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EFFECT OF THE ORGANIC FERTILIZER "ACTOSOL®" AND "EM" BIOSTIMULANT ON VEGETATIVE GROWTH AND LEAF CHEMICAL COMPOSITION OF YOUNG PEAR AND APRICOT TREES GROWN IN CALCAREOUS SOILS

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ABSTRACT

This study was carried out during 2003 and 2004 seasons on one-year- old Le Conte pear and Canino apricot trees budded on *Pyrus betulaefolia* and seedlings of apricot rootstocks, respectively, grown in calcareous soil in a private orchard at west of Alexandria. The aim of this study was to investigate the effect of commercial fertilizers; Actosol® (organic fertilizer which contains 2.9% humic acid and 0.5% for each of Fe, Zn, Mn and Cu) and EM biostimulant (containing more than 60 selected strains of effective micro organisms). Actosol® was added as soil drench around the trees, as foliar spray on leaves and finally soil and foliar altogether. Meanwhile, EM was only added to the soil. The obtained results revealed that Actosol® treatment as (soil + foliar) and soil application of EM gave a significant increase in vegetative growth parameters of pears and apricots (trunk circumference, number of new shoots, shoot length, shoot diameter, leaf area, tree height and canopy diameter) as well as leaf chlorophyll readings and total carbohydrates content if compared to other treatments in both seasons of study. Data also indicated that application of Actosol® (soil + foliar) increased the value of N, P, K, Ca, Fe, Mn, and Zn in Le Conte pear and Canino apricot leaves in both seasons. Furthermore, EM soil treatment gave the same significance as the later treatment with P, K and Ca in Le Conte pear leaves and with N, P and Fe in Canino apricot leaves during the second season only. On the other hand all the treatments of Actosol® decreased leaf Na content compared to EM and control in both crops.

From this study, it could be recommended that the use of organic fertilizer Actosol® (soil + foliar treatment)and EM biostimulant on young
Le Conte pear and Canino apricot trees grown in calcareous soil gave vigorous growth and increased leaf nutrients content. Furthermore, it decreased the cost of production and boosted the income.

INTRODUCTION

Le Conte pear and Canino apricot trees are major crops grown in newly reclaimed areas. Those areas are considered calcareous soil, which has high $CaCO_3$ content and pH value that caused some elements in an unavailable form for trees. So , applying organic and biofertilizers to such soils is very important in agro management due to their beneficial effects on the physical ,chemical and biological properties of soils organic matter, cation exchange capacity ,availability of mineral nutrients ,plant growth and productivity (EL-Nagar,1996). Furthermore, these fertilizers are safe and environment friendly. Recently, most investigators recommended using natural organic substances.

Thus, using Actosol® containing humic acid and EM biostimulant seems to be valuable in correcting the widespread occurrence of certain nutrient deficiency symptoms. This is attained through increasing the soil

water holding capacity, promoting soil structure and enhance the metabolic activity of micro organisms. They also act as a source of nitrogen, phosphorus and sulfur for plants (Petrovic *et al.*, 1982 and Higa and Wididana, 1991). The effect of humic acid at different growth phases on yield and quality of apple and pear trees was studied. For instance, Li-Nan *et al*, (1999) and Zhu and Zhu (2000) reported that application of liquid fertilizer (containing humic acid) improved the yield and fruit quality of apples and pears .Guo *et al.*, (2000) mentioned that Komix (an organic humic acid as liquid fertilizer) sprayed at different stages promoted shoot growth, increased chlorophylls content, increased fruit weight and improved fruit quality. Moreover, Daly and Stewart (1999) Sangakkara (1999) and using EM biostimulant on bean, pea and onion, reported that the EM improved the nutrient uptake efficiency, enhanced root growth, and increased yield. According to our circumstances, Eissa (2002 and 2003) on Canino apricot and Kelsey plum trees, respectively and Atef *et al.*, (2005) on le Conte pear and Canino apricot trees grown in sandy soil using the organic liquid fertilizer (contain a minimum of 2.9% humic acid) they found that soil and foliar applications gave the highest values of vegetative growth, increased the leaf mineral contents and improved fruit quality. Furthermore, Abd El-Messeih *et al.*, (2005) indicated that EM enhanced vegetative growth, leaf chlorophylls, improved soil structure, yield and fruit quality of le Conte pear trees grown in calcareous soil.

Consequently, the present study was carried out to clear the effect of Actosol® (an organic humic acid as liquid fertilizer) and EM biostimulant on vegetative growth characters and leaf chemical composition of young Le Conte pear and Canino apricot trees grown under calcareous soil conditions.

MATERIALS AND METHODS

This experiment was conducted during 2003 and 2004 growing seasons on one-year-old Le Conte pear and Canino apricot trees grafted on *Pyrus betulaefolia* and seedlings of apricot rootstocks, respectively. These trees were grown in newly reclaimed calcareous soil at 4x5 m apart under flood irrigation system at a private orchard, situated at the west of Alexandria, Egypt. The experimental soil was analyzed before starting the experiment according to (Chapman and Pratt, 1961) and the data are presented in Table (1).

Table (1): Physical and chemical properties of the experimental soil at two depths.

Depth (cm)	Texture	pH	Total $CaCo_3$	EC. (ds/m)	O.M. (%)	Cations (meq/100g soil				DTPA- extractable, mg/kg		
						Na+	K+	Ca++	Mg++	Fe	Mn	Zn
0-30	Sandy loam	8.60	30.52	1.36	0.52	2.04	0.08	3.33	2.37	0.38	0.46	0.29
30-60	Sandy loam	8.20	32.14	0.99	0.55	1.99	0.08	3.52	1.51	0.37	0.44	0.28

Actosol® is a commercial liquid organic fertilizer, containing a minimum of 2.9% humic acid and 0.5% for each of Fe, Zn, Mn and Cu. EM

biostimulant contains more than 60 selected strains of "effective micro organisms", (viz, photosynthetic and lactic acid bacteria, yeast, actinomycetes and various fungi). All trees in the orchard were treated with the common agricultural practices in both seasons. Fourty uniform as possible trees for each crop were selected for this study and received the following treatments:

T_1: Control (no Actosol® or EM, sprayed with water only).
T_2: Soil application of Actosol® fertilizer.
T_3: Foliar application of Actosol® fertilizer.
T_4: Soil + Foliar application of Actosol® fertilizer.
T_5: Soil application of EM solution.

All applications were done once per month starting from April till September during both growing seasons. Actosol® was used at a rate of 10 cm per liter of water for soil treatment and 5 cm per liter for foliar application. EM solution consists of (5L EM+5L molasses+90L well water) and fermented for one week under anaerobic conditions before application. Each tree received one L of diluted Actosol® solution or 1 L of EM suspension solution as soil treatments and 1\2 L of Actosol® spraying solution for foliar treatment. Each treatment was surrounded by two rows as guard trees.

The experimental treatments were arranged in a randomized complete blocks design and the treatments were replicated 4 times with two trees each i.e. 5 treatments x 4 replicates x 2 tree = 40 trees of each crop.

Data recorded:-

1- Measurements of some vegetative growth characters:

These characters were measured on each treated tree of the two tested fruit crops. They included trunk circumference (cm) at10 cm above the graft union in late February and Late October of each season. The difference between the two recorded values represents the net increase in trunk circumference. Four main branches, as uniform as possible, were also chosen on each of the same trees and tagged. The average numbers of the new shoots grown on the selected branches were counted. Length, diameter of these new shoots, tree height and canopy diameter were measured (cm) in Late October .To determine the leaf area , samples of 10 mature leaves were taken from all over the circumference of each experimental tree , on mid August, using leaf area meter Model (1-203.CID,Inc,USA).

2- Determination of leaf chemical composition:

a- Leaf mineral contents: leaf samples consisted of 30 leaves each were collected from the tested pear and apricot trees on mid August of both seasons. Leaf samples were taken from the middle of the tagged shoots, washed several times with tap water, rinsed into distilled water and dried at 65 °C to a constant weight. The dried leaves were ground and digested with sulphoric acid and hydrogen peroxide according to the method described by Evenhuis and De Waard (1980). Suitable quantities were taken for mineral elements determination .Nitrogen and Phosphorus were determined calorimetrically according to Evenhuis (1976) and Murphy and Riley (1962), respectively. As for K and Na, were determined by flame photometer, while Ca, Fe, Zn and Mn by Perken

Elemer Atomic Absorption Spectrophotometer. These Macro and micro-elements were expressed as a percentage (%) and a part per million (ppm), respectively on leaf dry weight basis.

b- Leaf chlorophyll readings: they were recorded by using Minolta Chlorophyll Meter SPAD-502 (Minolta camera. Co, LTD Japan) at the field .The average of ten readings was read on the middle of pear and apricot leaves that represent all over the tree circumference on mid June .

c -Total carbohydrates: they were determined as a percent on leaf dry weight basis according to Dubios *et al.* (1956).

All obtained data were statistically analyzed according to Snedecor and Cochran (1990) and LSD test at 0.05 level was used for comparison between treatments.

RESULTS AND DISCUSSION

1- Effect of Actosol® and EM fertilizers on vegetative growth characters:

According to the results in Tables (2 and 3) the comparison among the five treatments indicated that ,in general ,all Actosol® and EM treatments improved all vegetative growth parameters measured on Le Conte pear and Canino apricot trees i.e. trunk circumference, number of new shoots ,shoot length ,shoot diameter ,leaf area ,tree height and canopy diameter if compared to the untreated trees, in both seasons. It was noticed that the treatments T_4 (Actosol® soil + foliar) and T_5 (soil EM biostimulant) were superior in that respect, during the two seasons of study. However, in case of trunk circumference and leaf area of Le Conte pear trees, treatments of T_2 (Actosol® soil), T_4 (Actosol® soil + foliar) and T_5 (soil EM) did not reach the level of significance in the second season. Meanwhile, the number of new shoot of Canino apricot trees in the first season did not reflect any significant response as a result of using different Actosol® and EM treatments. The pronounced enhancing effects of fertilization with Actosol® as soil + foliar application (T_4)and soil EM treatment (T_5) may be related to the improving effect on soil structure, aeration, water retention and uptake of nutrients from the soil. Moreover, they increase microbial activity in the soil and enhance plant cell biomass. The low molecular weight humics in Actosol® have the cytokinnin/auxin like response and not only help in transport of trace elements, but also greatly stimulate root growth (Patti *et al.* 1988). The present results are in harmony with Abd El-Messeih *et al.*, (2005) who reported that all applications of EM biostimulant significantly increased vegetative growth of le Conte pear trees grown in calcerous soil. Also Atef *et al.*, (2005) concluded that the use of Actosol® on Le Conte pear and Canino apricot trees led to a high availability of soil nutrients for the plant uptake, under sandy soil conditions. Moreover, Actosol® treatment (soil and foliar) gave the highest vegetative growth parameters. The same trend was recorded on apple trees by Abadia (1984), Silvia *et al.*, (1999) and Guo *et al.*, (2000).

Table (2): Effect of Actosol® and EM fertilizer applications on seven vegetative growth of Le Conte: pear trees in 2003 and 2004 seasons.

Treatments	Trunk circumference (cm)	Number of new shoots	Shoot length (cm)	Shoot diameter (cm)	Leaf area (cm^2)	Tree height (cm)	Tree diameter (cm)
			2003				
T_1	1.593	8.67	37.83	0.72	25.64	118	77
T_2	2.331	10.17	45.83	0.92	26.29	133	89
T_3	1.695	9.33	40.66	0.74	26.01	124	81
T_4	3.979	12.5	49.50	0.96	27.85	140	96
T_5	4.210	12.43	48.88	0.96	27.88	147	99
L.S.D.0.05	0.392	1.885	1.951	0.028	1.494	3.209	2.719
			2004				
T_1	3.611	11.67	43.33	0.84	30.21	179	86
T_2	6.711	15.83	52.17	0.98	32.36	194	99
T_3	4.081	14.00	47.17	0.87	30.28	183	90
T_4	7.889	18.17	55.00	1.20	33.55	203	110
T_5	7.938	18.70	59.00	1.22	33.65	213	116
L.S.D.0.05	0.507	1.63	1.997	0.042	2.356	9.849	2.849

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

Table (3): Effect of Actosol® and EM fertilizer applications on seven vegetative growth of "Canino" apricot trees in 2003 and 2004 seasons.

Treatments	Trunk circumference (cm)	Number of new shoots	Shoot length (cm)	Shoot diameter (cm)	Leaf area (cm^2)	Tree height (cm)	Tree diameter (cm)
			2003				
T_1	0.859	11	50	0.65	17.11	159	104
T_2	1.946	14	60	0.81	21.92	170	115
T_3	1.139	13	58	0.75	19.84	165	110
T_4	3.217	16	65	1.22	23.76	183	128
T_5	3.215	17	64	1.21	24.00	186	128
L.S.D.0.05	0.827	2.610	2.844	0.028	0.250	8.069	6.327
			2004				
T_1	2.546	15	56	0.72	18.24	205	116
T_2	4.253	20	65	0.98	22.75	233	132
T_3	3.132	17	61	0.85	20.85	224	126
T_4	5.821	24	77	1.33	25.77	262	144
T_5	5.818	24	79	1.35	25.76	260	146
L.S.D.0.05	0.808	2.866	2.824	0.250	0.896	10.697	5.648

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

2-Leaf chemical composition:

a- Leaf chlorophyll readings:

The tabulated data (Table 4) showed that during both experimental seasons, Actosol® fertilizer and EM applications on Le Conte pear and Canino apricot trees had relatively a positive effect on leaf chlorophyll reading values. The effect of all treatments could be arranged in descending

order as follows: EM soil>Actosol® soil + foliar > Actosol® soil > Actosol® foliar > control in both seasons. All the previous treatments were significant when compared to the control. However, it was noticed that the differences between the Actosol® either used alone as soil treatment or used as soil+ foliar application as well as EM soil treatment were not enough to be significant for Le Conte pear trees in both seasons. In addition, the differences between Actosol® (soil + foliar) and EM treatments were insignificant in Canino apricot trees in both seasons. In general , these results are in line with those obtained by Guo *et al* .,(2000) who reported that sprayed apple trees with different concentrations of Komix (an organic humic acid as liquid fertilizer) at different stages promoted shoot growth , increased chlorophyll content and enhanced photosynthesis. Eissa (2003) recommended the use of EM and humic acid on Kelesy plum in the following descending order: EM soil biostimulant > Retender (contains humic acid) = Vegimax (contains vitamins > EM foliar > control.

b- Leaf carbohydrates content:

Leaf carbohydrate content of Le Conte pear and Canino apricot trees, were in the same trend as leaf chlorophyll readings with Actosol® (soil + foliar) and soil EM treatment, in both seasons (Table 4) .This results may be due to their increasing effect on leaf total chlorophylls which led to an increase in total carbohydrate contents in Le Conte pear and Canino apricot leaves under this study.

Table (4): Effect of Actosol® and EM fertilizer applications on leaf chlorophyll reading and total leaf carbohydrates of "Le Conte pear and "Canino apricot trees in 2003 and 2004 seasons.

Treatments	Leaf chlorophyll reading		Total leaf carbohydrates %	
	2003	2004	2003	2004
Pears				
T_1	31.14	32.08	9.10	9.36
T_2	32.46	35.24	10.14	10.31
T_3	31.18	33.12	10.60	10.90
T_4	33.21	36.52	10.98	11.20
T_5	33.23	35.41	10.88	11.21
L.S.D.0.05	1.197	1.258	0.640	0.840
Apricots				
T_1	20.82	20.85	9.20	9.63
T_2	25.23	25.44	10.40	10.73
T_3	23.42	23.45	10.10	10.02
T_4	29.62	30.20	10.75	11.09
T_5	30.00	30.21	10.77	11.00
L.S.D.0.05	1.242	0.740	0.648	0.827

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

c- Leaf mineral content:

- **Leaf macro nutrient content:**

1. Nitrogen:

The concerned results in Tables (5 and 6) indicated that, during the two experimental seasons of study pears or apricots, the leaf nitrogen values were greatly affected mostly by T_4 (Actosol® soil + foliar) than by other treatments. These results may be due to humic matter which has an increasing effect on the uptake of nitrogen by plants and soil nitrogen utilization efficiency (Patti *et al.*, 1988). The only exception was in 2004 season in Canino apricot leaves; the differences between T_2, T_4 and T_5 were not significant.

2. Phosphorus:

Data in Tables (5 and 6) proved that the addition of Actosol® and EM to Le Conte pear and Canino apricot trees increased leaf P content than in the control in both seasons under study. These findings are in line with Li-Nan *et al*, (1999) who reported that the humates played an important role in phosphate utilization by plants evidenced by an increase in ppm of humic acid and P% in plants.

3. Potassium:

Tables (5 and 6) illustrated that, leaf K content was significantly affected by different Actosol® and EM treatments. Leaf K values were much higher with T_4 (Actosol® soil + foliar) treatment in Le Conte pear and Canino apricot leaves in both seasons. However, in the second season, T_2 (Actosol® soil alone), T_4 (Actosol® soil + foliar) and T_5 (soil EM) were not quite significant in le Cont pear leaves.

4. Calcium:

Results tabulated in Table (5) showed that, applying Actosol® and EM fertilizers to Le Conte pear trees appreciably increased the leaf Ca content compared to the control during both seasons. It was noticed that leaves on trees under T_2, T_4 and T_5 treatments have the highest significant Ca levels compared to those of the other treatment in the two years of study. As regard of Canino apricot trees, results being cleared in Table (6) showed that, T_4 (Actosol® soil + foliar) was superior over the other treatments, in both seasons.

5. Sodium:

It was obvious from Tables (5 and 6) that, all Actosol® (an organic fertilizer contains humic acid) treatments significantly decreased leaf Na content compared to the EM biostimulant and control treatments in both crops and years. However, the differences between EM biostimulant and control treatments were insignificant. These results are due to the effect of humic acid which prevented the absorption of sodium ions from the soil, that this enables the tree to withstand high levels of salinity. (Patti *et al.*, 1988).

All the obtained results are in harmony with Senn and Kingman (1973) who reported that the humic acid increased the permeability of plant membranes, so promoting the uptake of nutrients. Russo and Berlyn (1990) and Eissa (2003) when using various groups of biostimulants and humates, they found that these substances increased the nutrient uptake. Furthermore, using Actosol® (organic fertilizer)and EM biostimulant which contain "effective

micro organisms" led to modification of the soil-root interface and so making nutrients more available to the plant. (Atef et al., 2005 and Abd EL-Messeih et al., 2005).

Table (5): Effect of Actosol® and EM fertilizer applications on some macro elements in "Le Conte" pear leaves in 2003 and 2004 seasons.

Treatments	Leaf N %	Leaf P %	Leaf K %	Leaf Ca %	Leaf Na %
2003					
T_1	1.73	0.11	1.32	1.32	0.97
T_2	2.00	0.15	1.40	1.40	0.91
T_3	1.78	0.13	1.37	1.35	0.90
T_4	2.10	0.16	1.44	1.45	0.89
T_5	2.00	0.16	1.40	1.42	0.97
L.S.D.0.05	0.066	0.030	0.034	0.036	0.030
2004					
T_1	1.80	0.12	1.30	1.32	0.98
T_2	2.10	0.16	1.43	1.42	0.84
T_3	1.90	0.17	1.36	1.37	0.92
T_4	2.20	0.18	1.45	1.47	0.83
T_5	2.14	0.17	1.44	1.45	1.00
L.S.D.0.05	0.055	0.023	0.035	0.034	0.028

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

Table (6): Effect of Actosol® and EM fertilizer applications on some macro elements in "Canino" apricot leaves in 2003 and 2004 seasons

Treatments	Leaf N %	Leaf P %	Leaf K %	Leaf Ca %	Leaf Na %
2003					
T_1	1.80	0.12	1.11	1.25	1.20
T_2	2.10	0.16	1.20	1.36	1.10
T_3	2.03	0.16	1.13	1.29	1.18
T_4	2.21	0.18	1.25	1.40	0.87
T_5	2.11	0.18	1.20	1.38	1.22
L.S.D.	0.096	0.030	0.027	0.028	0.026
2004					
T_1	1.83	0.17	1.13	1.30	1.23
T_2	2.28	0.20	1.20	1.38	0.99
T_3	2.13	0.21	1.15	1.33	1.16
T_4	2.25	0.22	1.25	1.40	0.81
T_5	2.24	0.22	1.20	1.37	1.21
L.S.D.	0.051	0.020	0.027	0.026	0.028

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

- **Leaf micro nutrients content:**

The general effect of Actosol® (an organic liquid fertilizer) and EM biostimulant on leaf micronutrients of the two tested crops i.e., Fe, Mn and Zn were significant, in 2003 and 2004 seasons, are illustrated in Tables (7 and 8). The fourth treatment significantly gave higher values of micronutrients

than other treatments in both years. The only exception was found for Fe in the second season in Canino apricot leaves where the T_2, T_4 and T_5 were not enough to be significant. These results may be due to Actosol® which contains humic acid and EM biostimulant which increased the surface area per unit of root length and hence enhanced the root hair branching with an eventual increase in acquisition of nutrients from the soil. Furthermore, Actosol® contains some micro elements especially iron which became available to plants in the presence of humates. iron element corrects the phenomenon of chlorosis that is usually present in alkaline, calcareous soils which are normally deficient in available iron and is low in organic matter. These positive responses were acknowledged by numerous investigators such as Abou Hussein *et al.*, (2002) and Atef *et al.*, (2005).

Conclusion

Obtained results in this study clearly showed that fertilizing of le Conte pear and Canino apricot trees grown in calcareous soil by Actosol® (an organic liquid fertilizer contain humic acid and micro nutrients) and EM biostimulant (Effective Microorganisms) improved vegetative growth, leaf chlorophyll readings and total carbohydrate contents as well as with mineral contents. It is evident that adding Actosol® (soil + foliar) at the same time makes complete benefit to the trees. Indeed, foliar treatment led to quick absorption via leaves and limited loss of the nutrient. This can be explained by the ability of humic acid to adjust pressure potential of guard cell of stoma in leaves thus controlling the opening and closing and so lowering moisture transpiration rates. Thus, the application of such treatment may be useful for decreasing the cost of production and increasing the return income.

Table (7): Effect of Actosol® and EM fertilizer applications on some micro element in "Le Conte pear" leaves in 2003 and 2004 seasons

Treatments	Leaf Fe ppm	Leaf Mn pm	Leaf Zn ppm
	2003		
T_1	98	21.27	37
T_2	110	32.16	40
T_3	105	28.34	41
T_4	116	35.26	44
T_5	113	31.50	40
L.S.D. 0.05	2.045	2.935	2.005
	2004		
T_1	96	24.21	37
T_2	112	35.14	41
T_3	107	29.33	41
T_4	120	39.22	43
T_5	117	34.50	40
L.S.D. 0.05	2.021	2.947	2.008

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

Table (8): Effect of Actosol® and EM fertilizer applications on some micro element in "Canino" apricot leaves in 2003 and 2004 seasons

Treatments	Leaf Fe ppm	Leaf Mn pm	Leaf Zn ppm
	2003		
T_1	95	26.10	31
T_2	102	29.20	34
T_3	98	30.30	32
T_4	105	35.30	37
T_5	100	30.50	33
L.S.D. 0.05	2.739	2.637	2.811
	2004		
T_1	97	27.07	30
T_2	103	30.00	35
T_3	100	31.00	33
T_4	106	35.50	37
T_5	103	31.80	34
L.S.D. 0.05	2.837	2.857	2.082

T_1= Control- T_2 = Soil application of Actosol®- T_3= Foliar application of Actosol®- T_4 = Soil + foliar application of Actosol®- T_5= Soil application of EM.

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تأثير السماد العضوى الاكتوسول والمنشط الحيوى EM على المجموع الخضرى والمحتوى الكيماوى لاوراق اشجار الكمثرى والمشمش الصغيرة المنزعة فى تربة جيرية

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اجرى هذا البحث خلال عامى ٢٠٠٣ و ٢٠٠٤ على اشجار الكمثرى صنف ليكونت والمشمش صنف كانينو عمر سنه والمطعومة على اصل البتشليقوليا والمشمش البذري على التوالى ومنزرعة فى ارض جيرية بمزرعة خاصة غرب الاسكندرية بهدف دراسة تأثير الاسمدة التجارية مثل الاكتوسول (سماد عضوى محتوى على حمض الهيوميك بنسبة ٢,٩% و٠,٥% لكل من الحديد و الزنك و النجنيز و النحاس) والسماد الحيوى EM (المحتوى على أكثر من ٦٠ نوع من الكائنات الدقيقة). وتم اضافة سماد الاكتوسول الى التربة حول الاشجار أو رش على الاوراق أو (اضافة ارضية + رش على الاوراق) . اما EM فقد تم اضافة الى التربة فقط . وقد اظهرت النتائج أن :-

معاملة الاكتوسول (اضافة ارضية + رش على الاوراق) و الإضافة الأرضية لـ EM ادت الى زيادة قياسات النمو الخضرى (قطر الجذع - عدد النموات الحديثة وطولها وقطرها - مساحة الورقة - طول الشجر وقطرها) وايضا الى زيادة محتوى الاوراق من الكلوروفيل والكربوهيدرات لكل من صنفى الكمثرى والمشمش خلال عامي الدراسة .

كما اظهرت نتائج الدراسة ان معاملة الأكتوسول (الرش على الأوراق + الاضافة الارضية) قد ادت الى زيادة محتوى الاوراق من النيتروجين- الفوسفور - البوتاسيوم والكالسيوم والحديد والزنك والمنجنيز خلال عامي الدراسة في كل من الصنفين. و تساوت معاملة الEM ومعاملة الأكتوسول (الرش على اوراق + الاضافة الارضية) في عناصر الفوسفور و البوتاسيوم و الكالسيوم في أوراق الكمثرى صنف ليكونت و عناصر النيتروجين و الفوسفور و الحديد في أوراق المشمش الكانينو في السنة الثانية من الدراسة. وانخفض محتوى الاوراق من الصوديوم لكل معاملات الاكتوسول مقارنه باشجار الكنترول و الEM في صنفي الدراسة.

ومن خلال هذه الدراسة يمكن التوصية باستخدام السماد العضوى الاكتوسول (إضافة أرضية + رش على الأوراق) والمنشط الحيوى EM لأشجار الكمثرى والمشمش المنزعة فى ارض جيرية للحصول على مجموع خضرى قوى وزيادة محتوى الاوراق من العناصر الغذائية. بالاضافة الى تقليل المصروفات وزيادة العائد.