stem diameter (cm.) of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	1.36	1.41	1.48	1.53	1.45
Amino acids 100ppm	1.40	1.42	1.50	1.52	1.46
Active yeast 5ml/L	1.45	1.49	1.55	1.76	1.56
Seaweed 3m/L	1.36	1.44	1.60	1.85	1.56
Amino acids + Active yeast	1.50	1.72	1.86	1.90	1.75
Seaweed + Active yeast	1.43	1.77	1.93	2.00	1.78
Amino acids + Seaweed	1.68	1.83	1.90	2.03	1.86
Am. acids + Ac.yeast + Seaweed	1.77	1.83	1.95	2.22	1.94
Mean (A)	1.49	1.61	1.72	1.85	
L.S.D (0.05)	A= 0.05		B= 0.17		AB= 0.33
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	1.32	1.34	1.43	1.45	1.39
Amino acids 100ppm	1.39	1.44	1.47	1.53	1.46
Active yeast 5ml/L	1.46	1.45	1.57	1.54	1.51
Seaweed 3m/L	1.44	1.46	1.54	1.70	1.54
Amino acids + Active yeast	1.48	1.54	1.79	1.77	1.65
Seaweed + Active yeast	1.50	1.72	1.82	1.91	1.74
Amino acids + Seaweed	1.64	1.70	1.86	2.05	1.81
Am. acids + Ac.yeast + Seaweed	1.69	1.79	1.84	2.17	1.87
Mean (A)	1.49	1.56	1.67	1.77	
L.S.D (0.05)	A= 0.08		B= 0.16		AB= 0.32

Concerning active yeast **Ahmed (2002**) on *Leucaena lencucephala*, **Ahmed (2014**) on Kapok seedlings, **Hanafy *et al* .(2012)** on *Schefflera arbricola* while **Al- Hchami (2013)** on peach transplants, **Haggag *et al*. (2014)** on olive seedlings**, Al- Rawi *et al*. (2016)** on Peach, **Hamed (2017)** on aniseand **Farghaly (2018)** on Kapok seedlings for seaweed extract.

According to the combined effect between the two studied factors, the listed data in **table (5)** cleared that is was statistically significant on stem diameter during the two consecutive seasons. The addition of most of combined treatments in both seasons, resulted a significant augment in such trait comparing to untreated plants. Obviously, the most effective treatments were obtained by applying either the high level of filter mud (54 g/seedling) and the moderate level

of filter mud (36 g/seedling) in combination with (amino acids+ active yeast+ seaweed extract) or (amino acids+ seaweed extract) in comparison with those obtained by other combination treatments, during the two growing seasons.

Leaves dry weight/ seedling:

The obtained data in **table (6)** indicated that leaves dry weight/ seedling of khaya seedlings was significantly increased, in both seasons, due to applying organic manure as filter mud at all levels, comparing to the check treatment. Clearly, significant differences among all filter mud levels in both seasons, except for between the high and moderate levels in the first season were observed. Therefore, the use of filter mud at the moderate level in the first season gave the heaviest leaves dry weight reached 43.7 over untreated plants. While, in the second season the heaviest weight of such trait was noticed by applying the high level of filter mud as ranged 43.2 % over control.

The increaments of leaves weight due to the application of organic manure have been reported by **Ali *et al* (2001)** and **El-Sayed, and Abdou (2002)** on *khaya senegalansis*, **Abou - El-Makarem (2016)** on moringa, **Ali *et al* (2020)** and **Abd El-Raheem (2020)** on *Taxodium distichum* seedling .

With respect to stimulant substance treatments, the registered results in **table (6)** indicated that spraying khaya seedlings with all the three studied substances, in both seasons, either alone or to together resulted a significant augment in leaves dry weight/ seedling as compared to no sprayed plants. Obviously, the heaviest leaves dry weight/ seedling was obtained as a result of adding the triple combined treatment (amino acids+ active yeast+ seaweed extract) reached 40.6 and 35.6 % over control, during the two seasons, respectively.

The role of stimulant substances in augmenting leaves weight was also discussed by **Talaat *et al*. (2005)** on *Catharanthus roseus*, Abou **Dahab and Abd El - Aziz (2006)** on *Philodenvron erubescens*, **Shehata *et al*. (2011)** on Celeriac, **Mustafa and Ebeid (2013)** on *Albizza lebbekand* and *Taxodium distichum*, **Aly *et al*. (2014**) on Kapok seedlings. Regarding to amino acids, **Al-Qubia (2012)** on roselle, **El-Sherbeny *et al*. (2007)** on rue, **Ahmed (2014)** on Kapok seedlings and **Ali *et al*. (2020**,) on *Taxodium distichum*. Concerning to active yeast and **Akila and Jeyadoss (2010)** on *Helianthus annus*, **Shhehata *et al*. (2011**) on *Apium graveolens*, **Ali *et al*. (2018)** and **Farghaly (2018)** on Kapok seedlings for seaweed extract.

The interaction between the two examined factors on leaves dry weight/ seedlings of khaya had significant effect during the two experimental seasons **(table 6).** Such trait was significantly increased due to applying the most of combined treatments, during the two growing

seasons. Apparently the use of filter mud at the high level (54 g/ seedling) with the triple combined treatment (amino acids+ active yeast+ seaweed extract) or (seaweed extract+ active yeast) or (amino acids+ seaweed extract) proved to be more effective in increasing leaves dry weight than those obtained by other combination treatments, during the two consecutive seasons.

Table (6): The influence of filter mud evel, amino acids, active yeast and seaweed extract on stem diameter (cm.) of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	35.0	45.5	48.4	51.1	45.0
Amino acids100ppm	38.3	44.8	58.4	65.0	51.6
Active yeast 5ml/L	37.0	51.3	55.2	62.3	51.5
Seaweed 3m/L	43.4	45.9	59.5	57.3	51.5
Amino acids + Active yeast	44.7	47.0	59.1	54.9	51.4
Seaweed + Active yeast	42.3	53.3	61.8	68.2	56.4
Amino acids + Seaweed	41.6	50.6	63.0	66.5	55.40
Am. acids + Ac.yeast + Seaweed	45.3	62.9	66.0	78.9	63.3
Mean (A)	41.0	50.2	58.9	63.0	
L.S.D (0.05)	A= 4.9		B= 6.3		AB= 12.7
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	33.0	40.5	43.7	47.8	41.3
Amino acids 100ppm	36.1	42.7	49.4	57.9	46.5
Active yeast 5ml/L	37.9	48.6	53.6	57.3	49.3
Seaweed 3m/L	41.2	44.7	58.3	55.9	50.0
Amino acids + Active yeast	43.7	46.8	56.7	56.1	50.8
Seaweed + Active yeast	40.9	50.2	55.4	60.8	51.8
Amino acids + Seaweed	43.5	47.5	55.6	58.0	51.1
Am. acids + Ac.yeast + Seaweed	43.3	56.2	59.4	65.0	56.0
Mean (A)	40.0	47.2	54.0	57.3	
L.S.D (0.05)	A= 2.7		B= 4.9		AB= 9.7

Stem dry weight/ seedling:

Illustrated data in **table (7)** cleared that fertilizing khaya seedlings with organic manure as filter mud at all levels in both seasons ,caused a significant augment in stem dry weight/ seedling as compared to the check treatment. Apparently, the difference among all levels of filter mud

were significant except for between the low and moderate levels in the second season. The use of the high level of filter mud (54 g/seedling) gave the heaviest stem dry weight/ seedling reached 76.9 and 61.7% over control in the first and second seasons, respectively.

The positive effect of organic manure on stem weight was also revealed by **Ali *et al*.(2001)** and **El-Sayed** and **Abdou (2002)** on *khaya senegalansis* seedling, **Ahmed *et al* (2006)** on *populous nigra* and **Ali *et al*.(2020)** and **Abd El-Raheem (2020)** on *Taxodium distichum* seedling .

In connection, data in **table (7)** showed that stem dry weight/ seedling of khaya was significantly increased, during the two seasons, due to foliar spray with the combined treatments (amino acids+ active yeast+ seaweed extract), (amino acids+ seaweed extract) and (seaweed extract+ active yeast), as well as, the single treatment (amino acids) in comparison with no sprayed ones. From the obtained results, it could be noticed that the utilization of the triple combined treatment (amino acids + active yeast+ seaweed extract). Proved to be more effective in increasing stem dry weight/ seedling, in both seasons, as compared to no sprayed plants. This superior previous treatment increased such trait by 60 and by 55 % over check treatment, during the two experimental seasons, respectively.

The capability of the stimulant substances on enhancing stem weight was also insured by **Talat *et al.* (2005)** on *Catharanthus rosens*, **Abou Dahab and Abd El – Aziz (2006)** on *Philodendron erubescens*, Mustafa and **Ebeid (2013)** on *Albizza lebbekand* and *Taxodium distichum* **Aly *et al*. (2014**) on Kapok seedlings for amino acids, **Al-Qubaia (2002)** on roselle, **El-Sherbeny *et al*. (2007)** on rue **Ahmed (2014)** on kapok concerning to active yeast, while **Ali *et al*.(2018**) and **Farghaly (2018)** on Kapok, **AbdEl-Aziz *et al*.(2011)** on *Amaranthus triclor* regarding to seaweed extract.

Table (7) emphasized that the combined effect between the two tested factors, in both seasons, had statistically significant on stem dry weight/ seedling of khaya. Clearly, the most of combined treatments, during the two growing seasons, resulted a significant augment in stem dry weight/ seedling as compared to untreated ones. The most effective treatments of such trait were detected when applying filter mud at the high level (54 g/ seedling) with the combined treatments (amino acids + active yeast + seaweed extract), (amino acids + seaweed extract) and (seaweed extract + active yeast), in addition to the moerrate level of filter mud (36 g/ seedling) plus the triple combined treatment (amino acids + active yeast + seaweed extract), in comparison with those obtained by other combination treatments, during the two experimental seasons.

Table (7): The influence of filter mud levels, amino acids, active yeast and seaweed extract on stem dry weight of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	19.0	27.0	32.0	37.9	29.0
Amino acids 100ppm	27.9	33.0	38.9	46.0	36.5
Active yeast 5ml/L	27.7	31.3	35.9	39.5	33.6
Seaweed 3m/L	21.0	23.8	33.7	40.9	29.9
Amino acids + Active yeast	23.7	32.7	39.4	42.3	34.5
Seaweed + Active yeast	27.0	34.7	44.8	50.6	39.3
Amino acids + Seaweed	28.7	39.3	42.6	50.6	40.3
Am. acids + Ac.yeast + Seaweed	33.7	43.0	49.4	59.9	46.5
Mean (A)	26.0	33.1	39.6	46.0	
L.S.D (0.05)	A= 4.9		B= 6.2	AB= 12.4	
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	20.1	25.8	33.0	34.2	28.3
Amino acids 100ppm	26.9	29.8	34.2	48.6	34.9
Active yeast 5ml/L	25.0	31.1	33.2	36.0	31.3
Seaweed 3m/L	23.0	27.3	29.6	35.7	28.9
Amino acids + Active yeast	24.1	30.4	33.6	40.3	32.1
Seaweed + Active yeast	27.0	32.5	39.2	46.9	36.4
Amino acids + Seaweed	29.0	36.4	40.9	43.9	37.6
Am. acids + Ac.yeast + Seaweed	33.9	45.0	44.6	52.2	43.9
Mean (A)	26.1	32.7	36.0	42.2	
L.S.D (0.05)	A= 5.9		B= 5.6	AB= 11.3	

Nitrogen, phosphorus and potassium percentages:

The obtained results in **Tables (8,9 and 10)** Revealed that supplying Khaya seedlings with organic manure as filter mud at all levels, during the two experimental seasons , led to a significant increase in the three examined elements (N, P and K %) in the leaves, except for the low level of filter mud (18 g/ seedling) regarding N% in the first season and P and K% for the two seasons, as well as, the moderate level (36 g/ seedling) concerning K % in the second one, as compared to unfertilized ones. As for N%, significant differences among all levels of filter mud in the second season, were detected. On the other hand, the difference among all levels of filter mud were no significant in the first one. Regarding P%, significant differences among all levels of filter mud,

in both seasons were observed, except for between the moderate and high levels, in the first season. conserving K%, no significant difference among all levels of filter mud, in the two seasons, were noticed, except for between the low and high levels in the first season. The highest values of N, P and K% were given by applying the high level of filter mud (54 g/ seedling) as ranged 11.2 And 8.4 % for N%, 12.6 and 17.5 % for P% and 6 and 5% for K% over control, in both seasons, respectively.

The promoting effect of organic manure on N, P and K was also. studied by **Ali *et al.* (2001)** and **El-Sayed and Abdou (2002)** on *khaya senegalansis*, **Ahmed *et al.* (2006)** on *populous nigra* and *populous alba* and **Mahmmoud (2014)** on *populous nigra*, **Ali *et al*. (2020)** and **Abd El-Raheem (2020)** on *Taxodium distichum* seedling .

Regarding stimulant substance treatments, data in **Tables (8,9 and 10)** indicated that spraying Khaya seedlings with the examined substances either alone or mixed, in both seasons, caused a significant augment in N%, except for amino acids treatment in the two seasons and seaweed extract treatment in the second one, comparing to untreated ones. With regard to P%, it was significantly increased, in both seasons, duo to using the combined stimulant substances, except for the treatment of amino acids + active yeast, in the first season, as compared to no sprayed plants. Concerning K% foliar spray with the examined stimulant substances either single or together resulted a significant augment in such trait, in the two seasons, as compared to control, except for amino acids treatment in both seasons and active yeast treatment in the second one. Clearly, the use of triple combined treatment (amino acids + active yeast + seaweed extract) and double combined treatment (amino acids + seaweed extract) gave the highest values of the three studied elements. N, P and K% as compared to other treatments, during the two experimental seasons. Numerically, these previous superior treatments increased N% by 11.9, 12.2, 9.6, And by 8.4%, by 15.3, 10.8, 22and by 15.7% for P% and by 10.6, 9.1, 11.8 and by 8.6% for K% over no sprayed ones, during the two consecutive seasons, respectively.

The role of amino acids in enhancing the elements of N, P and K was also insured by **Abd El-Azziz *et al*.(2010)** on *Thuja orientalis*, **Ali and Hassan (2013)** on *Tagetes eracta* **Abd El-Rahman *et al.* (2008)** on fennel. **Abd–Rahman *et al.* (2016)** on Chamomil. Concerning active yeast, meanwhile, **Ahmed (2002)** on *Leucaena leucoceohala*, **Moustafa and El-Hosseiny (2001)** on Washington Navel orange, **Shoug (2019)** on Balady mandarin trees, **Saoir and Archer (2010)** on apple seedlings, **Shehata *et al* (2011)** on *Apium graveolens*, **Al-Hadethi (2015)** on apricot trees, **Hassan (2015)** on dill, **Al- Rawi *et al* (2016)** on peach **Hamed (2017)** on anise and **Ali *et al*. (2018) and Fargaly (2018)** on Kapok seedling, Regarding seaweed extract.

In connection, the interaction effect between the two studied factors was statistically significant on N, P and K % in the leaves of Khaya seedlings, during the two experimental seasons. Clearly, the use of most of combined treatments, in both seasons, resulted a significant increase in N, P and K % comparing to untreated ones. Apparently, the highest values of N, P and K % were given by receiving Khaya seedlings the high level of filter mud (54g / seedling) and the moderate one (36g / seedling) in combination with the triple combined treatment (amino acid + active yeast + seaweed extract) plus the double combined treatment (amino acids + seaweed extract), mostly, in comparison with those obtained by other combination treatments during the two experimental seasons, as clearly shown in **Tables (8 , 9 and 10).**

Table (8): The influence of filter mud levels, amino acids, active yeast and seaweed extract on N% of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	3.25	3.30	3.33	3.50	3.35
Amino acids 100ppm	3.33	3.35	3.60	3.58	3.47
Active yeast 5ml/L	3.37	3.59	3.78	3.80	3.64
Seaweed 3m/L	3.26	3.51	3.79	3.83	3.60
Amino acids + Active yeast	3.39	3.60	3.58	3.81	3.60
Seaweed + Active yeast	3.42	3.70	3.72	3.64	3.62
Amino acids + Seaweed	3.48	3.78	3.85	3.92	3.76
Am. acids + Ac.yeast + Seaweed	3.57	3.55	3.90	3.96	3.75
Mean (A)	3.38	3.55	3.69	3.76	
L.S.D (0.05)	A= 0.18		B= 0.15		AB= 0.30
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	3.34	3.36	3.50	3.56	3.44
Amino acids 100ppm	3.32	3.40	3.46	3.55	3.43
Active yeast 5ml/L	3.30	3.53	3.65	3.75	3.56
Seaweed 3m/L	3.30	3.40	3.56	3.70	3.49
Amino acids + Active yeast	3.43	3.57	3.62	3.79	3.60
Seaweed + Active yeast	3.54	3.68	3.71	3.75	3.67
Amino acids + Seaweed	3.63	3.72	3.74	3.84	3.73
Am. acids + Ac.yeast + Seaweed	3.65	3.70	3.80	3.92	3.77
Mean (A)	3.44	3.55	3.63	3.73	
L.S.D (0.05)	A= 0.07		B= 0.12		AB= 0.23

Table (9): The influence of filter mud levels, amino acids, active yeast and seaweed extract on p % of *khaya senegalensis* seedlings during the two season of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	0.292	0.300	0.366	0.375	0.333
Amino acids 100ppm	0.308	0.302	0.359	0.370	0.335
Active yeast 5ml/L	0.328	0.340	0.365	0.376	0.352
Seaweed 3m/L	0.331	0.335	0.355	0.380	0.350
Amino acids + Active yeast	0.337	0.333	0.362	0.360	0.348
Seaweed + Active yeast	0.346	0.353	0.351	0.367	0.354
Amino acids + Seaweed	0.359	0.368	0.364	0.384	0.369
Am. acids + Ac.yeast + Seaweed	0.374	0.381	0.385	0.397	0.384
Mean (A)	0.334	0.339	0.363	0.376	
L.S.D (0.05)	A= 0.020		B= 0.019		AB= 0.038
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	0.265	0.282	0.322	0.326	0.299
Amino acids 100ppm	0.277	0.287	0.317	0.315	0.299
Active yeast 5ml/L	0.275	0.281	0.313	0.336	0.301
Seaweed 3m/L	0.295	0.304	0.322	0.354	0.319
Amino acids + Active yeast	0.293	0.300	0.342	0.350	0.321
Seaweed + Active yeast	0.310	0.308	0.350	0.362	0.333
Amino acids + Seaweed	0.315	0.335	0.365	0.370	0.346
Am. acids + Ac.yeast + Seaweed	0.348	0.359	0.373	0.380	0.365
Mean (A)	0.297	0.307	0.338	0.349	
L.S.D (0.05)	A= 0.011		B= 0.022		AB= 0.044

Table (10): The influence of filter mud levels, amino acids, active yeast and seaweed extract on k % of *khaya senegalensis* seedlings during the two seasons of 2018 and 2019.

First season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	2.00	2.10	2.12	2.10	2.08
Amino acids 100ppm	2.11	2.15	2.13	2.17	2.14
Active yeast 5ml/L	2.14	2.17	2.21	2.26	2.20
Seaweed 3m/L	2.19	2.17	2.23	2.21	2.20
Amino acids + Active yeast	2.15	2.21	2.23	2.32	2.23
Seaweed + Active yeast	2.13	2.18	2.26	2.30	2.22
Amino acids + Seaweed	2.20	2.25	2.28	2.35	2.27
Am. acids + Ac.yeast + Seaweed	2.18	2.26	2.33	2.42	2.30
Mean (A)	2.14	2.19	2.22	2.27	
L.S.D (0.05)	A= 0.08		B= 0.08		AB= 0.17
Second season					
Simulant substances treatment (B)	Filter mud g/seedling (A)				Mean (B)
	0	18	36	54	
Control	2.15	2.18	2.23	2.27	2.21
Amino acids 100ppm	2.22	2.20	2.23	2.32	2.24
Active yeast 5ml/L	2.23	2.28	2.29	2.26	2.27
Seaweed 3m/L	2.30	2.33	2.35	2.36	2.34
Amino acids + Active yeast	2.32	2.35	2.33	2.37	2.34
Seaweed + Active yeast	2.28	2.34	2.36	2.35	2.33
Amino acids + Seaweed	2.31	2.39	2.43	2.46	2.40
Am. acids + Ac.yeast + Seaweed	2.35	2.40	2.51	2.63	2.47
Mean (A)	2.27	2.31	2.34	2.38	
L.S.D (0.05)	A= 0.09		B= 0.09		AB= 0.18

From the obtained results, it could be discussed as follows: the enhancement in plant growth parameters (stem length, stem diameter, leaves dry weight / seedling and stem dry weight / seedling, as well as, N, P and K% due to fertilizing Khaya seedlings with filter mud as organic manure reflected the positive, biological and physiological roles of organic manures which were explored by many investigators such as, **Bohn *et al*. (1985)** emphasized that organic matter as a main source of the elements, N, P and S, as well as, contains high content of B and Mo, and bisedes to considered as a source of energy for Azotobacter growth. the use of organic manure minimized nutrients lost by leaching **(Saber, 1997)** .Also, organic manure increased microbial activities in the root

zone by using it to the soil **(Taiwo, *et al*., 2002).** Furthermore, **Natarajan (2007) and Sreenivasa *et al*. (2010)** claimed the organic manures contain growth promoting hormones (IAA and GA), macronutrients, essential micronutrients and beneficial microorganisms. the positive effect of amino acids on improving the studied traits due to the physiological and biological roles of amino acids which were explained by many authors such as, **Kamar and Omar (1987)** mentioned that amino acids play physiological roles for examples: biosynthesis of enzymes, coenzymes, purine and pyrimidine basis, vitamins, pigments, terpenoids and alkaloids. They are precursors or activators of phytohormones and growth substances. **Kowalczyk and Zielony (2008)** proved that amino acids capable enhancing plant growth, yield and mitigates the injuries by a biotic stress. Moreover, utilizing amino acids on many plants grown under low fertile soils resulted an enhancement in growth of these plants **(Tantawy *et al*.2009 and Abd El-Mawgoud *et al*., 2011).** The increments in plant growth characteristics and N, P and K% due to foliar spray with active yeast could be attributed to the biological and physiological roles of active yeast which were discussed by some authors such as, **Tarrow and Nakase (1975), and Subba Rao (1984)** pointed that active dry yeast contains high amounts of four vitamins, especially vitamin B which plays an important role in improving the plant growth and controlling the incidence of fungi diseases.

Nagodawithana (1991) reported that active dry yeast is considered as a good source of many natural growth substances i. e. cytokinins, a lot of vitamins, Most nutritional elements namely P, K, S, Ca, Na, and Mg and also, organic compounds (nucleic acids, proteins, lipids and carbohydrates). The enhancement in parameters studied of this study as a result of applying seaweed extract might be attributed to the positive, physiological and biological roles of seaweed extract which were explained by several authors such as, **Adam (1999)** showed that seaweed extract contains phytohormones (IAA, GA and cytokinins). It is an excellent natural fertilizer and as a source of organic matter. It contains higher amounts of elements namely, N, P, K, S, Ca, Mg, Zn, Mn, Fe, and C **(Tung *et a*l. 2003).** It is a good source of bioactive compounds such as, vitamins, protein, mineral carotenoids, essential fatty acids and dietary fiber **(Osman and Salem, 2011). Pramanick *et al*. (2013)** verified that seaweed extract improved various plant growth parameters and development due to good health around the plants. From the obtained results, it could be recommended to supply the soil of *khaya*

senegalensis seedlings with filter mud at 54 g/ seedling and foliar spray with amino acids (tryptophan and methionine) at 100 ppm, active yeast at 5 g/l and seaweed extract at 3 ml/l to enhancing the growth and some chemical constituents traits under the investigation conditions.

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دور طين المرشحات والاحماض الامينية والخميرة النشطة ومستخلص الأعشاب البحرية في تحسين النمو وبعض المكونات الكيميائية لشتلات الكايا السنغالي

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** قسم بحوث الأشجار الخشبية – مركز البحوث الزراعية – الجيزة

أجري هذا البحث في مزرعة كلية الزراعة – جامعة الازهر – فرع أسيوط خلال موسمي متتاليين 2018/2017 بهدف دراسة تأثير إضافة سماد طين المرشحات وبعض المواد المشجعة (أحماض أمينية "تريبتوفان،ميثيونين" ، خميرة نشطة ، مستخلص الاعشاب البحرية) وكذلك التفاعل بينهما عل صفات النمو وبعض المكونات الكيميائية لشتلات الكايا السنغالي.

تم إمداد الشتلات بسماد طين المرشحات بمعدلات صفر،18،36،54 جرام/كيس ورشت الشتلات بالمواد المشجعة حيث كانت معاملاتها على النحو التالي:

صفر، أحماض أمينية بتركيز 100 جزء في المليون، خميرة نشطة بتركيز 5جرام/لتر، مستخلص الأعشاب البحرية بتركيز 3مل/لتر، احماض أمينية + خميرة نشطة، مستخلص الأعشاب البحرية + خميرة نشطة، أحماض أمينية + مستخلص الأعشاب البحرية، أحماض أمينية + خميرة نشطة + مستخلص الأعشاب البحرية.

أشارت النتائج المتحصل عليها ان استعمال سماد طين المرشحات بجميع معدلاته قد أدى إلى زيادة معنوية في صفات النمو الخضري (طول الساق، سمك الساق، الوزن الجاف للأوراق/الشتلة، الوزن الجاف للسيقان/الشتلة) وكذلك النسبة المئوية لعناصر النيتروجين و الفوسفور و البوتاسيوم باستثناء المعدل المنخفض من طين المرشحات (18 جرام/الشتلة) في بعض الحالات

ولقد تم الحصول أغلب أقيم من هذه الصفات عند إضافة المعدل التالي من طين المرشحات (54جرام/شتلة) .في كثير من الحالات أدى رش الشتلات بالمواد المنشطة سواء

بصورة منفردة أو خليطة إلى حدوث زيادة معنوية في الصفات تحت الدراسة – أفضل النتائج تم الحصول عليها بمعاملة الشتلات بخليط لثلاث مواد مشجعة (أحماض أمينية + خميرة نشطة +مستخلص الأعشاب البحرية) و أيضاً بالمعاملة المزدوجة (أحماض أمينية + مستخلص الأعشاب البحرية).

أدت معظم معاملات التداخل إلى زيادة معنوية لصفات النمو و النسبة المئوية لعناصر النيتروجين و الفوسفور و البوتاسيوم . ولقد إتضح في كثير من الحالات أن أكثر المعاملات تأثيراً عند إمداد الشتلات بالمعدل العالي من طين المرشحات (54جرام/الشتلة) يلية المعدل المتوسط من طين المرشحات (36جرام/الشتلة) مع الرش بخليط الثلاث مواد المشجعة (أحماض أمينية +خميرة نشطة + مستخلص الأعشاب البحرية و المعاملة المزدوجة (أحماض أمينية + مستحلص الأعشاب البحرية) .