RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

In this regard two experiments included in the present disertation were dealing to investigate the vegeative growth; flowering behaviour, fruting, as well as fruit and seed characteristics and some chemical composition of young (12 month old) olive trees belonging to two commerical cultivars namely Manzanillo and Coronaiki in response to various Bio and mineral NPK fertilization treatmetns (soil and foliar aplied either solely or in combinations) were investigated comparing with the adopted doses recommended by Ministry of Agriculture during two experimental seasonss (2002- 03 and 2003-04)

Thus it was so worthly that data of each experiment might be dis-cussed separately as follows:-

IV.I. Experiment, I :

Effect of different combinations between some mineral and bio-NPK soil fertilizers soil applied on some growth parameters of Manzanillo and Coronaiki olive trees :

IV.I.I. Response of vegetative growth measurements:

In this regard, number of shoots per one meter branch; number of leaves/shoot, shoot length (cm), shoot diameter (cm), number of leave / shoot, leaf area (cm^2), leaf fresh and dry weight, shoot fresh and dry weight were the siven growth measurements of both Manzanillo and Coronaiki olive cultivars trees investigated pertaining their response to the specific effect of investigated variables (factors) i.e fertilization treatments (6 soil bio- NPK fertilizers treatments) and 2 olive cultivars, and interaction effect of

the differential 12 combinations between two variables of both studied factors during 2002-2003 and 2003-2004 seasons.

IV.I.1.1.Number of developed shoots:

The average number of shoots per one meter tagged branch, in response to specific and interaction effects of olive cultivars and bio-NPK mineral fertilizer soil application treatments as well as interaction effect of their combinations were investigated, wheras data obtained during both 2002-2003 and 2003-2004 experimental seasons are presented in **Table (2)**:

A- Specific effect:

Concerning the specific effect of olive cultivars, **Table (2)** reveals that the greatest number of shoot meter branch was significantly exhibited by Cronaiki olive cultivar during both 2002-2003 and 2003-2004 seasons.

On the contrary, Manzanilla cvs had significantly the least number of shoots/ one meter branch during 1st and 2nd seasons. The same trend was found partially by **Ikram et al., (1992) and Hasan (2005)** on olive seedlings.

As for the specific effect of different Bio-NPK mineral fertilization soil applied treatments, it is quite evident as shown from **Table (2)** that all the five of different Bio-NPK mineral fertilization soil treatments resulted in a significant increase in number of shoots / one meter branch as compared to control (ordinary fertilization program) treatment.

Also the differences between the five soil fertilization treatments were significant as each was compared to the four other ones during the two seasons of study. Such trend was true during

both seasons, however, both the T6 (Kotengin + Biofertilizer + K_2SO_4) and the T3 (kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) as well as the T4 (Kotengin + Phosphorene +Rhizbacterin + K_2SO_4) soil applied treatments was the most effective in this concern. Meamwhile two other treatments i.e. where differences between these effective treatments did not reach level of siginficante as they were compered each other druing two seaosns of study T5 (Koterngin + superphosphate + Rhizobacterin + K_2SO_4) and T2 (NPK) Soil applied treatments descindingly ravted 2nd and 3rd , respectively as this appeared to be less effective than the above mentioned 3 effecitve ones. In addition, the (ordinary program-control) soil treatment was significantly the inferior during both seasons of study.

These results are in harmony with the findings of **Abdel Hameed (2002)** who reported that the highest significant number of shoots / twig were obtained with BF + BS. In addition, **Omran and Abdel Latif (2003)** found that adding yest strain (to roomy Red grapevine cv as a soil drench for three different application times were more effective on the total shoots number as compared to untreated (control) .

B.Interaction effect:

Referring the interaction effect of the investigated two factors i.e., olive cultivars, soil Bio-NPK mineral treatments on the average number of shoots/ one meter branch, data obtained from **Table (2)** showed that specific effect of each factor was directly reflected on their combinations during both seasons of study, since, Cronaiki trees received either T3 (Kotengin + Phosphorene + $(NH_4)_2$ So_4 + K_2So_4) or T6 (kotengin + Boifertilizer + K_2So_4) soil

Toffahi, Manzanillo and PICUAL" Morover, **Aly (2005)** reported

applied treatments exhibited statistically the greatest number of shoots/ one meter branch during two seasons of study.

In addition; "Manzanillo olive" olive trees received the T1 ordinary NPK program (control) treatment was statistically the inferior as exhibited the lowest value of number of shoots/ one meter branch in both seasons of study. Meanwhile; other combinations were in between the aforesaid two discussed categories (the superior and infeuor combinations). In this concern, **Abdel Hameed, (2002)** mentioned that the interaction between 100% N and BF + BS gave the highest significant number of shoots / twig.

IV.I.1.2. Number of leaves per shoot:

Concerning the specific and interaction effects of two investigated factors (olive cultivars, Boi- mineral NPK fertilizers soil added treatments) and their combination on number of leaves per shoot during both 2002-2003 and 2003-2004 seasons are presented in **Table (2)**.

Aspecific effect:

With regard to specific effect of cultivar, data obtained during two seasons displayed that "Coronaiki" cv was statistically superior regarding the number of leaves/ shoot dis cendingly followed by "Manzanillo" cvs which markedly ranked signifnclty last during two seasons of study.

Similar findings were also reported by **Abdel Ella (1999)** who detected that leaves number/ shoot of Massolati and Meski olive cultivars was significantly different . In addition **El – Khawaga (2001)** indicated that significant differences in leaves number / meter among five olive cultivars, "Coronaiki, Aggizi,

reported that, inoculation of banana cv. Povan with *Azaspirillum*

Table (2): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on numbers of shoots/ one meter of branch and number of leave/ shoot during both 2002-03 and 2003-04 experimental seasons.

Treatments	Number of shoots/ branch/ m						Number of leaves/ shoot					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	12.3 g	16.13 f	**14.22 D**	13.6 g	17.9 f	**15.75 D**	11.13 i	16.73 f	**13.93 E**	11.83 l	17.83 i	**14.83 F**
(T_2) Kotengin +NPK	15.4 f	20.2 c	**17.80 C**	17.03 f	22.37 c	**19.70 C**	13.03 h	21.43 d	**17.23 D**	13.93 k	22.87 e	**18.40 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	17.6 de	23.1 a	**20.35 AB**	19.47 de	25.63 a	**22.55 AB**	18.20 e	28.87 b	**23.53 B**	19.03 h	31.57 c	**25.30 C**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	16.63 ef	21.83 b	**19.23 A-C**	18.37 ef	24.2 b	**21.28 A-C**	14.78 g	23.73 c	**19.26 C**	15.57 j	25.93 d	**20.75 D**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	16.23 f	21.27 bc	**18.75 BC**	17.9 f	23.57 bc	**20.73 BC**	19.17 e	28.93 b	**24.05 B**	20.47 g	32.63 b	**26.55 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	18.1 d	23.73 a	**20.92 A**	20.0 d	26.33 a	**23.17 A**	20.47 d	33.63 a	**27.05 A**	21.40 f	35.83 a	**28.62 A**
Mean*	**16.04 B**	**21.04 A**		**17.73 B**	**23.33 A**		**16.13 B**	**25.56 A**		**14.07 B**	**27.78 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.1.3.Shoots length

A-Specific effect:

Concerning the specific effect of different factors involved in this study i.e., olive cultivars and different Bio-NPK mineral fertilization treatment soil applied on average shoot length (cm), data obtained in **Table (3)**, showed that "Coronaiki" shoots had statistically the greatest value of average shoot length as compared to those of "Manzanillo" cv in both seasons of study.

The obtained results are confirmed with the findings of **Aly (2005)** who mentioned that the average shoot length of "Aggizi shami" , Manzanillo" and "Kalamata" olive trees were differed according to cultivar. In this respect, "Kalamata" had the longest shoots. Moreover**, Hasan (2005)** showed that Coronaiki transplants was the superior, while Aggizi cvs. was the inferior in this concern. Moreover, Manzanillo was intermediate. In addition, **Girgis (2005)** reported that Coronaiki cv. Showed the best rate of shoot length compared with other varieties (Picual, Aggizi and Manzanillo).

Regarding the specific effect of different Bio-NPK mineral soil fertilization treatments on shoot length (cm) data in **Table (3)** showed that shoot length was significantly affected by different Bio-NPK mineral soil fertilization treatments in both seasons. The five investigated soil treatments resulted in an obvious increase over (contriol) treatment in shoot length of olive plants during two seasons.

Whereas the differences between the five soil fertilization treatments were significant as each was compared to the four other ones during the two seasons of study. On the other hand, The T6 (Kotengin +Biofertilizer + K_2So_4) soil application treatment ranked

statistically first in this regard, followed in a descending order by the T5 (Kotengin + Superphosphate + Rhizobacterin + K_2So_4). The T4 (kotengin+ Phosphorene +Rhizobocterin + K_2So_4) came in the third class; meanwhile, both the T3 (kotengin + Phosphorene +$(NH_4)_2$ So_4 + K_2So_4) and the T2(NPK) soil application treatments appeared to be less effective than the above mentioned ones in both seasons of study. On the contrary, ordinary program (control) treatment exhibited the lowest value in this respect.

Jeeva *et al.*, (1988) reported that, inoculation of banana cv. Povan with *Azospirillum* plus the highest N rate (100%) enhanced the height of the pseudostem. Similar observation was obtained by **Akl *et al.*, (1997)** who demonstrated that supplying of Reed Roomy grapevines with phosphorene, (2g / vine), active dry yeast (1% as faliar application), Rhizobacterine (10g / vine) or Nitrobein (10g / vine) significantly improved shoot length compared with untreated vines .

B-Interaction effect:

Referring the interaction effect of the different combinations between two factors i.e., olive cultivars and different Bio-NPK mineral soil fertilization treatments on shoot length (cm), data in **Table (3)** showed obviously a variable response of olive trees to the different combinations during two seasons of stud. The most increase, in shoot length was exhibited by such combinations of "Coronaiki" trees fertilized with the T6 (Kotengin + Biofertilizer + K_2So_4) soil application treatment which ranke the superior in this respect. On the other hand, the least increase in stem length below the analogous ones of control was detected by "Manzanillo" olive trees fertilized with the T2 (NPK) as compared to those fertilized

with ordinary program (control) treatment. Other combinations were in between the aforesaid two extremes.

The obtained results are in partial agreement with those mentioned by **Abdel Hameed (2002)** who mentioned that the interaction between 100% N and Biofertilizer gave the highest significant shoot length of Manzanillo olive trees.

IV.I.1.4 Shoot diameter:

Data obtained during both 2002-2003 and 2003-2004 experimental seasons regarding the specific and interaction effects of two investigated factors (olive cultivars and different Bio-NPK mineral fertilization treatments), as well as their combinations are presented in **Table(3)**.

A. Specific effect:

With regard to the specific effect of olive cultivar, tabulated data in **Table (3)** show that Coronaiki trees had the thickest shoots whereas; Manzanillo olive trees had the thinnes ones during two seasons of study.

Referring the specific effect of different Bio-NPK mineral fertilization treatments, data obtained revealed that, the stem diameter was significantly affected by different treatments in both seasons. However, all five inrestigted soil applied Bio- mineral fertilization treatments resulted in an obvious increase over control but differences were significant with Comparing T6; T5 ; T4 and T3 only to control during both experimental seasons. The previous results go in line with that mentioned by **Das. *et al.*, (1996)** on Mulbery , **Dibut Avlarez *et al.*, (1996)**. On banana plants, **Haggag and Azzezy (1996)**. On mango seedliags, **Ahmed *et al.*, (1998)** on Red Roomy grapevine, **Sivakumar, (2001)**. On mango rootstock,

Soliman (2001) on guava and banana plants and **El-Kholy (2004)** on Grand Nain banana plants. In addition, **Akl et al., (1997)** who demonstrated that supplying Red Roomy grapevine with phosphorene (29 / vine), active dry yeast (1% as a faliar application), Rhizobacterin (10g / vine) or Nitrobien (10g / vine) significantly improved cane thickness as compared with untreated vines. Moreover, **Abedl – Hameed (2002)** reported that the average shoot diameter were significantly increased by nitrogen fertilization.

B. Interaction Effect:

As for the interaction effect between olive cultivars and soil applied Bio-NPK mineral fertilizers treatments on stem diameter of olive shoots, it is quite clear that the most increase in shoot diameter was exhibited by two combinations represented Coronaiki cultivar which received either T6(Kotengin + Biofertilizer + K_2So_4) or T5 (Kotengin +superphosphate +Rhizobacteria + K_2So_4) treatment in both seasons and to great extent those supplied with T3 (kotengin + phosphorene + $(NH_4)_2$ So_4 + K_2So_4) in the second season. However, the lower increase in shoot diameter was detected by Manzanillo tress fertilized with the T2 (NPK) treatment as compared to those fertilized with ordinary program (control) treatment. Moreover, other combinations were in between the aforesaid two extremes. In this respect, **Abdel Hameed (2002)** found that the interaction between 100% N and Biofertilizer gave the highest significant shoot diameter of Manzanillo olive trees.

Table (3): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Shoots length and diameter (cm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Shoot length (cm)						Shoot diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	11.37 k	18.20 h	**14.78 E**	12.10 l	19.37 i	**15.73 F**	0.15 g	0.18 f	**0.16 B**	0.15 h	0.18 g	**0.17 C**
(T_2) Kotengin +NPK	14.23 j	23.27 e	**18.75 D**	15.13 k	24.8 e	**19.97 E**	0.18 f	0.22 b-d	**0.20 AB**	0.18 g	0.27 c-e	**0.21 BC**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	19.33 g	31.43 c	**25.38 B**	20.6 h	33.5 c	**27.05 C**	0.19 d-f	0.24 a-c	**0.21 A**	0.20 e-g	0.25 bc	**0.21 AB**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	15.97 i	26.17 d	**21.07 C**	16.93 j	27.9 d	**22.42 D**	0.19 ef	0.23 bc	**0.21 A**	0.20 fg	0.24 b-d	**0.22 AB**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	20.80 f	33.27 b	**27.03 A**	21.8 g	35.43 b	**28.62 B**	0.21 c-e	0.25 ab	**0.23 A**	0.22 d-f	0.26 ab	**0.24 AB**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	21.60 f	35.47 a	**28.53 A**	23.0 f	37.77 a	**30.38 A**	0.21 c-e	0.26 a	**0.24 A**	0.23 c-e	0.28 a	**0.26 A**
Mean*	**17.22 B**	**27.97 A**		**18.26 B**	**29.79 A**		**0.19 B**	**0.23 A**		**0.20 B**	**0.24 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.1.5. Average leaf area (Cm^2):

The average leaf area (Cm^2) in response to specific and interaction effects of olive cultivars and different Bio-NPK mineral fertilization treatments and their combinations were investigated. Data obtained during both 2002-2003 and 2003-2004 experimental seasons are presented in **Table (4)**.

A. Specific effect:

Table (4) displays that average leaf area responded specifically to olive cultivar, whereas, Coronaiki was the superior, while Manzanillo was the inferior. The response was pronounced with average leaf arera (cm^2) whereas, differences were significant as the two cultivars were compared each other during both 2002-2003 and 2003-2004 experimental seasons.

These results go in line with the findings of **Hassan (1980)** who found that Frantoio cv. had the highest leaf area in comparison with Chemlali, Dolce. del Morocco, Mission and Aggizi shami olive cvs. and **Hasan (2005)** mentioned also that Coronaiki cvs. had the widest leaf area than Aghizi cvs. And Manzanillo cvs.

Referring the specific effect of different Bio-NPK mineral soil fertilization treatment, obtained data in **Table (4)** Showed that all five investigated Bio-NPK mineral soil treatments resulted in an obvious increase in leaf area (cm^2) during 1^{st} and 2^{nd} seasons. The differences between five soil fertilized treatments were significant as each was compared to the four other ones during two seasons of study. Such increase was significant as compared to those of ordinary fertilization program (control). On the other hand. The most increase was always in concomitant to the T6 i.e., (Kotengin +Biofertilizer + K_2So_4) soil application treatment followed

statistically in a descending order by two treatments T5 (kotengin + superphosphate +Rhizobacterin + K_2So_4) and T3 (Kotengin+ phosphorene + $(NH_4)_2So_4$+ K_2So_4) treatments where both ranked statstically 2nd. Moreover T4 (kotengin + phosphorene +Rhizobacterin + K_2So_4) soil applied treatment came third while, T2 (NPK) treatment appeared to be the least effective one as compared to control.

The observation are in accordance with those obtained by **Haggag (1996)** whereas, he pointed out that increasing nitrogen fertilization increased leaf area. Also, **Jeeva *et al.*, (1988)** reported that, inoculation of banana cv. Pavan with *Azospirillum* enhanced the leaf area ;Moreover, **Amhed *et al.*, (1997-a)** demomtrated that supplying Red Roomy grape vines with phosphorene (2g / vine), active dry yeast (1% as foliar application), Rhizobacterin (10g/ vine) of Nitrobein (10g/ vine) significantly improved leaf area compared with untreated vines. In addition, the previous results are in agreement with that reported by **El – Demerdash (1988); Noval *et al.*, (1997)** on banana; **Ahmed *et al.*, (1998)** on Red Roomy grapevine; **Sharma and Bhutani (1998)** on apple seedlings; **Tiwary *et al.*, (1998) ; Soliman (2001) ; Abd El Aziz (2002)** on banana plants, **Moustafa (2002)** on Washington navel orange and **El-Kholy (2004)** on banana cvs.

B.Interaction effect:

Referring the interaction effect of the different combiantion between the investigated two factors i.e., olive cultivars and different Bio-NPK mineral fertilization treatments on the average leaf area, data obtained in **Table (4)** showed that the most increase in leaf area was coupled with such combination represented

Table (4): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average leaf area (cm^2) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf area (cm^2)					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	2.87 l	4.63 f	**3.76 E**	2.91 l	4.69 f	**3.80 E**
(T_2) Kotengin +NPK	2.93 k	4.73 e	**3.83 D**	3.00 k	4.79 e	**3.89 D**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	3.10 h	5.00 b	**4.05 B**	3.14 h	5.07 b	**4.11 AB**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	3.02 j	4.87 d	**3.95 C**	3.06 j	4.93 d	**3.99 C**
(T_5) Kotengin+ P+ Rhizo- bacterin +K_2SO_4	3.08 i	4.96 c	**4.02 B**	3.12 i	5.03 c	**4.07 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	3.14 g	5.05 a	**4.10 A**	3.18 g	5.11 a	**4.14 A**
Mean*	**3.02 B**	**4.87 A**		**3.07 B**	**4.94 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

Coronaike trees received the T6 (kotengin + Biofertilizer + k_2SO_4) soil treatment, whereas the highest increase if average leaf area was resulted. On the other hand, the lowest increase in average leaf area was detected by Manzanillo trees received T2(NPK) soil treatment as compared to those of other combinations during 2002-2003 and 2003-2004 seasons, Moreover, other combinations were in between the aforesaid two extremes.

IV.I.1.6 leaf fresh and dry weights (gm):

Data obtained during both experimental seasons of 2002-2003 and 2003-2004 regarding the specific and interaction effects of two investigated factors (olive cultivar and different Bio-NPK mineral soil fertilization treatments) as well as their combinations are presented in **Table(5).**

A. Specific effect:

With regard to the specific effect of olive cultivar, tabulated data in **Table (5)** show that both parameters (fresh and dry weight) followed typically the same trend. Hence, Coronaiki trees had the greatest leaf fresh and dry weights, while Manzanillo had the lightest values during the 1st and 2nd seasons of study. In this concern, **El Said *et al.*, (1995)** showed a wide variations, between Rosciolo, Beutellan, Nabal, Mission, Wordan, Coronaiki, Taffahi; Manzanillo, Mostazal, Aghizi, PICUAL, Verdeal, Pocama and Hamed olive cvs. In addition, **Hasan (2005)** reported that Coronaiki transplants had the greatest leaves fresh and dry weights, while Manzanillo transplants had the lightest values and Aghizi cultivar was in between during the study.

Concerning the specific effect of different Bio-NPK mineral soil fertilization treatments, data obtained revealed that, the leaf fresh and dry weights were significantly increased by any of the five investigated treatments as compared with control trees. Herein, the greatest increase in leaf fresh and dry weights was exbibited by T6 (Kotengin + Biofertilzer + K_2SO_4) treatment during two season of study, followed in a descending order by both T5 (kotengin + Superphosphate + $K_2 SO_4$) and the T4 (kotengin + phosphorese + Rhizobacterin + K_2So_4) soil treatments as they ranked statistically 2nd. Meanwhile, the T3 (kotengin + phosphorene + $(Nh_4)_2 So_4$ + $K_2 So_4$) treatment came third, while T2 (NPK)soil application treatment appeared to be the least effective during two seasons of study, The observations are in accordance with those obtained by **Haggag and Azzazy (1996),** who demonstrated that the use of multi – strain biofertilizer "Microbein" has a significant positive effect on the vegetative growth patterns of mango seedlings.

B. Interaction effect:

As for the interaction effect between olive cultivar and different Bio-NPK mineral fertilization treatments on fresh and dry weights of olive leaf, it is quite clear that the most increase in leaf fresh and dry weights was exhibited by combination represented Coronaiki cultivar received T6 (Kotengin + Biofertilizer + K_2So_4) soil applied treatment. However, the least increase in leaf fresh and dry weights was detected by Manzanillo trees received the T2 (NPK) treatments as compared to other combinations during two seasons of study. On the contrary, the ordinary program treated. Manzanillo trees were always the in superior from the statisitical

Table (5): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average leaf fresh weight and dry weight (g) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf fresh weight (g)						Leaf dry weight (g)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	2.44 i	3.37 e	**2.90 D**	2.51 l	3.60 f	**3.06 D**	0.86 l	1.17 f	**1.02 E**	0.92 l	1.24 f	**1.08 E**
(T_2) Kotengin +NPK	2.61 h	3.61 d	**3.11 C**	2.69 k	3.85 e	**3.27 C**	0.97 k	1.31 e	**1.42 D**	1.03 k	1.39 e	**1.21 D**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	2.66 gh	3.61 d	**3.13 C**	2.74 j	3.92 d	**3.33 BC**	1.01 j	1.37 d	**1.19 C**	1.08 j	1.46 d	**1.27 C**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	2.66 gh	3.67 c	**3.16 BC**	2.80 i	4.00 c	**3.40 B**	1.05 i	1.43 c	**1.24 B**	1.12 i	1.52 c	**1.32 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	2.71 g	3.74 b	**3.22 B**	2.85 h	4.14 b	**3.50 B**	1.08 h	1.47 b	**1.27 B**	1.15 h	1.56 b	**1.35 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	2.81 f	3.88 a	**3.34 A**	3.05 g	4.21 a	**3.63 A**	1.12 g	1.51 a	**1.31 A**	1.19 g	1.61 a	**1.40 A**
Mean*	**2.65 B**	**3.64 A**		**2.77 B**	**3.95 A**		**1.01 B**	**1.37 A**		**1.08 B**	**1.46 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

point of view during the 1st and 2nd seasons. In addition, other combinations were in between the aforesaid two extremes.

IV.I.2.Response of flowering behaviour and some fruiting measurements:

Data presented in **Tables (6, 7 and 8)** show the specific effect of different soil Bio-NPK mineral fertilization treatments and two olive cultivars , as well as intraction effect of their possible combinations on number of inflorescences / shoot, number of flowers/inflorescence, sex expression percentage, fruit set percentage, fruit drop% and fruit retention percentage during both 2002-2003 and 2003-2004 experimental seasons.

IV.I.2.1. Number of inflorescences per shoot:

Data obtained regarding the specific effect of olive cultivar, different Bio-NPK mineral soil fertilization treatments, as well as interaction effect of their combinations on number of inflorescences per shoot are presented in **Table(6).**

A. Specific effect:

Table (6) shows that Cronaiki olive trees had significantly higher number of inflorescences per shoot than Manzanillo olive cv. during the study.

Generally, flowering density of olive trees is differed according to cultivar , in this concern, **Shahin *et al.*, (1982) ; Fouad *et al.*, (1992) ; Hassan (1996); Abd Ella (1999); Abdel Naeem (2000) ; Nouman *et al.*, (2000) And Aly (2005)** reported that olive cultivars varied significantly in number of inflorecences/meter of shoot length .

Concerning the specific effect different Bio-NPK mineral soil application treatments on number of inflorescences per shoot, data in **Table (6)** indicate that, number of inflorescences /shoot was significantly affected by different soil fertilization treatments in both seasons. In addition, data also show that however, T6 (Kotengin + Biofertilizers + K_2 So_4) exhibited the highest number of inflorescences per shoot but it didn't significantly surpassed both T5 (Kotengin + superphosphate + Rhizobacterin + K_2 So_4) and T4 (Kotengin + phosphorene + Rhizobacterin + K_2 So_4) soil applied treatments in both seasons of study. On the other hand both T3 (kotengin + phosphorene + $(NH_4)_2$ So_4) and T2 (NPK) came 2^{nd}, however former one tended sto be slightly more effective than later one. Taking into consideration that the ordinary program (control) treatment completely failed to bloom and did not give any inflorescences during both seasons of study.

These results partially agree with **Emtithal *et al.*, (2002)** that, increasing N and K fertization rate significantly increased number of inflorescences permeter of Manzanillo olive tres. This may be due to the essentiality of potassium in needed all processes neded to sustain plant growth and reproduction **(Bob, 2001)** or to the presence of some benifical/ growth substances released by micro organism ured as Bio- fertilizers.

The positive effect of effective micro organisms (EM) may be due to its effect in improving physical; chemical and biological environments of the soil and suppresses soil borne pathogens and pests as suggested by **Higa (1994)** .

Also, **Kilany and Kilany (1990)** showed that, soil nitrogen application (250 or 500 gm N/tree) induced significant increase in

the number of inflorescences / shoot of olive cv. PICUAL as compared with the control.

B. Interaction effect:

As for the interaction effect of two investigated factors i.e., olive cultivar and different Bio- mineral NPK fertilizers soil added treatments on the number of inflorescences / shoot, **Table (6)** clears that the specific effect of each investigated factor was reflected on its various combinations. Herein, the greatest number of inflorescences/shoot were significantly in closed relationship to Coronaiki olive trees received either T6 (Kotengin + Biofertilizer + K_2 So_4) or T5 (Kotengin + superphosphate + Rhizobacterin + K_2 So_4) soil applied treatments. On the other hand, T2 (NPK) soil treated Manzanillo trees showed statistically the least increase in number of inflorescence/shoot in both seasons of study. On the contrary, Both Manzanillo and Coronaiki olive trees received the ordinary program (control) treatment, completely failed to bloom.

IV.I.2.2 Number of flowers/inflorescence:

Data obtained during both 2002-2003 and 2003-2004 seasons, regarding the response of number of flowers per inflorescence are presented in **Table (6).**

A. Specific effect:

Concerning the specific effect of two factors involved in this study i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on number of flowers per inflorescences, data obtained in **Table (6)** showed that Coronaiki olive cultivar surparred statistically. Manzanillo cv. regarding the number of flowers per inflorescence. Such trend was true during two seasons of study.

Referring the specific effect of different Bio mineral NPK fertilizers soil added treatments, it is quite evident that all five investigated NPK soil added treatments resulted in an obvious increase in number of flowers/inflorescence over ordinary program (control) during two seasons of study. Such increase was significant as compared to those of ordinary program (control) treated olive trees. On the other hand, the most increase was always in concomitant to the T6 (Kotengin + Biofertilizer + K_2 So_4) followed in a descending order by T3 (kotengin + phosphorene + $(NH_4)_2$ So_4 + K_2So_4) soil applied treatments. and/or T5 (kotengin + superphosphate + Rhizobacterin + K_2So_4) then T4 (kotengin + phosphorene + Rhizobacterin + K_2So_4), and T2 (NPK) soil application whil appeared to be less effective than four other ons and ranked last just before control. Differences between the aforesaid 4 categories different of Bio mineral NPK soil applied treatments were significant as each was compared to either other ones or control during two season of study.

The present results are in general agreement with those obtained by **Wange and Patil, (1994)** who observed that applying 100 kg N / ha alone or inoculating with *Azotobacter* and *Azospirillum* mixtures significantly increased the number of flowers per stalk. And the number of flower stems prouced by *polianthes tuberosa* cv. Single in pot experiments.

Abdel – Hameed (2002) found that nitrogen fertilizer significantly increased number of flowers/inflorescence and the number of inflorescences / shoot.

B. Interaction effect:

Regarding the interaction effect of the investigated two factors i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on number of flowers/inflorescence, data in **Table (6)** showed obviously that combinatuion represented Coronaiki trees received the T6 (Kotengin + biofertilizer + K_2SO_4) soil applied treatment exhibited the greatest number of flowers/inflorescence. On the other hand, the least increase in number of flowers/inflorescence over control was detected by Manzanillo cv. fertilized with the T2(NPK) treatment during two seasons of study. Conversely, ordinary program (control) treated trees of both olive cultivars failled entirely to flower during both 2002-2003 and 2003-2004 experimental seasons. In addition, other combinations were in between the aforesaid discussed combinations during the study.

IV.I.2.3 Sex expression percentage of perfect flowers:

A. Specific effect:

Concerning the specific effect of two factors involved in this study i.e., olive cultivars and different Bio mineral NPK fertilization treatments on sex expression percentage, data as shown in **Table (7)** revealed that Manzanillo olive cultivar exhibited the greates value of sex expression percentage in both seasons, while the reverse was found with Coronaiki olive cultivar. These results agreed with **Brooks (1948); Elant and Proloran, (1950); Hartmann and Opitze (1966) ; Hegazi and Stino, (1982), Fouad *et al.*, (1992) and Laz, (1993),** Who indicated that sex expression in olive was affected by cultivar and weather conditions.

Table (6): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on No. of inflorescences / shoot and No. of flowers/ inflorescence during both 2002-03 and 2003-04 experimental seasons.

Treatments	No. of inflorescences / shoot						No. of flowers/ inflorescence					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.000 h	0.000 h	**0.000 D**	0.000 g	0.000 g	**0.000 D**	0.000 i	0.000 i	**0.000 E**	0.000 j	0.000 j	**0.000 F**
(T_2) Kotengin +NPK	3.84 g	4.30 de	**4.07 C**	4.03 f	4.51 cd	**4.27 C**	13.60 h	15.05 f	**14.31 D**	17.93 i	19.84 g	**18.88 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	4.03 fg	4.65 c	**4.34 BC**	4.23 ef	4.70 c	**4.46 BC**	15.69 e	17.46 b	**16.56 B**	20.74 f	23.01 b	**21.87 B**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	4.15 ef	4.77 bc	**4.46 AB**	4.35 de	5.00 b	**4.68 AB**	14.55 g	16.12 d	**15.33 C**	19.18 h	21.25 e	**20.21 D**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	4.30 de	4.90 ab	**4.60 AB**	4.51 cd	5.14 ab	**4.83 A**	15.23 f	16.86 c	**16.04 B**	20.09 g	22.24 c	**21.15 C**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	4.42 d	5.08 a	**4.75 A**	4.63 c	5.32 a	**4.98 A**	16.45 d	18.32 a	**17.38 A**	21.70 d	23.58 a	**22.63 A**
Mean*	**3.46 B**	**3.95 A**		**3.62 B**	**4.11 A**		**12.59 B**	**13.97 A**		**16.60 B**	**18.32 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

Like wise **Girgis (2005)** found that sex expression of four studied olive cultivars can be arranged in a descending order as follows: Aggizi, Manzanillo, Coronaiki and Picual, as Aggizi was the superior cv. regarding the perfect flower percentage

With respect to the specific effect of different Bio mineral NPK fertilizers soil added fertlizers on sex expression percentage, **Table (7)** displays that sex expression % tended to increase significantly by Bio mineral NPK soil applied. Whereas the differences between the five investigated soil appliel treatments were significant as each was compared to the four other during the two seasons of study. In this respect both T6 (Kotengin + Biofertilizer + K_2SO_4) and T4 (kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatments exhibited the greatest value of sex expression % in both seasons of study. The T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) treatment came in the second class, followed in a descending order by T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) treatments; meanwhile T2 (NPK) soil added fertilizers ranked last i.e just before the ordinary program (control) during two seasons of study.

These results agreed with **Emtithal *et al.*, (2002)** who reported that adding potassium to soil, significantly enhanced the sex epression % , also, the same trend was found by **Aly, (2005)** who found that adding N, P, K, Mg, NF and EM each at two levels to the soil significantly enhanced the sex expression % of "Aggizi shami" , "Manzanillo" and "Kalamata olive" trees as compared to control trees.

As for the effect of EM on flowering, **Higa (1994)** cleared that EM promotes flowering and fruiting in plants. Also, it improves physical, chemical and biological enviromments of the soil and suppresses soil borne.

B. Interaction effect :

As for the interaction effect of the investigated two factors i.e. olive cvs different Bio mineral NPK fertilizers treatments on sex expression percentage, data obtained in **Table (7)** showed obviously that Manzanillo olive cv. received either T4 (kotengin + phosphoren + Rhizobacterin + K_2SO_4) or T6 (Kotengin + biofertilization + K_2SO_4) exhibited the highest values of sex expression % during 1st and 2nd seasons, repectively. Moreover, Coronaiki olive plants received T2 (NPK) had the least increase of sex expression % during the two seasons of study. In addition, the least value was statistically coupled with both Manzanillo and Coronaiki olive trees fertilized with ordinary program (control). Other combinations were in between.

IV.I. 2. 4. Fruit set percentage :

Data obtained during both 2002 – 2003 and 2003 – 2004 seasons regarding the response of fruit set percentage are presented in **Table (7)** .

A – Specific effect :

Regarding the specific effect of the two factors involved in this study i.e., olive cultivar and different Bio mineral NPK fertilizers treatments on fruit set % **Table (7)** clearly shows that Manzanillo trees had significantly higher value of fruit set

percentage than Coronaiki olive trees were the lowest value during 2002 – 2003 and 2003 – 2004 experimental seasons.

Generally, fruit set are differed according to cultivar, the results go in parallel with the results of sex expression. These results go in the same line of findings reprted by **Hartman (1953); Hassan (1980); Hassan (1996); Ibrahim (1997); Abd- Ella (1999); Abdel- Naeem (2000); Nouman et al. (2000); El-Khawaga (2001)** and **Aly (2005). Morover; Morettini (1951); Hegazi (1970) and Fouad *et al.*, (1992)** found that fruit set was correlated with the percentage of perfect flowers and abortion of some pistle flowers. In addition, **Laz (1993)** noted that cultivars of higher number of inflorescences per meter have higher values of sex expression and fruit set.

With respect to the specific effect of different Bio mineral NPK fertilizers soil added treatments, it is clear as shown from **Table (7)** that fruit set percentage was significantly affected by Bio mineral NPK soil applied treatments whereas the differences between the five investigated treatments were significant as each was compared to the four other ones during two seasons of stndy. In this regard, T6 (Kotengin + bio-frtilizer + K_2 SO_4) treatment had the largest value of fruit set % followed in a descending order by T5 (Kotengin + superphosphate + Rhizobacterin + K_2 SO_4) followed by T4 (Kotengin + phosphorene + Rhizobacterin + K_2 SO_4). T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 + K_2 SO_4) treatment came in the fourth class; meanwhile T2 (NPK) appeared to be less effective than the above mentioned ones. Conversly, ordinary program (control) treatment exhibited the lowest value during two seasons of study.

Similarly, **Frega *et al.*, (1995)** found that foliar spray application of potassium sulphate increased fruit set in Leccino olive cultivar. Also, **Akl *et al.*, (1997)** mentioned that, phosphorene and active dry yeast caused highly significant increase in berry set of Red Roomy grapevines compared with the control. Moreover, such observation was also recorded by **Mansour, (1998)** showed that, all fertilizers (Phosphorene, active dry yeast and Nitrobein) were very effective in improving yield of Anna apple trees. **Amit - Jasrotia *et al.*, (1999),** who reported that fruit set and crop yield of olive trees cv Frantoio increased significantly as the nitrogen application rate increased from 250 to 1000 g/ tree.

Abdel- Hameed (2002) found that fruit set % was significantly increased by nitrogen fertilization. Also, **Aly (2005)** revealed that all soil nutrient treatments improved fruit set as compared with control. Moreover, potassium applied followed by EM had the superiority in this concern.

B. Interaction effect :

Data presented in **Table (7)** indicated a significant variations due to interaction between Bio mineral NPK soil added fertilizers and olive cultivars. Where, Manzanillo olive trees received T6 (Kotengin + biofertilizer + $K_2 SO_4$) treatment showed the greatest value of increase in fruit set %, while T2 (NPK) treated Coronaiki trees showed the least increase during the study. Conversly, both Manzanillo and Coronaiki trees received ordinary program (control) treatment took the other way arround in fruit set % during 1^{st} and 2^{nd} season of study. In addition, other combinations were in between the aforesaid two discussed combinations. In this respect, **Abdel- Hameed (2002)** mentioned similar tred in this respect.

Table (7): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Sex expression and Fruit set % during both 2002-03 and 2003-04 experimental seasons.

Treatments	Sex expression						Fruit set%					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 k	0.00 k	**0.00 F**	0.00 k	0.00 k	**0.00 E**	0.00 k	0.00 k	**0.00 F**	0.00 k	0.00 k	**0.00 F**
(T_2) Kotengin +NPK	19.63 i	16.22 j	**17.92 E**	20.35 i	16.79 j	**18.56 D**	13.18 i	11.21 j	**12.19 E**	13.74 i	11.47 j	**12.61 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	27.29 c	22.48 g	**24.87 C**	28.40 c	23.23 g	**25.81 B**	17.21 e	14.29 h	**15.75 D**	17.80 e	14.84 h	**16.32 D**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	28.92 a	23.10 e	**26.11 A**	29.34 b	27.19 e	**26.76 A**	18.40 c	15.68 g	**17.04 C**	18.82 c	15.99 g	**17.41 C**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	26.80 d	21.42 h	**24.10 D**	27.75 d	22.19 h	**24.96 C**	19.25 b	16.51 f	**17.88 B**	20.03 b	17.17 f	**18.59 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	28.36 b	22.89 f	**25.61 B**	29.77 a	23.74 f	**26.74 A**	20.32 a	18.01 d	**19.17 A**	20.63 a	18.17 d	**19.40 A**
Mean*	**21.83 A**	**17.72 B**		**22.59 A**	**18.35 B**		**14.73 A**	**12.62 B**		**15.17 A**	**12.94 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.2.5. Fruit retention percentage:

Data obtained during both seasons, regarding the response of fruit retention percentage are presented in **Table (8)**.

A. Specific effect:

Concerning the specific effect of the different factors involved in this study i.e., olive cultivars, and different Bio mineral NPK fertilizers soil added treatments on fruit retention percentage, data obtained in **Table (8)** showed that Coronaiki olive cultivar had the greatest value of fruit retention percentage while Manzanillo cvs ranked last. Such trend was true during two seasons of study regarding the response of fruit retention percentage, whereas, variances were significant during two seasons two cultivars compared each other.

Such result goes swith that found **Girgis, (2005)**

Referring the specific effect of different Bio mineral NPK soil added treatments, it is quite evident that all the five investigated treatments resulted in an obvious increase in fruit retention percentage over control during two seasons of study. On the other hand, the most increase was always in concomitant to T3 (Kotengin + phosphoren + $(NH_4)_2$ SO_4 + K_2SO_4) during both seasons of study, followed in a descending order by T6 (Kotengin + Biofertilizer + K_2SO_4) Soil treatment. However, both T4 (Kotengin + phosphorene + Rehizobacterin + K_2SO_4) and T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) treatments came in the third class; meanwhile, T2 (NPK) mineral fertilizers appeared to be less effective than the above mentioned ones.

In this respect, **Abdel- Hameed (2002)** mentioned that retained fruits % was significantly increased by raising nitrogen fertilization.

B. Interaction effect:

Regarding the interaction effect of the two investigated factors i.e., olive cultivars and different Bio mineral NPK fertilizers treatments on the fruit retention percentage, data in **Table** (8) showed obviously that combination between the Coronaiki cv x T3 (Kotengin + phosphorene + $(NH_4)_2$ So_4 + K_2So_4) treatment exhibited the highest value of the fruit retention percentage, Moreover; Manzanillo olive plants received T2 (NPK) soil fertilizer treatment had the least value of the fruit retention % during two seasons of study. Other combinations were in between. In addition, both Manzanillo and Coronaiki olive received ordinary program (control) treatment had no retained fruits.

IV.I.2.6 Fruit drop percentage:

Data obtained during both 2002-2003 and 2003-2004 seasons are presented in **Table (8).**

A. Specific effect:

Concerning the specific effect of two factors involved in this study i.e., olive cultivars and different Bio mineral NPK soil added fertilizers on fruit drop percentage, data obtained in **Table (8)** showed that Manzanillo olive cultivar had significantly fruit drop percentage than Coronaiki cv. during two seasons of study.

In this concern, **Girgis (2005)** found that Manzanillo olive trees exhibited higher fruit drop %, while the least fruit drop percentage appeared in Coronaiki cv in both seasons.

Referring the specific effect of different Bio mineral fertilizers NPK soil added treatments, it is quite evident that five investigated Bio mineral NPK soil fertilization varied significantly in their effect on fruit drop percentage during the two seasons of study. On the other hand the highest % was exhibited by T2 (NPK) soil treatment followed in descending order by both T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) and T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatments. However, T6 (Kotengin + Biofertilizer + K_2SO_4) and T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) descendingly ranked 3rd and 4th respectively during both seaons of study.

B. Interaction effect:

Regarding the interaction effect of the investigated two factors i.e., olive cultivars, and different Bio mineral NPK fertilization soil added treatments on fruit drop percentage, data in **Table (8)** show obviously that combination between Manzanillo cv x T2 (NPK) soil applied treatment exhibited the highest value of fruit drop percentage during two seasons of study. Moreover, the least value in fruit drop percentage was detected by Coronaiki olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4) treatment during 2002-2003 and 2003-2004 seasons. Other combinations were in between. Such trend was to great extent prevailing during both seasons.

Table (8): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Fruit drop % and Fruit retention% during both 2002-03 and 2003-04 experimental seasons.

Treatments	Fruit retention%						Fruit drop %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 h	0.00 h	**0.00 E**	0.00 k	0.00 k	**0.00 E**	0.00 h	0.00 h	**0.00 E**	0.00 k	0.00 k	**0.00 E**
(T_2) Kotengin +NPK	17.11 g	21.10 d	**19.11 D**	18.15 j	21.87 f	**20.01 D**	82.77 a	78.74 d	**80.75 A**	81.85 a	78.13 e	**79.98 A**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	21.03 d	26.59 a	**23.81 A**	22.20 e	27.05 a	**24.63 A**	78.97 d	73.41 g	**76.19 D**	77.81 f	72.95 j	**75.38 D**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	19.11 f	23.85 c	**21.48 C**	20.09 h	24.78 c	**22.44 C**	80.89 b	76.15 e	**78.52 B**	79.91 c	75.22 h	**77.57 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	19.30 f	24.06 c	**21.68 C**	19.82 i	24.52 d	**22.17 C**	80.67 b	75.81 e	**78.25 B**	80.18 b	75.48 g	**77.83 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	19.82 e	25.68 b	**22.75 B**	21.19 g	25.85 b	**23.52 B**	80.19 c	74.32 f	**77.25 C**	78.81 d	74.15 i	**76.48 C**
Mean*	**16.06 B**	**20.22 A**		**16.91 B**	**20.68 A**		**67.25 A**	**63.07 B**		**66.43 A**	**62.66 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.3. Response of fruit and seed physical characteristics:

IV.I.3.1- fruit physical characteristics:

In this regard the fruit dimensions (height and diameter); fruit shape index (height : diameter; fruit weight (gm), volume (cm^3), flesh weight (gm), flesh thickness (cm) and flesh weight : fruit weight were the evaluated fruit physical characteristics pertaining their response to the specific and interaction effects of the two investigated factors (olive cultivars and different Bio mineral NPK soil fertilizers treatments). Data obtained during both 2002-2003 and 2003-2004 seasons are presented in **Tables (9, 10, 11 and 12).**

IV.I.3.1.a. fruit height and fruit diameter (cm):

A. Specific effect:

Concerning the specific effect of different factors involved in this study i.e., olive cultivars and different Bio mineral NPK soil applied treatments on fruit height (cm), and fruit diameter, data obtained in **Table (9)** showed that fruit height and diameter was significantly responded to olive cultivars. Herein, Manzanillo olive fruits were significantly taller and thickner than those of Coronaiki fruits during two seasons of study.

The present results are in an agreement with those found by **Fouad *et al.*, (1992) and Aly (2005)** who noticed that both fruit length and diameter differed according to cultivar. Also, the same trend was reported by **Girgis (2005)** who mentioned that Aggizi cv. exhibited the highest values of both fruit dimenter ons in reverse to Coronaiki olive cultivar, meantime PICUAL and Manzanillo were in between.

Referring the specific effect of different Bio mineral NPK soil applied treatment, it is quite evident that the five investigated soil added treatments significantly vaired in this Concern as they were compared each other. On the other hand, the T6 (Kotengin + biofertilzer + K_2SO_4) resulted significantly in the greatest values of both fruit height and diameter followed in descending order by the T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) treatment. The T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatment came in the third class; meanwhile, the other treatments T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) and T2 (NPK) appeared to be less effective than the above mentioned ones.

B. Interaction effect:

Regarding the interaction effect of the investigated two factors i.e., olive cultivars and different Bio mineral NPK applied treatments on fruit **Table (9)** obviously displays that the specific effect of each investigated factor was directly reflected on their combinations. Herein, Manzanillo olive trees received T6 (Kotengin + biofertilzer + K_2SO_4) soil application exhibited statistically the greatest value of both fruit height and diameter. On the other hand, the lowest values of both fruit height and diameter were detected by Coronaiki olive trees received T2 (NPK) soil treatment during two seasons of study. Other combination were in between the above mentioned two extents during the study.

Table (9): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average fruit dimenations (cm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Fruit height (cm)						Fruit diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 k	0.00 k	**0.00 F**	0.00 k	0.00 k	**0.00 F**	0.00 j	0.00 j	**0.00 E**	0.00 j	0.00 j	**0.00 E**
(T_2) Kotengin +NPK	2.76 e	2.39 j	**2.58 E**	2.87 e	2.49 j	**2.68 E**	1.98 e	1.29 i	**1.64 D**	2.10 e	1.34 i	**1.72 D**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	2.88 d	2.51 i	**2.70 D**	3.00 d	2.57 i	**2.79 D**	2.05 d	1.33 h	**1.69 C**	2.17 d	1.39 h	**1.78 C**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	2.98 c	2.53 h	**2.76 C**	3.09 c	2.64 h	**2.86 C**	2.13 c	1.36 g	**1.74 B**	2.25 c	1.42 g	**1.84 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	3.03 b	2.58 g	**2.80 B**	3.15 b	2.68 g	**2.91 B**	2.16 b	1.38 g	**1.77 B**	2.28 b	1.45 g	**1.87 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	3.18 a	2.70 f	**2.94 A**	3.30 a	2.81 f	**3.06 A**	2.25 a	1.45 f	**1.85 A**	2.38 a	1.52 f	**1.95 A**
Mean*	**2.47 A**	**2.12 B**		**2.57 A**	**2.20 B**		**1.76 A**	**1.14 B**		**1.86 A**	**1.19 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.3.1.b. Fruit shape index:

Data obtained during both 2002-2003 and 2003-2004 seasons, regarding the response of fruit shape index (fruit height/fruit diameter) are presented in **Table (10).**

A. Specific effect:

Referring the specific effect of olive cultivar, **Table (10)** reveals that Coronaiki fruit had significantly higher value of fruit shape index than Manzanillo fruits in both seasons.

The present results are in harmony with the findings of **Aly (2005)** who reported that significant differences in shape index (lenght/ diameter) of olive cultivars under investigation. "Kalamata" Fruits were more elongated descendingly followed by "Aggizi Shami", then "Manzanillo" fruits.

With respect to the specific effect of different Bio mineral NPK soil fertilization treatments, **Table (10)** displays that fruit shape index tended to be significantly as Bio mineral NPK fertilizers soil added treatments were compared each other during stable and didn't significantly respond to various Bio mineral NPK fertilizers treatments as compared each other during two seasons of study.

B. Interaction effect:

As for the interaction effect of the investigated two factors i.e., olive cultivars x different Bio mineral NPK fertilizers soil added treatments on fruit shape index, data obtained in **Table (10)** showed that the highest value was statistically coupled with the fertilized Coronaiki olive trees with any of five Bio mineral NPK

Table (10): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on fruit shape index during both 2002-03 and 2003-04 experimental seasons.

Treatments	Fruit length/ diameter					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 d	0.00 d	**0.00 B**	0.00 c	0.00 c	**0.00 B**
(T_2) Kotengin +NPK	1.39 c	1.86 ab	**1.63 A**	1.37 b	1.85 a	**1.61 A**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	1.41 c	1.89 a	**1.65 A**	1.38 b	1.86 a	**1.62 A**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.40 c	1.86 ab	**1.63 A**	1.37 b	1.85 a	**1.61 A**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.40 c	1.86 ab	**1.63 A**	1.38 b	1.85 a	**1.62 A**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.41 c	1.85 b	**1.62 A**	1.39 b	1.85 a	**1.62 A**
Mean*	**1.17 B**	**1.55 A**		**1.15 B**	**1.54 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

soil treatments as compared to Manzanillo olive trees received any of the same treatments in both seasons.

IV.I.3.2. Fruit weight and size:

Data obtained during both 2002-2003 and 2003-2004 seasons, regarding the response of fruit weight (gm) and fruit size (cm^3) are presented in **Table (11)**

A. Specific effect:

With respect to the specific effect of olive cultivar, tabulated data in **Table (11)** show that both parameters (fruit weight and size) followed typically the same trend. Hence, Manzanillo was the superior while Coronaiki was the inferior. The response was pronounced with both average fruit weight and size. Difference was significant as two cutlivars were compared each other during both 2002-2003 and 2003-2004 experimental seasons. These results agree those found by **Hassan, (1980); Fouad *et al.*, (1992); Abd Ella (1992); Nouman *et al.*, (2000); El- Khawaga (2001) and Aly (2005)** who reported that cultivars differed in their fruit weight and size.

Referring the specific effect of different Bio mineral NPK fertilizers soil applied treatments, obtained data exhibited that both fruit weight and size followed typically the same trend of response. Anyhow, it was quite clear that all five investigated Bio mineral NPK fertilizers treatment resulted in an obvious variance in both fruit weigth (gm) and size (cm^3) during 1^{st} and 2^{nd} seasons.

Differences between the five soil fertilized treatments were significant as each was compared to the four other ones during the two seasons of study. On the other hand, the most increase in both

fruit parameterswas always in concomitant to T6 (Kotengin + biofertilizer + K_2SO_4) during both seasons of study followed in a descending order by T5 (Kotengin + superphosphate + Rhizobacterin +K_2SO_4); T4 (Kotengin +Phosphorene + Rhizobacterin + K_2SO_4); T3 (Kotengin +phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) meanwhile and T2 (NPK) soil fertilized treatments.

These observations are in accordance with those obtained by **Haggag (1996)** who observed that all nitrogen application of treatments increased both fruit weight and size of olive (cv. picula) as compared with control trees.

Also, **Abdel- Hameed (2002)** found that nitrogen fertilizer significantly increased both fruit weight and volume. In addition; **Aly (2005)** mentioned that K and EM increased fruit weight. The beneficial effect of potassium may be due to its important role in water relationships and consequently quality factors such as size, shape and other quality measurements **(Bob, 2001)**.

Moreover, the effect of EM may be due to its role to improve physical, chemical and biological environments of the soil **(Higa, 1994)**. On the other hand, **Martin *et al.*, (1997) and Fernadez *et al.*, (1998)** who suggested that, olive trees which treated with nitrogen (0 to 1 kg/ tree) did not show any response on fruit size. Moreover, **Jeeva *et al.*, (1988)** who reported that, inoculation of brunch cv. povan with *Azospirillum* plus the highest N rate (100%) increased bunch weight as compared with the non-inoculated control receiving 100% N.

B . Interaction Effect :

Referring the interaction effect of the investigated two factors i.e. olive cultivars and different Bio mineral NPK fertilizers soil added treatments on the average fruit weight (gm) and fruit size (cm3) , data obtained in **Table (11)** showed that the greatest values of both parameters were coupled with such combination represented fertilized Manzanillo olive trees with the T6 (Kotengin+ Biofertilization + K_2SO_4) treatment. On the other hand, the least values of both average fruit weight and size were detected by Coronaiki olive tress fertilized with the T2 (NPK) soil treatment during 1st and 2nd seasons. Moreover other combinations were in between the aforesaid two extremes.

In this concern; **Abdel- Hameed (2002)** reported reported similar tremd.

IV.I.3.3. Flesh weight:

Data obtained regarding the specific effect of olive cultivar and different Bio mineral NPK soil added fertilizers as well as interaction effect of their combinations on flesh weight (gm) are presented in **Table (12).**

A. Specific effect:

Table (12) shows that Manzanillo fruits had significantly heavier flesh weight than those of Coronaiki olive cv. during two seasons.

In this concern, **Girgis (2005)** found that Aggizi cv. exhibited the highest value in flesh weight, in reverse to Coronaiki cv. , meantime; Picual and Manzanillo olive trees were in between.

Table (11): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average fruit weight (g) and volume (cm^3) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Fruit weight (g)						Fruit volume (cm^3)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 j	0.00 j	**0.00 F**	0.00 k	0.00 k	**0.00 F**	0.00 k	0.00 k	**0.00 F**	0.00 e	0.00 e	**0.00 F**
(T_2) Kotengin +NPK	5.11 e	1.76 i	**3.43 E**	5.20 e	1.76 j	**3.48 E**	4.90 e	1.59 j	**3.25 E**	5.31 b	1.55 d	**3.43 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	5.40 d	1.85 h	**3.62 D**	5.48 d	1.85 i	**3.67 D**	5.17 d	1.67 i	**3.42 D**	5.30 b	1.60 cd	**3.45 D**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	5.49 c	1.87 h	**3.68 C**	5.58 c	1.88 h	**3.73 C**	5.26 c	1.70 h	**3.47 C**	5.33 b	1.69 cd	**3.51 C**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	5.59 b	1.90 g	**3.75 B**	5.67 b	1.91 g	**3.79 B**	5.35 b	1.73 g	**3.54 B**	5.42 a	1.75 cd	**3.59 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	5.73 a	1.96 f	**3.85 A**	5.81 a	1.97 f	**3.89 A**	5.48 a	1.78 f	**3.63 a**	5.55 a	1.99 c	**3.77 A**
Mean*	**4.55 A**	**1.56 B**		**4.62 A**	**1.56 B**		**4.36 A**	**1.41 B**		**4.93 A**	**1.20 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

Concerning the specific effect of different Bio mineral NPK soil added fertilizers, data obtained revealed that the five investigated treatments varied significantly regarding their effect on flesh weight during the two seasons of stud. Whereas the differences were significant as each was compared to the four other ones during two seasons of study. T6 (Kotengin + Biofertilizer + K_2SO_4) soil applied treatment exhibited statistically the greatest value during two seasons, followed in the descending order by T5 (Kotengin+ Superphsphate + Rizobacterin +K_2SO_4) treatment; T4 (Kotengin + Phosphorene + Rizobacterin +K_2SO_4); T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 +K_2SO_4) and T2 (NPK) soil fertilized treatments which ranked last and appeared to be less effective than the above mentioned foure ones. In addition; differences between the five soil fertilizer treatments was significant as each was compared to two other ones during two seasons of study.

B. Interaction effect:

As for the interaction effect of the two investigated factors i.e., olive cultivar and different Bio mineral NPK soil added fertilizers treatments, on flesh weight, **Table** (12) clears that the specific effect of each investigated factor was reflected on its various combinations. Herein, the heaviest fruit flesh weight was significantly in closed relationship with Manzanillo olive trees soil fertilized with T6 (Kotengin + Biofertilizer + K_2SO_4) treatment, whereas, Coronaiki olive trees received T2 (NPK) treatment exhibited the lowest value of fruit flesh weight. Such trend was true during both seasons of study.

IV.I.3.4. Flesh thickness (cm):

Data obtained during both 2002-2003 and 2003-2004 seasons are presented in **Table (12)**.

A. Specific effect:

Concerning the specific effect of different factors involved in this study i.e., olive cultivars and different Bio mineral NPK fertilizers soil added treatments on flesh thickness (cm), data obtained in **Table (12)** showed that Manzanillo olive cultivar had significantly thicker fruit flesh than Coronaiki cv. Such trend was true during two seasons of study.

Referring the specific effect of different Bio mineral NPK soil added fertilizers treatments; it is quite evident that five investigated Bio mineral NPK varied significantly as compared each other during two seasons of study T6 (Kotengin + biofertilizer + K_2So_4) treatment was significantly the superior and induced the largest value of flesh thickness descendingly followed by both T5 (Kotengin +superphosphate + Rizobaterin +K_2SO_4) and T4 (Kotengin + Phosphoreno + Rhzobacterin + K_2SO_4) as well as the T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 +K_2SO_4) treatments. However, T2 (NPK) soil treatment appeared to be the inferior in this concern.

B. Interaction effect:

Regarding the interaction effect of the investigated two factors i.e., olive cultivars and different Bio mineral NPK soil added fertilizers on flesh thickness (cm), data in **Table (12)** showed obviously that combination represented Manzanillo olive trees received T6 (Kotengin +biofertilizer + K_2SO_4) exhibited

Table (12): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average flesh weight (g) and thickness (cm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Flesh weight (g)						Flesh thickness (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 j	0.00 j	**0.00 F**	0.00 k	0.00 k	**0.00 F**	0.00 h	0.00 h	**0.00 D**	0.00 h	0.00 h	**0.00 D**
(T_2) Kotengin +NPK	4.34 e	1.34 i	**2.84 E**	4.40 e	1.32 j	**12.86 E**	1.09 d	0.77 g	**0.93 C**	1.18 d	0.81 g	**1.00 C**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	4.59 d	1.41 h	**3.00 D**	4.64 d	1.39 i	**3.02 D**	1.13 c	0.80 f	**0.97 BC**	1.22 c	0.83 fg	**1.03 BC**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	4.68 c	1.43 h	**3.05 C**	4.73 c	1.42 h	**3.08 C**	1.14 be	0.81 f	**0.98 B**	1.24 be	0.85 f	**1.05 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	4.76 b	1.46 g	**3.11 B**	4.81 b	1.45 g	**3.13 B**	1.16 b	0.81 f	**0.98 B**	1.25 b	0.85 f	**1.05 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	4.87 a	1.51 f	**1.19 A**	4.92 a	1.49 f	**3.21 A**	1.24 a	0.87 e	**1.06 A**	1.34 a	0.91 e	**1.13 A**
Mean*	**3.87 A**	**1.19 B**		**3.92 A**	**1.18 B**		**0.96 A**	**0.68 B**		**1.04 A**	**0.71 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

statistically the highest value of fruit flesh thickness. Moreover, Coronaiki olive trees received T2 (NPK) soil treatment had statistically the lowest value in this regard in both seasons of study. In addition, other combinations were in between the above mentioned two extremes.

IV.I.3.5. Seed (stone) characteristics:

In this regard specific and interaction effects of two factors i.e., olive cultivar (Manzanillo and Coronaiki) and different Bio mineral NPK soil added fertilizers treatments, as well as their combinations were investigated pertaining the response of the following measurements of seed characteristics:

IV.I.3.5.a. Average seed length (cm):

A. Specific effect:

Regarding the specific effect of olive cultivar and different Bio mineral NPK fertilizers soil added treatments on seed length (cm), **Table (13)** clearly shows that Manzanillo olive fruits had statistically longer stones than Coronaiki olive fruits during both seasons.

With respect to the specific effect of different Bio mineral NPK soil applied fertilizers on seed length of olive fruits, **Table (13)** shows that seed length of olive fruits responded significantly various five treatments. In this concern, T6 (Kotengin + Biofertilizer + K_2SO_4) soil treated olive trees had the tallest seeds, descendingly followed by both the T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) and T4 (Kotengin + Phosphorene + Rhizobacterin + K_2SO_4) treatments in both seasons. T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 +K_2SO_4) treatment came in the third

class; meanwhile, the T2 (NPK) treatment appeared to be less effective than the above mentioned four ones.

B. Interaction effect:

Referring the interaction effect of the two factors i.e.,, olive cultivars and different Bio mineral NPK soil added treatment on seed length of olive fruit, data in **Table (13)** showed obviously avariable to the different combinations during two seasons of study. In addition, the specific effect of each factor (olive cultivars and soil fertilization treatments) was directly reflected on their combinations during both seasons of study. Since , Manzanillo olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4) treatment exihibited statistically the tallest fruit seeds. In addition, Coronaiki olive trees received T2 (NPK) Soil treatment had significantly the shortest seeds during study. Moreover, other combinations were in between the aforesaid two extremes.

IV.I.3.5.b. Average seed diameter (cm):

A. Specific effect:

Concerning the specific effect of two factors involved in this study i.e., olive cultivars and different Bio mineral NPK soil added treatments on seed diameter (cm) of olive fruits, data obtained in **Table (**13) showed that Manzanillo olive fruits had statistically thicker seed than Coronaiki olive seeds during two seasons.

Regarding the specific effect different Bio mineral NPK soil added fertilizers (Five investigated treatments) on seed diameter of olive fruits **Table (13)** shows a comderable response during two seasons. On the other hand, T6 (Kotengin + Biofertilizer+ K_2SO_4); T5 (Kotengin + superphosphate +Rhizobacterin +K_2SO_4) and T4 (Kotengin + Phosphorene + Rhizobacterin + K_2SO_4) soil added

fertilizers treatments ranked statistically first in this regard, which surpassed statistically both T3 (Kotengin + Phosphorene + $(NH_4)_2 SO_4$ +K_2SO_4) and T2 (NPK) treatments where both appeared to be less effective than the above mentioned three ones.

B, Interaction effect:

Referring the interaction effect of two investigated factors i.e., olive cultivars and different Bio mineral NPK soil added treatment on seed diameter of olive fruits, data in **Table (13)** showed obviously a variable response to different combinations during two seasons of study. On the other hand, **Table** (13) shows that the greatest value of olive seed diameter was significantly coupled with Manzanillo olive trees received either T6 (Kotengin + Biofertilizer + K_2SO_4) or T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) treatments. In addition, the least increase of seed diameter was found with Coronaiki olive trees received T2 (NPK) treatment. Moreover, other combinations were in between the above mentioned two extents.

IV.I.3.5.c Seed length/diameter:

Concerning the specific and interaction effects of two investigated factors (olive culivar and different Bio mineral NPK soil treatments) and their combinations on seed length/diameter, data obtained during both 2002-2003 and 2003-2004 seasons are presented in **Table (14).**

A. Specific effect:

With regard to the specific effect of olive cultivar, tabulated data in **Table** (14) show that Coronaiki olive fruits had the highest value of seed length/diameter, while Manzanillo fruits had the lowest value during both seasons of study.

Table (13): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on average seed dimenations (cm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Seed length (cm)						Seed diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 k	0.00 k	**0.00 E**	0.00 j	0.00 j	**0.00 E**	0.00 g	0.00 g	**0.00 C**	0.00 i	0.00 i	**0.00 C**
(T_2) Kotengin +NPK	1.630 e	1.220 j	**1.425 D**	1.693 e	1.270 i	**1.482 D**	0.894 d	0.518 f	**0.706 B**	0.918 d	0.534 h	**0.726 B**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	1.700 d	1.260 i	**1.480 C**	1.763 d	1.317 h	**1.540 C**	0.924 c	0.528 f	**0.726 B**	0.948 c	0.554 gh	**0.751 B**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.760 c	1.290 h	**1.525 B**	1.827 c	1.340 h	**1.583 B**	0.984 c	0.558 e	**0.771 A**	1.007 b	0.574 fg	**0.791 A**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.790 b	1.320 g	**1.555 B**	1.863 b	1.370 g	**1.617 B**	1.003 ab	0.578 e	**0.791 A**	1.03 ab	0.594 ef	**0.813 A**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.863 a	1.380 f	**1.622 A**	1.937 a	1.440 f	**1.688 A**	1.013 a	0.584 e	**0.799 A**	1.040 a	0.604 e	**0.823 A**
Mean*	**1.457 A**	**1.078 B**		**1.514 A**	**1.123 B**		**0.804 A**	**0.461 B**		**0.824 A**	**0.477 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

Concerning, the specific effect of different Bio mineral NPK soil treatments, data obtained revealed that, no significantly variations between 5 treatments as seed length/diameter of olive fruit cultivars under study during both seasons.

B. Interaction effect:

As for the interaction effect between olive cultivar and different Bio mineral NPK soil treatments on seed length/diameter, it is quite clear that Coronaiki olive trees received any of the five soil treatments surpossed statistically the analogous ones of Manzanillo olive trees during two seasons of studs.

IV.I. 3.5.d. Seed weight:

A. Specific effect:

Data obtained during both 2002-2003 and 2003-2004 seasons as shown in **Table (14)** revealed that the seed weight (gm) of olive fruits responded significantly to the specific effecr of olive cultivar. However, it could be generally observed than Manzanillo olive fruits had significantly heavier seeds than Coronaiki cultivar during two seasons of study.

These results agreed those found by **Hassan (1980); Fouad *et al.*, (1992); Abd- Ella (1999); Nouman *et al.*, (2000); El-Khawaga (2001) and Aly (2005)** who reported that olive cultivars diffred in their seeds weight. Also, **Girigs (2005)** found that Aggizi cv. exhibited the highest value of seed weight, followed by Picula, Manzanillo and Coronaiki in a des- cending order in both seasons of study.

As for the specific effect of different Bio mineral NPK soil treatments, **Table (14)** show that the 5 NPK soil added treatmetns

varied significantly as their effect on average seed (stone) weight was concernal during two seasons of study. Any how, T6 (Kotengin + Biofertilizer + K_2SO_4) ; T5 (Kotengin +superphosphate + Rhizobacterin +K_2SO_4); T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) and T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) soil fertilized treatments had the greatest seed weight of olive fruits. However T2 (NPK) soil applied treatment appeared to be less effective than the above mentioned four ones.

B. Interaction effect:

Data obtained during both 2002-2003 and 2003-2004 experimental seasons as shown from **Table (14)** diplayed the variable response to the interaction effect of two investigated factors, where each reflected its specific effect on its own combinations. Anyhow, it could be generally noticed that the heaviest seed weight was in significant relationship to Manzanillo olive trees received T6 (Kotengin +Biofertilizer + K_2SO_4) soil applied treatment. Contrary, to that the lightest seed weight was always in concomitant to fruits of Coronaiki olive trees received T2 (NPK) soil applied treatments. Meanwhile; other combinations were in between during two seasons.

IV.I.4.1. response of leaf and shoot chemical composition:

In this regard leaf photosynthetic pigments (chlorophyll A & B and Carotenes); total free amino acids and mineral composition of olive leaves, as well as shoot nitrogen; total carbohydrates contents and C/N ratio in response to specific and interaction effects of inrestigated factors and their combinations were concerned.

Table (14): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on seed length/ diameter and weight (g) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Seed length/ diameter						Seed weight (g)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 d	0.00 d	**0.00 B**	0.00 d	0.00 d	**0.00 B**	0.00 f	0.00 f	**0.00 C**	0.00 g	0.00 g	**0.00 C**
(T_2) Kotengin +NPK	1.82 c	2.36 b	**2.09 A**	1.79 c	2.38 a	**2.09 A**	0.77 c	0.42 e	**0.60 B**	0.81 c	0.44 f	**0.62 B**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	1.83 c	2.42 a	**2.12 A**	1.81 bc	2.36 a	**2.08 A**	0.81 b	0.43 de	**0.62 Ab**	0.84 b	0.46 ef	**0.65 AB**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.83 c	2.37 b	**2.10 A**	1.80 bc	2.36 a	**2.08 A**	0.82 b	0.44 de	**0.63 AB**	0.85 b	0.46 d	**0.67 AB**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.84 c	2.38 ab	**2.11 A**	1.80 bc	2.38 a	**2.09 A**	0.82 b	0.44 de	**0.63 Ab**	0.86 b	0.46 d-f	**0.66 AB**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.84 c	2.37 b	**2.11 A**	1.82 b	2.36 a	**2.09 A**	0.85 a	0.46 d	**0.66 A**	0.89 a	0.48 de	**0.69 A**
Mean*	**1.53 B**	**1.98 A**		**1.50 B**	**1.97 A**		**0.68 A**	**0.37 B**		**0.71 A**	**0.38 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.4.1.1. Photosynthetic pigments (foliar pigments):

Leaf chlorophyll (A&B) and carotenes of olive trees in response to specific and interaction effects of two in 1st experiment were investigated. Data obtained during both 2002-2003 and 2003-2004 experimental seasons are presented in **Table (15) and (16).**

IV.I.4.1.1.a. Leaf chlorophyll (A) content:

A. Specific effect:

Referring the specific effect of olive cultivar **Table (15)** reveals that Manzanillo trees had significantly richer leaf chlorophyll (A) content than Coronaiki olive trees during two seasons of study.

These results confirmed that reported by **Girgis (2005)** who mentioned that Manzanillo cv. was the superior as its of leaves chlorophyll A & B contents were compared to Coronaiki olive trees.

Concerning the specific effect of different Bio mineral NPK soil added fertilizers treatments, data obtained revealed that five investigated treatments varied significantly regarding their effect on leaf chlorophyll (A) content during two seasons of study. T6 (Kotengin + Biofertilizer + K_2SO_4) treatment induced significantly the highest value of leaf chlorophyll (A) descedingly followed by T3 (Kotengin + Phosphorene + $(NH4)_2$ SO_4 + K_2SO_4); T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) meanwhile; T2 (NPK) and T4 (Kotengin + Phosphorene + Rhizobacterin + K_2SO_4) treatments, respectively. On the contrary the ordinary

program (control) produced the poorest leaves chlorophyll (A) content during the two seasons of study.

The present results agree the early findings of **Jackson and Volk (1968)** who pointed out that potassium is required for chlorophyll "A" development and activated enzyme reactions involved in chlorophyll "A" synthesis **(Weaver, 1976)**. Moreover, **Aly (2005)** found that all treatments of soil nutrients (N, P, K, Mg and EM) increased the leaf chlorophyll "A" and magnesium gave the highest values concerning to chlorophyll "B" content there were no significant differences among treatments.

B. Interaction effect:

Referring the interaction effect of the combinations between two investigated factors on leave chlorophyll (A) content of olive leaves, data obtained in **Table (15)** showed obviously a variable response during two seasons. Results indicated that; Manzanillo olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4) treatment, had statistically the highest value of leaf chlorophyll (A) content. However, Coronaiki olive trees fertilized with the ordinary program (control) treatment showed significantly the lowest leaf chlorophyll (A) content during two seasons of study. In addition, other combinations were in between the above mentioned two extents.

IV.I.4.1.1.b Leaf chlorophyll (B) content:

A. Specific effect:

Regarding the specific effect of olive cultivar, on chlorophyll (B) content, the results presented in **Table (15)** clearly show that, Manzanillo olive leaves showed significantly higher value than Coronaiki olive cultivar during two seasons of study.

With regard to the specific effect of different Bio mineral NPK soil fertilizers treatments on leaf chlorophyll (B) content, **Table (15)** clearly shows that, there was significant differences among treatments. Moreover, both the T6 (Kotengin + Biofertilizer + K_2SO_4) and T5 (Kotengin + superphosphate + rhizobacterin + K_2SO_4) as well as the T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4+ K_2SO_4) treatments had the highest values of leaf chlorophyll (B) content, followed in a descending order by T2 (NPK) soil treatment and T4 (Kotengin + Phosphorene + Rhizobacterin + K_2So_4) treatments as compared to the ordinary program (control) treatment which exhibited the lowest value in this respect during the study.

The increase in chlorophyll "B" may be due to the increase in chlorophyll "A" because chlorophyll "A" is a precursor for the synthesis of chlorophyll "B" **(Snith and French, 1963 and Castelfranco and Beale, 1983).**

B. Interaction effect:

From **Table (15)** one can detect a significant variances exhibited by interaction effect of various combinations between olive cultivars and different Bio mineral NPK treatments in both seasons. Herien, Manzanillo trees received either T6 (Kotengin + Biofertilizer + K_2SO_4) or T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4+ K_2SO_4) soil fertiliation treatments showed the highest value of leaf chlorophyll (B) content during two seasons of study. Conversly, Coronaiki olive trees received the ordinary program (control) treatment exhibited the lowest value of leaf chlorophyll (B) content in both seasons. In addition, other combinations were in between the aforesaid discussed two categories .

Table (15): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on leaf Chlorophyll (A) and (B) contents (mg/100 gm. F.W) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Chlorophyll (A) content (mg/100 gm. F.W)						Chlorophyll (B) content (mg/100 gm. F.W)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.04 g	0.83 j	**0.93 F**	1.33 h	1.06 k	**1.93 E**	0.45 gh	0.36 j	**0.41 D**	0.61 f	0.49 i	**0.55 E**
(T_2) Kotengin +NPK	1.24 d	1.00 h	**1.12 D**	1.59 d	1.27 i	**1.43 D**	0.55 c	0.43. hi	**0.49 BC**	0.73 c	0.58 g	**0.66 C**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	1.38 b	1.10 f	**1.24 B**	1.76 b	1.41 ef	**1.59 B**	0.61 ab	0.48 ef	**0.55 A**	0.81 a	0.65 e	**0.73 Ab**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.16 e	0.93 i	**1.05 E**	1.49 e	1.19 j	**1.34 E**	0.52 d	0.41 i	**0.46 C**	0.69 d	0.55 h	**0.62 D**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.33 c	1.06 g	**1.20 C**	1.70 c	1.36 g	**1.53 C**	0.58 b	0.46 fg	**0.52 AB**	0.79 b	0.62 f	**0.70 AB**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.43 a	1.15 e	**1.29 A**	1.83 a	1.46 e	**1.65 A**	0.62 a	0.50 de	**0.56 A**	0.84 a	0.67 de	**0.75 A**
Mean*	**1.26 A**	**1.01 B**		**1.62 A**	**1.29 B**		**0.56 A**	**0.44 B**		**0.74 A**	**0.59 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.4.1.1.c. Leaf carotenes content:

A. Specific effect:

Regarding the specific effect of the different factors involved in this study i.e., olive cultivars and different Bio mineral NPK fertilizers soil added treatments on the leaf carotenes content, data in **Table (16)** clearly show that Coronaiki olive leaves were significantly richer in their carotenes content thin those of Manzanillo cv. during 2002-2003 and 2003-2004 experimental seasons.

These results are in coincidence with the findings of **Hasan (2005)** who mentioned that leaf carotenoids content was generally the richest in Coronaiki transplants followed in a descending order by those of Aghizi and Manzanillo cvs.

With respect to the specific effect of different Bio mineral NPK fertilizers soil added treatments on olive leaf carotene content, it is clear as shown from **Table (16)** that leaf carotene content was significantly increased by all five different Bio mineral NPK fertilizes treatments during two seasons of study. Whereas the differences between the five soil fertilization treatments were significant as each was compared to the four other ones during two seasons of study. In this regard T6 (Kotengin + Biofertilizer + K_2SO_4) ; T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4+ K_2So_4) and T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) treatments increased significantly leaf carotene content, descendingly followed by T2 (NPK) soil applied treatment and T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4). On the contrary, ordinary program (control) treatment was statistically the

inferior and showed the lowest value of leaf carotenes content in both seaons of study.

B. Interaction effect:

Concerning the interaction effect on the investigated, two factors i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on leaf carotenes content, data obtained in **Table (16)** showed obviously significant response during both seasons of study. However, Coronaiki olive trees received either T6 (Kotengin + Biofertilizer + K_2SO_4) in both seasons or T5/ T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4+ K_2SO_4) treatments during 1^{st} and 2^{nd} seasons, respectively showed the highest value of leaf carotene content. On the contrary, Manzanillo trees fertilized with the ordinary program (control) treatment exhibited statistically the lowest value during two seasons of study. In addition, other combinations were in between the aforesaid two extremes.

IV.I.4.2 Response leaf of total free amino acids contents:

Total free amino acids in fresh leaves of two olive cultivars under study in response to five different Bio-NPK mineral soil fertilized treatments were investigated. Date obtained are tabulated in **Table (17)**.

A. Specific effect:

With regard to the specific effect of olive cultivar (**Table 17**) displays that leaves of Manzanillo olive trees were significantly richer than of Coronaiki trees during both 2002-2003 and 2003-2004 experimental seasons.

Table (16): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Carotene content (mg/100 gm. F.W) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Carotene content (mg/100 gm. F.W).					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.33 h	0.41 ef	**0.37 D**	0.37 i	0.46 fg	**0.42 D**
(T_2) Kotengin +NPK	0.40 f	0.50 b	**0.45 B**	0.45 f	0.57 c	**0.51 B**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2SO_4$+K_2SO_4	0.43 c-e	0.55 g	**0.49 AB**	0.50 de	0.62 ab	**0.56 A**
(T_4) Kotengin+ Phosphorene + Rhizo-bacterin +K_2SO_4	0.37 g	0.46 c	**0.41 C**	0.42 h	0.52 d	**0.47 C**
(T_5) Kotengin+ P+ Rhizo- bacterin +K_2SO_4	0.42 d-f	0.53 a	**0.48 AB**	0.48 ef	0.60 b	**0.54 AB**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	0.44 cd	0.56 a	**0.50 A**	0.50 de	0.63 a	**0.57 A**
Mean*	**0.40 B**	**0.50 A**		**0.45 B**	**0.57 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

This result is in agreement with the findings of **Hasan (2005)** who found that leaves of Aghizi transplants were the richest followed by Manzanillo, while Coronaiki had the poorest leaves.

Referring the specific effect of different Bio mineral NPK fertilizers soil applied treatments, **Table (**17) reveals that, the highest level for total free amino acids were always in concomitant to leaves of olive trees subjected to T6 (Kotengin + Biofertilizer + K_2So_4) treatment, descendingly followed by the T4 (Kotengin + phosphorene + Rhizobacterin + K_2So_4); T5 (Kotengin + Superphosphate + Rhizobacterin + K_2So_4); meanwhile and T3 (Kotengin + Phosphorene + $(NH_4)_2$ So_4 + K_2So_4) treatments. However, booth T2 ((NPK) soil added ordinary program (control) treatments were statistically the pooreet as total free amino acids contents in fresh olive leaves were concerned during two seasons of study.

B. Interaction effect:

As for the interaction effect of the two investigated factors i.e., olive cultivar and different Bio mineral NPK soil added fertilizers treatments on leaf total free amino acids content, data presented in **Table (**17) showed obviously that the highest value of total free amino acids content were detected by that combination between Manzanillo olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4). However, the lowest value of total free amino acids content were detected by Coronaiki trees fertilized with ordinary program (control) treatment during both 2002-2003 and 2003-2004 seasons. Moreover, other combinations were in between the aforesaid two extents.

Table (17): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Total free amino acid (mg/ 100 D.W) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Total free amino acid (100 g. F.W.).					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.19 i	1.10 j	**1.15 F**	1.22 i	1.13 j	**1.17 F**
(T_2) Kotengin +NPK	1.37 f	1.27 h	**1.32 E**	1.40 f	1.30 h	**1.35 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	1.44 d	1.33 g	**1.39 D**	1.47 d	1.36 g	**1.42 D**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.58 b	1.47 d	**1.53 B**	1.62 b	1.50 d	**1.56 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.51 c	1.40 e	**1.46 C**	1.55 c	1.43 e	**1.49 C**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.64 a	1.52 c	**1.58 A**	1.68 a	1.55 c	**1.62 A**
Mean*	**1.46 A**	**1.35 B**		**1.49 A**	**1.38 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.4.3.1 Leaf mineral contents:

Leaf N, P, K, Ca, Mg, Fe, Mn, Zn and Cu contents in response ro specific and interaction effects of olive cultivar, different Bio mineral NPK fertilizers soil added treatments and their possiple combiniations were investigated. Data obtained during both 2002-2003 and 2003-2004 experimental seasons are presented in **Tables (18, 19, 20, 21 and 22).**

IV.I.4.3.1 Leaf nitrogen content:

A. Specific effect:

Table (18) displays that leaf-N % responded specifically to each of two investigated factors. Henc, Coronaiki had statistically richer leaf N content than those of Manzanillo trees during 1st and 2nd seasons.

These results are similar to those obtained by **Hasan (2005)** who stated that Coronaiki olive cultivar exceeded statistically Manzanillo and Aghizi olive transplants regarding their leaf N content. Moreover, **Girgis (2005)** found that, olive cultivars, can be arranged in a descading order regarding their leaf nitrogen content as follows Picual, Aghizi, Manzanillo and Coronaiki olive trees.

With respect to the specific effect of different Bio mineral NPK fertilizers soil added treatments on leaf nitrogen content of olive cultivars, it is obvious from the results of the **Table (18)** that all five investigated treatments increased significantly leaf N % as compared to those received ordinary program (control) treatment. Differences were significant as compared each other during two seasons of study. Moreover, in both seasons, T6 (Kotengin +

Biofertilizer + K_2SO_4) treatment exhibited significantly the highest value of leaf-nitrogen % followed in a descending order by T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4); T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4); T3 (Kotengin + phosphorene + $(NH_4)_2$ SO_4+ K_2SO_4) and T2 (NPK) treatments. However, ordinary program (control) was statistically the inferior during two seasons of study. In parallel to thise findings of **Sharaf *et al.*, (1984); Khamis *et al.*, (1984 a & b); Perica *et al.*, (1994); Shen *et al.*, (1995); Martin *et al.*, (1997); Abbas (1999) and Emtithal *et al.*, (2002)** all stated that adding nitrogen and / or potassium increased leaf nitrogen content.

Higa (1994) mentioned that EM improves physical, chemical and biological environments of the soil and suppresses soil borne pathogens and pests. In addition, it enhances the photosynthetis of crops and increase the efficacy of organic matter as fertilizer. Similar results were obtained by **Fernandez *et al.*, (1998)** who stated that, banana leaf- N concentration was higher when moculant was applied to soil (0-1 kg/ plant). In addition **Abdel- Hameed (2002)** mentioned that, leaf content of N was significantly increased by nitrogen fertilization, the highest significant leaf content of N obtained with BF + BS. Also, **Ismail (2000)** observed that, using Biomagic gave the highest values of N of pea plants.

B. Interaction effect:

Regarding the interaction effect of the two investigated factors i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on leaf nitrogen content, data obtained in **Table (18)** showed obviously that the highest level was observed

Table (18): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Leaf N content (%) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf N%					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.45 k	0.51 j	**0.48 F**	0.48 k	0.54 j	**0.51 F**
(T_2) Kotengin +NPK	0.72 i	0.82 h	**0.77 E**	0.77 i	0.86 h	**0.82 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	1.13 g	1.28 f	**1.21 D**	1.20 g	1.35 f	**1.28 D**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.35 e	1.53 d	**1.44 C**	1.44 e	1.62 d	**1.53 C**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.58 c	1.79 b	**1.69 B**	1.68 c	1.89 b	**1.79 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.75 b	1.99 a	**1.87 A**	1.87 b	2.12 a	**2.00 A**
Mean*	**1.16 B**	**1.32 A**		**1.24 B**	**1.40 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

with that combination between Coronaiki olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4) soil treatment during two seasons of study. Moreover, the least leaf-N content below control (ordinary program) was detected by Manzanillo trees fertilized with T2 (NPK) soil treatment during 2002-2003 and 2003-2004 seasons. On the other hand , other combinations were in between in this concern.

Abdel- Hameed (2002) found that the interaction between 100% N and BF+ BS recorded significantly the highest leaf N content.

IV.I.4.3.2 Leaf phosphorus content:

A. Specific effect:

Regarding the specific effect of the two factors involved in this study i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on leaf-P content, **Table (19)** clearly shows that leaf- P content was significantly influenced by olive cultivar. Herein, Coronaiki cv. had richer leaves than Manzanillo in both 2002-2003 and 2003-2004 experimental seasons.

These results are in harmony with those reported by **Hasan (2005)** who mentioned that Coronaiki transplants had the highest value of leaf-P content followed in a descending order by Manzanillo and Aghizi olive leaves during the study. Moreover; **Girgis (2005)** reported that Coronaiki cv. has the highst phosphorous content followed by Picual; Aggizi and Manzanillo cvs.

With respect to the specific effect of different Bio mineral NPK fertilizers soil added treatments on leaf phosphorus content, it is clear as showen from **Table (19)** that leaf phosphorus level was significantly affected by different Bio mineral NPK, treatments. In this regard, phosphuros level increased with any of five soil fertilized treatments. In this regard, data obtained during both seasons revealed that leaf -P % content was approximately constant and didn't respond to different investigated Bio-NPK mineral fertilized soil treatments (T2, T3, T4 and T5) during the two seasons of study.

These results agree with **Sharaf *et al.* (1984)** who stated that phosphorous foliar sprays increased leaf- P in olive and guava plants. Also, **Abbas (1999)** observed that phosphorus soil application resulted in an increase in leaf- P concentration in Manzanillo olive seedling. In addition, these results are in agreement with those of **Ahmed *et al.*, (1999)** who on chemlali olive seedlings. Moreover, **Haggag et al. (1994)** observed that, inoculation of guava seedlings with phosphorene (at 1.5 kg/ pot) increased significantly leaf P content compared with super phosphate treatments. Also, **Ismail (2000)** observed that using Biomagic gave the highest value of P of Pea plants. **Abdel-Hameed (2002)** found that leaf content of P was significantly increased by nitrogen fertilization, besides BF or BF + BS significantly increased leaf-P content.

B.Interaction effect:

Results in **Table (19)** showed the effect of the interaction between olive cultivars and different Bio mineral NPK soil added fertilizers on leaf phosphorus content. The result revealed that leaf-

P content exhibited significantly the highest level by such combination between Coronaiki olive trees fertilized with any five of T6; T4 ; T3 or T2 treatments. However, the least leaf P content was resulted by Manzanillo olive trees subjected to any investigated treatments, expectedly those received the ordinary adopted program or NPK fertilizers in both seasons. In this concern, **Abdel- Hameed (2002)** found that the interaction between 100% and BF+ BS gave the highest leaf P content.

IV.I.4.3.3 Leaf potassium content:

A. specific effect:

It is obvious from the results of **Table (19)** that Coronaiki cvs., had significantly higher leaf-k% content than Manzanillo cvs., in both seasons. These result is similar to that reported by **Girgis (2005) and Hasan (2005)** on olive cultivars.

Regarding the specific effect of different Bio mineral NPK soil added fertilizers on leaf potassium content, **Table (19)** clearly shows that T6 (Kotengin + Biofertilizer + K_2So_4) treatment exhibited the highest value of leaf-K %, followed by any of T2, T3, T4 and T5 treatments during two seasons of study. Since, variances in leaf-K % content between later four treatments were approximately absent from the statistical stand point in both seasons. On the contrary, the ordinary program (control) soil fertilized treatment exhibited the lowest leaf K % in this respect.

Similar results were obtained by **El- Shanshoury *et al.*, (1989)** who demonstrated that, inoculation of Luxor tomoto with *A. Chroococcum increased* shoot K content compared with uninoculated plants, and **Ismail (2000)** who observed that , using Biomagic as biofertilizer gave the highest leaf K % of pea plants.

Moreover, **Abdel- Hameed (2002)** found that leaf content of K was significantly increased by raising nitrogen fertilization level up to 100% as well as by BF+ BS which increased also leaf K content.

B. Interaction effect:

Concerning the interaction effect of the investigated two factors i.e., olive cultivars and different Bio mineral NPK fertilizers soil added treatments, on leaf-k content, data obtained in **Table (19)** showed obviously the significant variances in this concern, during 200-2003 and 2003-2004 experimental season. The most increase in leaf K content was detected by that combination between Coronaiki cvs fertilized with T6 (Kotengin + Biofertilizer + K_2SO_4), where the highest value was resulted. Moreover,the lowest increase in leaf-k content over control was detected by Manzanillo trees received T2, T3 and T4 treatment during two seasons of study. On the contrary, Manzanillo trees received the ordinary program (control) soil treatments exhibited the lowest value of leaf K % during 1^{st} and 2^{nd} seasons. Moreover, other combinations were in between the above mentioned two extents as leaf-K content was concerned. In this respect, **Abdel- Hameed (2002)** found that the interaction between 100% N and BF+ BS gave the highest significant leaf content of K.

Table (19): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on P and K content (%) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf P%						Leaf K%					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.10 c	0.12 be	**0.11 B**	0.13 e	0.18 c	**0.16 B**	0.67 g	0.86 c	**0.77 C**	0.70 f	0.91 c	**0.81 C**
(T_2) Kotengin +NPK	0.12 bc	0.17 a	**0.14 AB**	0.15 de	0.21 b	**0.18 AB**	0.80 f	1.04 b	**0.92 B**	0.84 e	1.10 b	**0.97 B**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	0.13 b	0.18 a	**0.16 A**	0.17 cd	0.24 ab	**0.20 A**	0.81 ef	1.05 b	**0.93 B**	0.84 e	1.10 b	**0.97 B**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	0.14 b	0.19 a	**0.16 A**	0.17 cd	0.23 ab	**0.20 A**	0.83 de	1.06 b	**0.94 B**	0.84 e	1.10 b	**0.97 B**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	0.13 bc	0.17 a	**0.15 AB**	0.16 c-e	0.21 b	**0.18 AB**	0.85 cd	1.07 b	**0.96 B**	0.88 d	1.11 b	**1.00 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	0.14 b	0.19 a	**0.17 A**	0.17 cd	0.25 a	**0.21 A**	0.86 c	1.18 a	**1.02 A**	0.91 c	1.19 a	**1.05 A**
Mean*	**0.13 B**	**0.17 A**		**0.16 B**	**0.22 A**		**0.80 B**	**1.05 A**		**0.83 B**	**1.09 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.4.3.4 Leaf calcium content:

Result pertaining the specific and interaction effects of olive cultivars, different Bio mineral NPK fertilized soil added treatments and their combinations on leaf-Ca % are presented in **Table (20).**

A. Specific effect:

Regarding the specific effect of olive cultivars; and different Bio- mineral NPK soil added fertilizers on leaf-Ca content, **Table (20)** clearly shows that Coronaiki olive leaves were statistically richer in their Ca content than those of Manzanillo cv. during both seasons. This is in according with finding of **Girigs (2005)** who found that Coronaiki olive cv. has the highest value of leaf- Ca content during the growing seasons.

With respect to the specific effect of different Bio mineral NPK soil added fertilizers on leaf Calcium % olive trees, it could be noticed that leaf-ca concentration increased by different Bio mineral NPK soil added fertilizers as compared with control. In this concern, the leaf-Ca % of olive trees had no appreciable response to the four (T2, T3, T4 and T5) differential soil treatments. Whereas, the variances in leaf-Ca % due to the four (T2, T3, T4 and T5) studied treatments were too slight to be taken into consideration and consequently it could be safely neglected in both seasons. Moreover, T6 (Kotengin + Biofertilizer + K_2So_4) showed slight increase in leaf-Ca % content as compared with ordinary program (control) soil treatment during two seasons of study.

In this respect, **Aly (2005)** found that added phosphorous, nitrogen and magnesium resulted in significant increase in the leaves calcium content as compared with control trees but K application has slight or no effect.

B. Interaction effect:

As four the interaction effect of the two investigated factors i.e., olive cultivar and different Bio mineral NPK soil added fertilizers on leaf-Ca % content, data obtained in **Table** (20) showed obviously the variable response of olive trees to the different combinations used during the two seasons of study. The highest leaf-Ca % was detected by that combinations between Coronaiki olive trees received either T2 (NPK); the T3 (Kotengin + Phosphorene + $(NH_4)_2$ So_4+ K_2SO_4) or T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) soil applied treatments and to great extent when same cultivar subjected to T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) on the contrary Manzanillo olive trees received the ordinary program (control) treatment were the poorest this regard during both seasons. Other combinations were in between the above mentioned two extents as leaf-Ca content was concerned.

IV.I.4.3.5 Leaf Magnesium content:

The specific and interaction effects of olive cultivars, different Bio- mineral NPK soil added fertilizers and their combinations on leaf magnesium level of olive trees are presented in **Table (20)**.

A. Specific effect:

With respect to the specific effect of different factors involved in this study i.e., olive cultivars and different Bio mineral NPK soil added fertilizers on leaf-Mg content, data as shown in **Table** (20) revealed that Coronaiki olive Cv was significantly richer than Manzanillo Cvs during two seasons of study.

The same trend was reported by **Hasan (2005) and Girgis (2005)** on olive trees.

Concerning the specific effect of different Bio mineral NPK soil added fertilizers on olive leaf-Mg content, **Table (20)** shown that all five investigated Bio mineral NPK treatmetns increased significantly leaf during two seasons of study. However, these five effective treatmetns didn't significantly differ as compared each other during two seasons of study.

B. Interaction effect:

As for the interaction effect of the different combinations between two investigated factors i.e., olive cultivar and different Bio mineral NPK soil added fertilizers on leaf-Mg content, data obtained in **Table (20)** showed obviously the more pronounced effect of olive cultivar , whereas Coronaiki trees supplied with any of (T2, T3, T4; T5 or T6) were statistically richer in their leaf Mg content as compared to the analogous ones of Manzanillo olive trees during two seasons of study. Such trend was true during both seasons even when olive trees of both olive cultivars. Manzanillo olive trees received the ordinary program (control) treatment were compared each other during 2002-2003 and 2003-2004 experimental seasons.

Table (20): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Ca and Mg content (%) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf Ca%						Leaf Mg %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.25 g	1.53 c	**1.39 C**	1.31 g	1.59 c	**1.45 C**	0.41 e	0.51 c	**0.46 B**	0.45 f	0.56 c	**0.50 B**
(T_2) Kotengin +NPK	1.34 d	1.61 ab	**1.48 A**	1.39 e	1.69 a	**1.54 AB**	0.48 d	0.60 ab	**0.54 A**	0.52 de	0.66 ab	**0.59 A**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	1.31 e	1.59 ab	**1.45 AB**	1.47 d	1.66 ad	**1.57 A**	0.49 cd	0.62 ab	**0.56 A**	0.54 c-e	0.68 a	**0.61 A**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.30 ef	1.58 b	**1.44 AB**	1.36 ef	1.64 ab	**1.50 A-C**	0.48 cd	0.61 ab	**0.55 A**	0.53 cd	0.67 ab	**0.60 A**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.33 de	1.61 a	**1.47 A**	1.39 e	1.67 a	**1.53 AB**	0.48 d	0.59 b	**0.54 A**	0.52 e	0.65 b	**0.59 A**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.28 f	1.55 c	**1.42 BC**	1.34 fg	1.61 bc	**1.48 BC**	0.50 cd	0.63 a	**0.57 A**	0.55 cd	0.69 a	**0.62 A**
Mean*	**1.30 B**	**1.58 A**		**1.38 B**	**1.64 A**		**0.47 B**	**0.59 A**		**0.52 B**	**0.65 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV.I.4.3.6 Leaf iron content:

Table (21) shows the specific and interaction effects of olive cultivars and different Bio mineral NPK soil added fertilizers as well as their combinations on leaf-Fe content in olive trees.

A. Specific effect:

Concerning the specific effect of olive cultivar on leaf-Fe content, **Table (21)** clearly shows that Coronaiki olive trees had richer leaf-Fe content, than Manzanillo during two seasons of study.

The same trend was obtained by **Hasan (2005)** who found that Coronaiki transplants had the highest leaf- Fe content, than both Manzanillo and Aghizi cvs. Conversely, **Girigs (2005)** reported that Picual cv. had significantly higher leaf- Fe content, than Coronaiki cv.

With respect to the specific effect of different Bio mineral NPK fertilizers soil applied treatments, obtained results indicated generally that all evaluated treatments increased significantly leaf-Fe content during 2002-2003 and 2003-2004 experimental seasons. However, T6 and T3 were statistically the superior during two seasons of study.

These observation are in accordance with those obtained by **Gordara *et al.*, (1996)** who reported that, significant increase in leaf- Fe contents of peach seedlings were recorded with *G. Fasciculatum* and with dual VAM and *Azotohacter* and with VAM and *Azotohacter* inoculation. Morover, **Ismail (2000)** who observed that, using Biomagic increase leaf Fe content in pea plants. In addition, **Abdel- Hameed (2002)** found that leaf- Fe content was

significantly increased by raising nitrogen fertilization, up to 100% N in Manzanillo olive trees. In addition, BF + BS increased also (slightly) leaf Fe content in Manzanillo olive trees.

B. Interaction effect:

Table (21) shows the interaction effect between olive cultivar and different Bio mineral NPK fertilizers soil added on leaf-Fe content of olive plants.

Data obtained revealed that the different combinations of two investigated factors can act together in affecting Fe level in olive plant leaves during 2002-2003 and 2003-2004 experimental seasons. In addition, pattern of Fe distribution showed that leaves of Coronaiki plants fertilized with either T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) or T6 (Kotengin + Biofertilizer + K_2SO_4) in both seasons had statistically the highest value of leaf-Fe concentration when compared with other combinations during the two seaons of study. On the other hand, the lowest increase value of in leaf-Fe content over control was detected by Manzanillo plants fertilized with the T2 (NPK) soil treatment during 1^{st} and 2^{nd} seasons. Other combinations were in between the aforesaid two extremes.

IV.I.4.3.7 Leaf Manganese content:

The specific and interaction effects of olive Cvs different Bio mineral NPK fertilizers soil added treatments and their combinations on leaf-Mn content of olive trees data obtained during both seasons are shown in **Table (21)**.

A. Specific effect:

Regarding the specific effect of olive cultivar on leaf-Mn content, **Table (21)** clearly shows that Coronaiki olive trees had significantly highert value of leaf-Mn content than Manzanillo plants during 2002-2003 and 2003-2004 experimental seasons.

The same findings was obtained by **Hasan (2005)** who mentioned that Coronaiki cultivar exceeded statistically the two cultivars (Manzanillo and Aghizi) regarding leaf Mn content.

Concerning the specific effect of different bio mineral NPK fertilizers treatments, data obtained revealed that all the five investigated soil added treatment (T2, T3, T4, T5 and T6) resulted in an obvious increase in leaf-Mn content over control (ordinary program) treatment during 1st and 2nd experimental seasons. Such increase in leaf-Mn content was significant. However, T6 (Kotengin + Biofertilizer + K_2SO_4) soil applied treatment was statistically the superior, followed in a descending order by T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4); T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) treatments. Meanwhile, both T4 (Kotengin + Phosphorene + Rhizobacterin + K_2SO_4) and T2 (NPK) treatments appeared to be less effective than the above mentioned ones.

The present results are in agreement with those obtained by **Ismail (2000)** who observed that, using Biomagic increased leaf-Mn content of pea plants. On the other hand, **Abdel- Hameed (2000)** found that leaf content of Mn was significantly increased by nitrogen fertilization of Manzanillo olive trees. The highest significant leaf content of Mn was obtained with BF+ BS.

B. Interaction effect:

Regarding the interaction effect of the different combinations between two investigated factors i.e., olive cultivar and different Bio mineral NPK fertilizers treatments, on leaf-Mn content, data obtained in **Table (21)** showed obviously a variable response during 1st and 2nd seaons.

Herein; the highest value in leaf-Mn content was detected by the combination between the Coronaiki cvs plants fertilized with T6 (Kotengin + Biofertilizer + K_2SO_4) while the reverse was true with Manzanillo cvs fertilized with T1 (Control) treatment during two seasons of study. The other combination were in between the aforesaid two extremes. In this concern, **Abdel- Hameed (2002)** reported that the interaction between 100% N and BF + BS gave the highest significant leaf Mn content.

IV.I.4.3.8 Leaf zinc content:

A. Specific effect:

Concerning the specific effect of olive cultivar, on leaf-Zn content, data obtained in **Table (22)** Showed that Coronaiki cvs. had significantly richer leaf-Zn content than Manzanillo leaves during two seasons of study.

This finding confirms the earlier findings reported by **Hasan (2005)** on olive transplants.

Regarding the specific effect of different Bio mineral NPK fertilizers treatments, data in **Table (22)** clearly show that leaf-Zn conecentration of olive cultivars trees significantly increased with any of the different investigated soil treatments as compared to

Table (21): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Fe and Mn content (ppm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf Fe ppm						Leaf Mn ppm					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	32.67 i	41.00 e	**36.83 E**	36.33 h	45.67 e	**41.00 E**	23.00 j	30.00 ef	**26.50 E**	27.33 k	34.33 g	**30.83 F**
(T_2) Kotengin +NPK	34.33 h	43.00 d	**38.67 D**	38.33 i	48.33 d	**43.33 D**	25.00 i	32.67 d	**28.83 D**	29.33 j	37.00 e	**33.17 E**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	40.33 ef	51.00 a	**45.67 AB**	45.33 e	58.00 a	**51.67 A**	29.00 fg	37.00 b	**33.00 B**	34.67 g	44.00 b	**39.33 B**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	39.67 f	50.00 b	**44.83 B**	44.33 f	55.67 b	**50.00 B**	27.00 h	34.33 c	**30.67 C**	32.00 i	40.33 d	**36.17 D**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	38.33 g	48.00 c	**43.17 C**	42.67 g	54.00 c	**48.33 C**	28.00 gh	34.67 c	**31.33 C**	32.67 h	42.00 c	**37.33 C**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	41.00 e	51.33 a	**46.17 A**	45.67 e	57.33 a	**51.50 A**	30.67 e	39.00 a	**34.83 A**	36.33 f	46.00 a	**41.17 A**
Mean*	**37.72 B**	**47.39 A**		**42.11 B**	**53.17 A**		**27.11 B**	**34.61 A**		**32.06 B**	**40.61 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

control during the two seasons of study. Differences were significant as five investigated treatments compared each other except T5 and T4 which were equally the same during the two seaons of study. In addition, both T6 (Kotengin + Biofertilizer + K_2SO_4) and T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) treatments gave the highest value of leaf-Zn content, followed in a descending order by both T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) and T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatments; meanwhile the T2 (NPK) treatment appeared to be less effective than the above mentioned ones.

The observations are in accordance with those obtained by **Godara *et al.*, (1996)** who reported that significant increase in, leaf- Zn content of peach seedlings, were recorded by inoculation with *G. Fasciculatum* VAM and *Azotobacter* inoculation, **Ismail, (2000)** observed also that, using Biomagic increased leaf- Zn content of pea plants. On the other hand, **Abdel- Hameed (2002)** mentioned that leaf Zn content was significantly increased by nitrogen fertilization and treatment with BF + BS treatment.

B. Interaction effect:

Referring the interaction effect of the two investigated factors i.e., olive cvs. And different Bio mineral NPK soil fertilizers on leaf-Zn content, data obtained in **Table (22)** showed obviously the variable response of olive trees to the different combinations during the 1st and 2nd seasons. It could be noticed that the most increase in leaf-Zn content was detected by such combination represented Coronaiki olive trees fertilized with T6 (Kotengin + Biofertilizer + K_2SO_4) in both seasons and T3 (Kotengin +

Posphoren + $(NH_4)_2$ SO_4 + K_2SO_4) in 1st season whereas the highest leaf-Zn content was resulted. On the other hand the least increase in leaf-Zn content was detected by Manzanillo olive trees fertilized with T2 (NPK) treatment as compared to control (ordinary program) during both seasons of study. Other combinations were in between the aforesaid two extremes.

This result is similar to that achieved by **Abdel- Hameed (2002)** who demonsteated that the interaction between 100% N and BF + BS gave significantly the highest leaf Zn content of Manzanillo olive trees.

IV.I.4.3.9 Leaf copper content:

Results presented in **Table (22)** show the specific and interaction effects of olive cultivar, different Bio mineral NPK soil added fertilizers and their combinations on leaf-Cu content.

A. Specific effect:

Concerning the specific effect of olive cultivar on leaf-Cu content, data as shown in **Table (22)** revelaed that Manzanillo had statistically richer leaves in their Cu content than those of Coronaiki olive cv. during both seasons of study. In this concern, **Girigs (2005)** found similar trend in both reasons.

With respect to the specific effect of different Bio mineral NPK soil fertilizers treatments on leaf-Cu content, it clear as shown from **Table (22)** that leaf-cu level was significantly affected by different treatments. In this regard, Copper level increased with any of five soil fertilized treatments. In this regard, data obtained during both seasons revealed that, both T6 (Kotengin + Biofertilizer + K_2SO_4) and T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4), as well as the T5 (Kotengin + Superphosphate +

Rhizobacterin + K_2SO_4) treatments gave the highest value of leaf-Cu content. T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) treatment came in the second class; meanwhile, T2 (NPK) appeared to be less effective than the above mentioned ones. Conversely, the ordinary program (control) treatment resulted in the lowest value of leaf-Cu content.

These observations are in accordance with those obtained by **Godara *et al.*, (1996)** who reported that, significant increase in leaf -Cu content of peach seedlings were recorded with *G.Fasciculatum* and with dual VAM and *Azotobacter* inoculation and **Ismail (2001)** who observed that, using Biomagic gave the highest value of leaf-Cu content of pea plants. On the other hand, **Abdel- Hameed (2002)** found that leaf content of Cu was significantly increased by nitrogen fertilization, the highest significant leaf content of Cu was obtained with BF+ BS on Manzanillo trees.

B. Interaction effect:

The interaction effect between olive cultivars and different Bio mineral NPK soil fertilizers treatments, **Table (22)** showed a considerable effect in both seasons of study where Manzanillo olive trees received T6 (Kotengin + Biofertilizer + K_2SO_4), T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) or T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) soil treatments had the highest value of leaf-Cu content while Coronaiki olive trees received T2 (NPK) exhibited the lowest increase in leaf-Cu content during both seasons of study. On the contrary, Coronaiki olive trees fertilized with the ordinary program, (control) treatment exhibited the lowest value of leaf-Cu content during 1st and 2nd seasons. In addition, other combinations were in between the aforesaid two

Table (22): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on Zn and Cu content (ppm) during both 2002-03 and 2003-04 experimental seasons.

Treatments	Leaf Zn ppm						Leaf Cu ppm					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	15.33 g	19.67 d	**17.50 D**	17.00 i	22.00 f	**19.50 D**	11.00 ef	10.00 f	**10.50 C**	12.00 ef	11.00 f	**11.50 D**
(T_2) Kotengin +NPK	17.00 f	21.00 c	**19.00 C**	18.33 h	24.00 e	**21.17 C**	12.00 de	11.00 ef	**11.50 BC**	13.00 de	12.00 ef	**12.50 CD**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	19.67 d	25.33 a	**22.50 A**	23.33 e	28.33 b	**25.83 A**	13.00 b-d	12.00 de	**12.50 AB**	14.00 b-d	13.00 de	**13.50 BC**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	18.33 e	23.33 b	**20.83 B**	20.00 g	26.00 d	**23.00 B**	14.00 ab	12.67 cd	**13.33 A**	15.00 ab	14.00 b-d	**14.50 AB**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	18.67 e	24.00 b	**21.33 B**	20.33 g	27.00 c	**23.67 B**	13.67 a-c	12.67 cd	**13.17 A**	15.00 ab	13.67 cd	**14.33 AB**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	20.67 c	26.00 a	**23.33 A**	22.33 f	29.33 a	**25.83 A**	14.33 a	13.00 b-d	**13.67 A**	15.67 a	14.33 bc	**15.00 A**
Mean*	**18.28 B**	**23.22 A**		**20.22 B**	**26.11 A**		**13.00 A**	**11.89 B**		**14.11 A**	**13.00 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

aforesaid discussed combinations. In this concern, Simillar results were obtained by **Abdel- Hameed (2002)** .

IV.II.4.4 Shoot nitrogen, total carbohydrates contents and C/N ratio:

IV.II.4.4.a. Shoot total nitrogen content.

A. Specific effect:

Referring the specific effect of olive cultivars, data as shown in **Table (23)** clearly show that Coronaiki olive trees had significantly higher shoot-N% than Manzanillo olive trees in both seasons of study.

Concerning the specific effect of different Bio Mineral NPK soil treatments on shoot nitrogen % content, data as shown in **Table (23)** clearly show that all the five investigated treatments resulted in an obvious increase in shoot-N content during 2002-2003 and 2003-2004 seasons, whereas the differences between the five soil fertilized treatments were significant as each was compared to the four other ones during the study. T6 (Kotengin + Biofertilizer + K_2SO_4) induced significantly the highest value of shoot-N % content, descendingly followed by both T5 (Kotengin + superphosphate + Rhizobacterin + K_2SO_4) and T3 (Kotengin + phosphorene + $(NH_4)_2 SO_4$+ K_2SO_4) treatments. Moreover, both the T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) and T2 (NPK) soil applied treatments appeared to be less effective than the above mentioned ones. In addition, trees received the ordinary program (control) treatment was the infenior in this respect during the study.

These results are in harmony with the findings of **El-Shanshoury *et al.*, (1989)** who demonstrated that, inoculation of Luxor tomato with *A Chroococcum* increased shoot N compared with uninoculated plants.

B. Interaction effect:

Regarding the interaction effect of the two investigated factors i.e., olive cultivar and different bio mineral NPK fertilizers soil applied treatments on shoot nitrogen content, data obtained in **Table (23)** showed obviously that the highest shoot N% was observed with that combination between Coronaiki olive trees fertilized with T6 (Kotengin + Biofertilizer + K_2SO_4) soil applied. Moreover, the lowest shoot - N content aws detected by Manzanillo trees recived control treatment during two seasons of study. On the other hand, other combination were in between the aforesaid two extremes.

IV.II.4.4.ь Response of shoot total carbohydrates :

Total carbohydrates in shoot dry matter of olive, trees as influenced by specific and interaction effects of olive cultivars different Bio mineral NPK treatments and their combinations were investigated. Data obtained during both 2002-2003 and 2003-2004 seasons are presenated in **Table (24)**.

A. Specific effect:

Regarding the specific effect of olive cultivar, **Table (24)** displays that shoot total carbohydrates content in Coronaiki olive was significantly higher than in Mazanillo olive cultivars during two seasons of study.

Table (23): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on shoot N % during both 2002-03 and 2003-04 experimental seasons.

Treatments	Shoot N%					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.43 h	1.74 f	**1.58 D**	1.51 h	1.83 f	**1.67 D**
(T_2) Kotengin +NPK	1.67 g	2.03 c	**1.85 C**	1.77 g	2.14 c	**1.95 C**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2 SO_4$+K_2SO_4	1.82 e	2.21 b	**2.01 B**	1.92 e	2.32 b	**2.12 B**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	1.69 g	2.05 c	**1.87 C**	1.78 g	2.15 c	**1.97 C**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	1.83 e	2.22 b	**2.03 B**	1.93 e	2.34 b	**2.14 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	1.90 d	2.31 a	**2.11 A**	2.01 d	2.43 a	**2.22 A**
Mean*	**1.72 B**	**2.09 A**		**1.82 B**	**2.20 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

Such trend is in agreement with the obtained results of **Hasan (2005)** on olive transplants.

With regard to the specific effect of different Bio mineral NPK soil treatments, data obtained displayed that, shoots total carbohydrates increased significantly by all the different Bio mineral NPK soil treatements comparing with those treated with ordinary program (control) in shoot olive cultivars during first and second seasons of study. Moreover,, differences between all five treatments were significant. In this respect, data as shown in **Table (24)** revealed that T6 (Kotengin + Biofertilizer + K_2SO_4) treatment resulted significantly in the greatest value of shoot total carbohydrates content followed in a descreasing order by T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatment; T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4) meanwhile; T3 (Kotengin + Phosphorene + $(NH_4)_2$ SO_4 + K_2SO_4) and the T2 (NPK) treatments. Conversely, the ordinary program (control) treatment exhibited statistically the lowest value of shoot total carbohydrates during two seasons of study.

The benceficial effect of nitrogen is supported by **Papric, (1991); Eid (1978); El- Garhy (1990) and Ahmed (1991)**. In regard to the effect of potassium on total carbohydrate, it had been reported by **Yagodin (1984)** and **Tisdale *et al.*, (1985)** that patssium intensifies carbohydrates, since K activating a number of enzymes which catalyse the formation of carbohydrates. Moreover, K is essential to regulate opening of stomata which encourages photosynthesis **Jackesan and Volk (1968) , Louis and Frederick (1985)** can give good reasons for the enhancing effect of potassium

on total carbohydrates, which consequently resulted in relative higher C/N ratio.

B. Interaction effect:

Concerning the interaction effect of two investigated factors i.e., olive cultivar and different Bio mineral NPK fertilizers treatments on shoot total carbohydrates content, data in **Table (24)** showed obviously significant response during 2002-2003 and 2003-2004 seasons. The most depressive influences on shoot total carbohydrate content exhibited by that combination between Coronaiki olive trees received the ordinary program (control) treatment compared with those fertilized with any of the five different Bio mineral NPK treatments during two seaons of study. However, Coronaiki trees received the T6 (Kotengin + Biofertilizer + K_2So_4) had the highest value of shoot total carbohydrates content during 1st and 2nd seasons. Meanwhile, other combinations were in between the aforesaid two discussed extremes.

IV.II.4.4.1.c C/N ratio:

A. Specific effect:

Data obtained regarding C/N ratio in shoots of olive trees as affected by olive cultivars and different Bio mineral NPK soil added treatments during two 2002-2003 and 2003-2004 seasons are presented in **Table (24)**.

Referring the specific effect of olive cultivars, **Table (24)** reveals that Coronaiki shoots of olive trees had the higher value of shoot C/N ratio than Manzanillo trees during two seasons of study. Differences in this concern were significant during the 1st and 2nd seasons.

Concerning the specific effect of different Bio mineral NPK soil treatments, data obtained revealed that, olive shoots C/N ratio are presented in **Table (24)**. T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatment had significantly the highest value of shoot C/N ratio followed in a descreasing order by both T5 (Kotengin + Superphosphate + Rhizobacterin + K_2SO_4), T6 (Kotengin+ Biofertilizer + K_2SO_4) soil applied treatments, T3 (Kotengin + Phosphoroene + $(NH_4)_2$ SO_4 + K_2SO_4) than control treatments.

B. Interaction effect:

As for the interaction effect of the two investigated factors i.e., olive cultivar and different Bio mineral NPK fertilizers soil added treatments on olive shoot C/N ratio, **Table (24)** shows that the specific effect of each investigated factor was reflected on its various combinations. Herein, Coronaiki olive trees received T4 (Kotengin + phosphorene + Rhizobacterin + K_2SO_4) treatment showed significantly the highest value of shoot C/N ratio during two seasons of study. Conversely, Manzanillo olive trees received the ordinary program (control) treatment were significantly the inferior during 1st and 2nd seasons of study. In addition, other combinations were intermediate as compared to the above mentioned two extents .

Table (24): Specific and Interaction effect of olive cultivars, some bio- mineral NPK fertilizers soil applied and thir combinations on shoot total carbohydrates (mg/100 D.W.) and C/N Ratio during both 2002-03 and 2003-04 experimental seasons.

Treatments	Shoot total carbohydrates (mg/100 D.W.)						Shoot C/N Ratio					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	5.54 l	6.93 k	**6.23 F**	5.76 l	7.20 k	**6.48 F**	12.33 j	13.60 i	**12.97 D**	12.00 i	13.33 h	**12.67 E**
(T_2) Kotengin +NPK	11.25 j	14.06 i	**12.66 E**	11.69 j	14.62 i	**13.15 E**	15.65 h	17.25 g	**16.45 C**	15.25 g	16.93 f	**16.09 D**
(T_3) Kotengin+ Phosphorene + $(NH_4)_2$ SO_4+K_2SO_4	19.39 h	24.25 g	**21.82 D**	20.16 h	25.20 g	**22.68 D**	17.19 g	18.97 e	**18.08 B**	16.76 f	18.63 d	**17.70 C**
(T_4) Kotengin+ Phosphorene + Rhizo- bacterin +K_2SO_4	30.47 e	38.10 b	**34.29 B**	31.68 e	39.60 b	**35.64 B**	22.61 b	24.94 a	**23.77 A**	22.01 b	24.45 a	**23.23 A**
(T_5) Kotengin+ P+ Rhizo-bacterin +K_2SO_4	29.09 f	36.37 c	**32.73 C**	30.24 f	37.80 c	**34.02 C**	18.31 f	20.35 c	**19.33 B**	17.97 e	19.97 c	**18.97 B**
(T_6) Kotengin+ Biofertilizer+ K_2SO_4	31.95 d	39.83 a	**35.89 A**	33.12 d	41.41 a	**37.26 A**	18.22 f	20.04 d	**19.13 B**	17.74 e	19.63 c	**18.68 B**
Mean*	**21.28 B**	**26.59 A**		**22.11 B**	**27.64 A**		**17.38 B**	**19.19 A**		**16.96 B**	**18.83 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and soil NPK mineral respectively. Means followed by the same letter/s for either specific effect or interaction effect in each season didn't significantly differ at 5% level.

IV. II. Second experiment :

Effect of different combinations between some bio-NPK foliar spray, and soil application on Manzanillo and Coronaiki olive trees .

In this regard specific and two investigated factors namely; olive cultivar (Manzanillo and Coronaiki) foliar sprayed and soil applied with some bio-NPK and their possible combination on olive trees were studied pertaining the response of the following parameters :

IV II. 1. Response of vegetative growth measurements :

IV II. 1.1 Number of shoots per one meter of branch:

Data obtained during both 2002/2003 and 2003/2004 experimental seasons regarding the specific effect of two investigated factors involved in this study i.e. olive cultivar, foliar and soil application of some Bio- mineral fertilizers and interaction effect of their possible combinations are presented in **Table (25)** .

A. Specific effect :

Concerning the specific effect of the olive cultivar, it is quite evident that Coronaiki cultivar trees had statistically greater numbers of shoots / one metter of branch than Manzanillo trees during two seasons of study.

The same trend goes partially with that fained by **Ikram *et al.*, (1992) and Hasan (2005)** on olive seedlings.

Refering the specific effect of sprayed and soil bio- NPK fertilizer treatments within cultivar, it is so clear as shown from **Table (25)** that both Nofaterin and Biomagic each sprayed solely or combined with the T4 from 1st experiment (Kotengin + phosphrene

+ Rhizobacterin + K_2SO_4) or the T6 1st (Kotengin + Biofertilizer + K_2SO_4) soil bio-NPK fertilized treatments resulted in an obvious increase in number of shoots / one metter branch as compared to the ordinary program foliar spray treatment during two seasons of study. In this concern, Biomagic foliar spray combined with soil added fertilizers of either T6 or T4 of 1st experiment i.e., (Kotengin + Biofertilizer + K_2So_4) or (Kotengin + Phosphorene + Rhizobacterin + K_2So_4), respectively exhibited significantly the greatest increase in number of shoots / one metter of branch followed in a descending order by those sprayed with Nofatern + one of both T4. 1st experiment (Kotengin + phosphorene + Rhizobacterin + K_2So_4) and T6 1st experiment (Kotengin + Biofertilizer + K_2So_4) soil fertilized treatments , respectively. In addition , both treatments of spray with Biomagic and Nofatern each solely came third. Meanwhile, NPK foliar spray treatment appeared to be less effective than the above mentioned 6 ones and ranked late just before control as the effect on numberof shoots per one metter of branch was concerned during 2002-2003 and 2003-2004 experimental seasons.

These results are in harmony with findings of **Abd El-Hameed (2002)** who mentioned that the highest significant number of shoot / twigs were obtained with biofertilizer + biostimulates. In addition; **Omran and Abd El-Latif, (2003)** reported that adding 5 g of yeast strain /vine of Roomy Red grape cv. when used as a soil drench for three different application times were more effective on the total shoots number.

B. Interaction effect :

As for the interaction effect of various combinations between two olive cultivars and eight Bio-fertilizer (Nofaterin and Biomagic) sprayed solely or combined with T4 or T6 soil fertilized treatments of previous experiment on number of shoots / branch of olive trees, data in **Table (25)** indicated obviously that the greatest increase in number of shoots / bransch meter were closely related to Coronaiki trees fertilized bio-Biomagic + combined with either T4 1st experiment (Kotengin + phosphorene + Rhizobacterin + K_2So_4) or T6 (Kotengin + Biofertilizer + K_2So_4) soil fertilized treatments.

However, the least increase in number of shoots / branch were detected by fertilized Manzanillo olive trees with NPK foliar spray treatment which ranked later just prior unsprayed ones (control) treatment during the 1st and 2nd experimental seasons. In addition, other combinations were in between. In this respect findings of , **Abd El-Hameed , (2002)** gave support to the present result.

IV. II. I. 2. Number of leaves per shoot :

A. Specific effect :

With regard to the specific effect of olive cultivar, **Table (25)** reveals that Coronaiki olive trees had significantly higher number of leaves/ shoot followed in a descending order by Manzanillo cv. during both 2002 – 2003 and 2003 – 2004 experimental seasons. The same trend agree with that reported by **Abd Ella (1999)** who found that there were significant differences in leaves number/ shoot between Mossolati and Meski olive cultivars. In addition, **El–Khawaga (2001)** indicated significant

differences in leaves number/ meter among five olive cultivars, Coronaiki, Aggisi, Toffahi, Manzanillo and picual .

Moreover, **Aly (2005)** reported that the average number of leaves / meter of "Aggizi shami", "Manzanillo" and "Kalamata" olive trees differed according to cultivar.

Referring the specific effect of bio-mineral fertilizers treatments, it is quite clear that the seven fertilizer treatments (NPK, Nofaterin, Biomagic sprayed solely or combined with the T4 or the T6 treatment of the previous experiment) resulted in significant increase in number of leaves / shoot as compared with control during two seasons of study. However, the highest increase ws significantly exhibited by Biomagic foliar spray + T6 1st experiment (Kotengin + biofertilizer + K_2SO_4) soil treatment followed in a descending order by Biomagic foliar spray + T4 1st experiment soil treatment; Nofaterin foliar spray + either T4 or T6 1st experiment soil fertilized. Then Biomagic foliar spray solely came fifth; while foliar spray with Nofaterin and NPK treatments each solely ramked six and seventh respectively as compared to control treatment during the study .

These observations are in occordance with those obtained by **Ahmed *et al.*, (1999)** who found that, applying phosphorene improved growth of shemlali olive seedlings in comparison to the phosphate fertilizer alone. **Jeeva *et al.*, (1988)** reported that, inoculation of banana cv. Povan with *Azospirillum* plus the highest N rate 100% enhanced with height and girth of pseduostem. **Haggag and Azzazy, (1996)** also domenstrated that, the use of Multi-strains biofertilizer "Microbien" has a significant positive effect on the vegetative growth patterns of mango seedlings. The

same results are in line with the findings of **Abd El-Hameed, (2002)** who mentioned that the highest significant number of leaves/ shoot was significantly obtained by using Biofertilizer + Biostimlate.

B. Interaction effect :

As for the interaction effect of the two investigated factors i.e. olive cultivar and bio-mineral NPK fertilizers (NPK, Nofaterin, Biomagic foliar sprayed solely or combined with the T4 or T6 1st experiment soil fertilized treatments on number of leaves / shoot. **Table (25)** shows a considerable and statisticall effect in both seasons of study. Herein, the greatest values of mumber of leaves / shoot were in closed relationship to Coronaiki olive trees sprayed with Biomagic foliar spray + T6 1st experiment (Kotengin + biofertilizer + K_2SO_4) during 2002 – 2003 and 2003 – 2004 experimental seasons. On the contrary , the least number of leaves / shoot was generally coupled with Manzanillo olive trees received the adopted NPK fertilization program and sprayed with water (control treatment) during two seasons of study. Moreover, other combinations were in between the aforesaid two extremes .

Table (25): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Number of shoots/ branch/ meter and Number of leaves/ shoot during both 2002-03 and 2003-04 eseperimental seasons.

Treatments	Number of shoots/ branch						Number of leaves/ shoot					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	15.97 l	20.93 jk	**18.45 F**	18.23 m	23.90 kl	**21.07 E**	10.83 n	16.30 jk	**13.57 H**	11.93 o	17.97 kl	**14.95 H**
(T_2) NPK	19.97 k	26.20 fg	**23.08 E**	22.80 l	29.87 ef	**26.33 D**	12.57 m	20.83 g	**16.70 G**	13.83 n	22.97 g	**18.40 G**
(T_3) Nofaterin .	20.77 k	27.20 ef	**23.98 DE**	23.73 kl	31.10 de	**27.42 CD**	14.63 l	22.83 f	**18.73 F**	16.10 m	25.17 f	**20.63 F**
(T_4) Biomagic	21.70 jk	28.47 de	**25.08 C-E**	24.80 jk	32.50 c	**28.65 BC**	15.70 K	24.47 e	**20.08 E**	17.33 l	27.00 e	**22.17 E**
(T_5) Nofaterin + (T_4) from 1st expe.	22.67 ij	29.77 cd	**26.22 B-D**	25.90 ij	33.93 b	**29.92 B**	16.93 j	26.07 d	**21.50 D**	18.60 k	28.77 d	**23.68 D**
(T_6) Nofaterin + (T_6) from 1st expe.	23.67 hi	30.97 bc	**27.32 A-C**	27.00 hi	32.03 cd	**29.52 B**	17.67 i	27.70 c	**22.68 C**	19.47 j	30.60 c	**25.03 C**
(T_7) Biomagic+ (T_4) from 1st expe.	24.40 hi	32.03 ab	**28.22 AB**	27.90 gh	36.57 a	**32.23 A**	18.97 h	29.37 b	**24.17 B**	20.87 i	32.33 b	**26.60 B**
(T_8) Biomagic+ (T_6) from 1st expe.	25.23 gh	33.07 a	**29.15 A**	28.83 fg	37.77 a	**33.30 A**	20.07 g	32.60 a	**26.33 A**	22.07 h	35.93 a	**29.00 A**
Mean*	**21.80 B**	**28.58 A**		**24.90 B**	**32.21 A**		**15.92 B**	**25.02 A**		**17.52 B**	**27.59 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

IV. II. I. 3. Average shoot length (cm) .

Data obtained during both 2002 – 2003 and 2003 – 2004 experimental seasons regarding the specific effect of two investigated factors involved in this study i.e. olive cultivar and bio- mineral fertilizers (NPK, Nofaterin, Biomagic foliar sprayed solely or combined with the T4 or T6 1st expereiment as well as interaction effect of their combinations were presented in **Table (26)** .

A- Specific effect :

Concerning the specific effect of olive cultivar, it is quit evident that Coronaiki olive cultivar trees had statistically taller shoot than Manzanillo olive trees during two seasons of study .

The obtained results are confirmed with the findings of **Aly (2005)** who mentioned that the average shoot length of Aggizi shami , Manzanillo and Kalamata olive trees were according to cultivar. In this respect, "Kalamata" had the longest shoots. In addition, **Hasan (2005)** showed that Coronaiki transplants had the tallest stem while Aghizi cvs. Was the-inferior, while, Manznaillo was intermediate . In addition, **Girgis (2005)** reported that Coronaiki cv. Showed the best rate of shoot length compared with other varieties (Picual, Aggizi and Manzanillo)

Referring the specific effect of bio-fertilizers treatments i.e., NPK, Nofaterin, Biomagic foliar spray solely or combined with either T4 or T6 from 1st experiment soil added fertilizers, it is so clear as shown from **Table (26)** that average shoot length of olive cultivar trees significantly increased with all bio-fertilizer as compared with control treatment during the 1st and 2nd seasons of study. In this concern, the highest increase was always in

concomitant to the Biomagic fertilized foliar spray + Both T4 or T6 1st experiment soil fertilized treatments. Also, the Nofaterin foliar spray + either T4 or T6 1st experiments came the second class; followed in a descending order by Biomagic foliar spray treatment during two seaons of study; Meanwhile, both Nofaterin and NPK foliar spray treatment appeared to be less effective than the above mentioned ones.

B- Interaction effect:

Regarding the interaction effect of the two investigated factors i.e. olive cultivar and bio- fertilizer treatments on the average shoot length (cm), **Table (26)** shows obviously the variable response of olive trees to the different combinations during first and second seasons It could be noticed that the most increase in shoot length was detected by such combinations represented Coronaiki olive trees fertilized with Biomogic foliar spray plus either T6 1st experiment (Kotengin + Biofertilizer + K_2So_4 soil fertilized) in both seasons of study or T4 1st experiment (Kotengin + phosphorene + Rhizobacterin + K_2 SO_4 soil fertilized treatment) in the second season only. On the other hand, the least increase in shoot length was dected by Manzanillo olive trees fertilized with NPK foliar spray treatment as compared to control (water spray) during both seasons of study. Other combinations, were in between the aforesaid two extremes. The obtained results are in partial agreement with those mentioned by **Abdel-Hameed (2002)**.

IV. II. 1.4. Average shoot diameter (cm) :

a. Specific effect :

Data obtained during both 2002 – 2003 and 2003 – 2004 seasons regarding the specific effect of two investigated factors and

interaction effect of their combinations on shoot diameter are presented in **Table (26)** .

Concerning the specific effect of olive cultivars, on shoot diameter, it is quite evident as shown from **Table (26)** that Coronaiki olive cultivar had statistically thicker shoot than Manzanillo cultivar during both seasons of study .

As for the specific effect of bio- mineral fertilizers treatments , it is so clear as shown from **Table (26)** that shoot diameter was significantly increased by any of (NPK, Nofaterin, Biomagic foliar spray solely or combined with the T4 or T6 soil added treatments of 1st experiment as compared to control . However, both Biomagic and Nofaterin foliar spray + combined with either T6 or T4 form 1st experiment treatments were the most effective from the statistical point of view during the two seasons of study. In this concern, the previous results go in line with that mentioned by **Das *et al.*, (1996)** on Mulbbery **; Dibut Avlarez *et al.*, (1996)** on banana plants , **Haggag and Azzazy (1996)** on mango seedlings, **Ahmed *et al.*, (1998)** on Red Roomy grape vine, **Sivakumar, (2001)** on mango rootstock; **Soliman (2001)** on guava and banana plants and **El- Kholy (2004)** on Grand Nain banana plants. Moreover, **Akl *et al.*, (1997)** who demonstrated that supplying of Red Roomy grapevine with phosphorene (2 g / vine) active dry yeast (1% as a foliar application) , Rhizobacterin (10g / vine) or Nitrobein (10g / vine) significantly improved cane thickness as compared with untreated vines. In addition. **Abd El-Hameed (2002)** reported that the average shoot diameter was significantly obtained by BF + BS.

B. Interaction effect :

Table (26) displays that shoot diameter response to the interaction effect of different combinations between two investigated factors were more pronounced and reached level of significance when compared each other .

Anyhow, the greatest diameter was detected by Coronaiki olive trees fertilized with Biomagic or Nofaterin foliar spray when each combined with one of both T6 and T4 from 1st experiment during the study. On the other hand, unfertilized Manzanillo olive trees with any of bio- fertilized treatments (control) had the thinnest shoot during two seasons of study.

In addition, other combinations were in between the above mentioned two extremes during 2002 – 2003 and 2003 – 2004 seasons. In this respect, **Abd El-Hameed , (2002)** found that the interaction between 100% N and BF gave the highest significant shoot diameter of Manzanillo olive trees .

IV. II. I.5. Average leaf area :

The average leaf area estimated in cm^2 in response to specific and interaction effects of olive cultivar and bio- mineratl fertilizers (NPK, Nofaterin, Biomagic solely foliar spray or combined with the T6 or T4 from 1st experiment) as well as their combination were investigated. Data obtained during both 2002 – 2003 and 2003 – 2004 experimental seasons are presented in **Table (27)** .

Table (26): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Shoot length and diameter (cm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Shoot length (cm)						shoot diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	11.37 n	18.17 j	**14.77 G**	12.23 k	19.27 h	**15.75 F**	0.15 k	0.18 j	**0.17 D**	0.16 j	0.19 i	**0.17 D**
(T_2) NPK	14.23 m	23.27 g	**18.75 F**	15.33 j	22.83 f	**19.08 E**	0.18 j	0.22 e-h	**0.20 C**	0.19 i	0.23 e-g	**0.21 C**
(T_3) Nofaterin	15.13 l	25.47 f	**20.30 E**	16.30 j	27.00 d	**21.65 D**	0.19 ij	0.23 d-f	**0.21 BC**	0.20 hi	0.24 d-f	**0.22 C**
(T_4) Biomagic	16.73 k	28.73 e	**22.73 D**	18.00 i	30.43 c	**24.22 C**	0.20 h-j	0.24 c-e	**0.22 BC**	0.21 g-i	0.25 c-e	**0.23 BC**
(T_5) Nofaterin + (T_4) from 1st expe.	18.43 j	31.63 d	**25.03 C**	19.80 gh	33.57 b	**26.68 B**	0.20 g-i	0.25 b-d	**0.23 A-C**	0.21 g-i	0.26 b-d	**0.24 A-C**
(T_6) Nofaterin + (T_6) from 1st expe.	19.43 i	32.70 c	**26.07 B**	20.93 g	34.70 b	**27.82 B**	0.21 f-i	0.26 bc	**0.23 A-C**	0.22 f-h	0.27 a-c	**0.24 A-C**
(T_7) Biomagic+ (T_4) from 1st expe.	22.17 h	36.33 b	**29.25 A**	23.87 ef	38.53 a	**31.20 A**	0.22 e-h	0.27 ab	**0.24 AB**	0.23 e-g	0.28 ab	**0.26 AB**
(T_8) Biomagic+ (T_6) from 1st expe.	22.73 gh	37.27 a	**30.00 A**	24.47 e	39.50 a	**31.98 A**	0.23 d-g	0.28 a	**0.26 A**	0.24 d-f	0.29 a	**0.27 A**
Mean*	**17.53 B**	**29.20 A**		**18.87 B**	**30.73 A**		**0.20 B**	**0.24 A**		**0.21 B**	**0.25 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

A. Specific effect :

Concerning the specific effect of olive cultivar, **Table (27)** reveals that the greatest area of individual leaf was significantly coupled with Coronaiki trees during both 2002 / 2003 and 2003 / 2004 experimental seasons.

On the contrary, Manzanillo cvs. had significant by the smallest leaf area during 1st and 2nd seasons.

These results are in line with the findings of **Hartmann** and **Papaionnou (1971)** who observed that leaf area in Dolce del Marocco olive cv. Were largest than those of both Mission and Frantoio cvs. Also, **Hassan (1980)** found that Frontoio cv. Had the highest leaf area in comparison with Chemlali, Dolce del Morocco, Mission, and Aggizi shami olive cvs. Moreover, **Hasan (2005)** mentioned that Coronaiki cvs. Was the superior as its leaf area, was compared to Aghizi cvs. and Manzanillo where later one was the inferior.

As for the specific effect of bio- fertilizers treatments, it is quite evident as shown from **Table (27)** that NPK, Nofaterin, Biomagic foliar sprayed solely or combined with ony of both T6 and T4 from 1st experiment soil fertilized treatments resulted in a significant increase in average leaf area as compared to control (water spray) .

Such trend was true during both seasons, however, both treatments of Biomagic foliar spray + T6 or T4 from 1st experiment were statistically the most effecitive in this concern followed in descending order by Nofaterin foliar spray + T6 from 1st experiment, and Nofaterin foliar spray + T4 fromt 1st experiment whereas both ranked 2nd and 3rd, respectively. Biomagic foliar spray

solely came in the fourth class; meanwhile, both Nofaterin and NPK foliar sprays treatments appeared to be less effective than the above mentioned ones .

Generally , different bio- NPK fertilizers foliar applied treatments increased leaf area as compared with control (ordinary program) with two investigated olive cultivars. In this concern, the present results were in general agreement with those were reported by **Haggag (1996)** and **Jasrotia *et al.*, (1997)** on olive trees. Besides, findings of **Jeeva *et al.*, (1988), El- Demerdash (1988) Noval *et al.*, (1997)** on banana; **Ahmed *et al.*, (1998)** on Red Roomy grapevine, **Sharma and Bhutani (1998)** on apple seedlings **Tiwary *et al.*, (1998) , Soliman (2001) Abd El-Aziz (2002)** on banana plants , **Moustafa (2002)** on Washington navel orange and **El-Kholy (2004)** on banana cvs. gave support to the present result.

B – Interaction effect :

Referring the interaction effect of the investigated two factors i.e. olive cultivar and bio- fertilizers treatments on average leaf area, data obtained in **Table (27)** showed that Manzanillo trees. Sprayed with mineral NPK fertilizers exhibited the least increase in the values of average leaf area over control. On the other hand, the highest increase in average leaf area value were detected by Coronaiki trees sprayed with Biomagic either + T6 or T4 soil added from 1st experiment during 2002-2003 and 2003-2004 experimental seasons. Moreover, other combinations were in between the aforesaid two extremes .

Table (27): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average leaf area (cm^2) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf area (cm^2)					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	2.88 n	4.64 g	**3.76 G**	2.90 n	4.66 g	**3.78 G**
(T_2) NPK	2.94 m	4.74 f	**3.84 F**	2.96 m	4.76 f	**3.86 F**
(T_3) Nofaterin	3.02 l	4.88 e	**3.95 E**	3.04 l	4.90 e	**3.97 E**
(T_4) Biomagic	3.05 kl	4.93 d	**3.99 D**	3.07 k	4.95 d	**4.01 D**
(T_5) Nofaterin + (T_4) from 1st expe.	3.08 jk	4.97 c	**4.03 C**	3.10 j	5.00 c	**4.05 C**
(T_6) Nofaterin + (T_6) from 1st expe.	3.11 ij	5.06 b	**3.09 B**	3.13 i	5.05 b	**4.09 B**
(T_7) Biomagic+ (T_4) from 1st expe.	3.20 h	5.06 b	**4.13 A**	3.17 h	5.10 a	**4.13 A**
(T_8) Biomagic+ (T_6) from 1st expe.	3.14 i	5.17 a	**4.16 A**	3.16 h	5.10 a	**4.13 A**
Mean*	**3.05 B**	**4.91 A**		**3.07 B**	**4.94 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively.

Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

IV. II. 1.6. Average leaf fresh and dry weights :

Data obtained during both experimental seasons of 2002 / 2003 and 2003 / 2004 regarding the specific and interaction effects of two investigated factors (olive cultivar and bio- NPK fertilizers treatments) as well as their combinations are presented in **Table (28)** .

A. Specific effect :

With regard to the specific effect of olive cultivar, tabulated data in **Table (28)** show that both parameters (leaf fresh and dry weight) followed typically the same trend. Hence, Coronaiki olive trees had statistically heavier leaves fresh and dry weights, than Manzanillo trees during 1st and 2nd seasons.

In this respect, **El – Said *et al.*, (1995)** showed a wide variations, between Rosciolo, Bautellan, Nabal, Mission, Wordan, Coronaiki, Toffahi, Manzanillo, Mostazal, Aghizi, Picual, Verdeal, Pocama and Hamed olive cvs. In addition , **Hasan (2005)** reported that Coronaiki transplants had the greatest leaves fresh and dry weights , while Manzanillo transplants had the lightest values and Aghizi cultivar was in between during the study .

Concerning the specific effect of bio-NPK fertilizers treatments, data obtained revealed that, the leaf fresh and dry weights were increased by any of seven bio-NPK fertilizer treatments. Such increase was significant as compared to those of control olive trees. Herein , the greatest increase in leaf fresh and dry weight was detected by the Biomagic foliar spray + the T6 from 1st experiment soil applied, followed in a des-cending order by the Biomagic foliar spray + the T4 from 1st experiment and Nofaterin foliar spray + the T6 from 1st experiment soil applied treatments.

The Nofaterin foliar spray+ the T4 from 1st experiment and Biomagic foliar spray treatments came in the third class; menwhile, the Nofaterin and NPK solution foliar spray treatments appeared to be less effective than the abovementioned ones.

These observations are in accordance with those obtained by **Haggag and Azzazy (1996)** who demosstrated that, the use of multi – strain biofertilizer "Microbein" has a significant possitive effect on the vegetative growth patterns of mango seedlings.

Similar observation was obtained by **Sarig *et al.*, (1990)** who stated that, inoculation of sorghum with *A. brasilense* increased total plant dry weight, shoot (root ratio and green leaf area) .

B- Interaction Effect :

As for the interaction effect between olive cultivars and bio-NPK fertilizers treatments on fresh and dry weight of leaves, it is quite clear that the most increase in leaves fresh and dry weights was exhibited by combination between Coronaiki trees fertilized with Biomagic foliar spray + the T6 from 1st experiment soil applied. Where as, the lowest increase in leaves fresh and dry weights was detected by Manzanillo trees fertilized with NPK solution foliar spray during both 2002 / 2003 and 2003 / 2004 seasons. Moreover, other combinations were in between the aforesaid two extremes.

Table (28): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average leaf fresh and dry weights (g) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf Fresh weight (g)						Leaf dry weight (g)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	2.48 l	3.42 f	**2.95 F**	2.57 m	3.55 g	**3.06 F**	0.88 m	1.19 g	**1.04 F**	0.91 m	1.23 g	**1.07 F**
(T_2) NPK	2.68 k	3.70 e	**3.19 E**	2.78 l	3.84 f	**3.31 E**	0.98 l	1.32 f	**1.15 E**	1.01 l	1.37 f	**1.19 E**
(T_3) Nofaterin	2.69 k	3.71 e	**3.20 D**	2.79 l	3.85 ef	**3.32 D**	1.01 k	1.37 e	**1.19 D**	1.05 k	1.42 e	**1.23 D**
(T_4) Biomagic	2.70 k	3.73 e	**3.21 CD**	2.80 l	3.87 e	**3.34 CD**	1.04 j	1.40 d	**1.22 Cd**	1.07 j	1.45 d	**1.26 Cd**
(T_5) Nofaterin + (T_4) from 1st expe.	2.73 i	3.77 d	**3.25 C**	2.83 k	3.19 d	**3.37 C**	1.06 j	1.43 c	**1.24 C**	1.09 j	1.48 c	**1.28 C**
(T_6) Nofaterin + (T_6) from 1st expe.	2.88 g	3.84 c	**3.36 B**	2.99 g	3.98 c	**3.49 B**	1.09 j	1.47 b	**1.28 B**	1.13 j	1.53 b	**1.33 B**
(T_7) Biomagic+ (T_4) from 1st expe.	2.83 h	3.91 b	**3.37 B**	2.94 i	4.06 b	**3.49 B**	1.10 i	1.49 b	**1.30 B**	1.14 i	1.54 b	**1.34 B**
(T_8) Biomagic+ (T_6) from 1st expe.	2.88 g	3.98 a	**3.43 A**	2.99 h	4.13 a	**3.56 A**	1.14 h	1.54 a	**1.34 A**	1.17 h	1.59 a	**1.38 A**
Mean*	**2.78 B**	**3.76 A**		**2.84 B**	**3.90 A**		**1.04 B**	**1.40 A**		**1.07 B**	**1.45 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

IV.II.2. Response of flowering behaviour and some fruiting measurements :

In this concern number of inflorescences per shoot, number of flowers/ inflorescence , sex expression %, fruit set %, fruit drop % , and fruit retention percentage were the investigated flowering and fruiting parameters in response to the different combinations between some bio-mineral NPK, foliar spray and soil added fertilization treatments (NPK, Nofaterin, Biomagic foliar spray solely or combined with T4 or T6 of 1st experiment). Data obtained during both experimental seasons of 2002 / 2003 and 2003 / 2004 are presented in **Tables (29 , 30 and 31).**

IV. II. 2.1. Number of inflorescences per shoot:

A. Specific effect :

Date obtained during both 2002 / 2003 and 2003 / 2004 seasons regarding the specific effect of two investigated factors (olive cultivar and bio- mineral fertilizers) and interaction effect of their combinations on number of inflorescences / shoot are presented in **Table (29)**.

Concerning the specific effect of olive cultivar, it is quite evident that Coronaiki olive trees had statistically greater number of inflorescences / shoot than Manzanillo olive trees during both seasons of study Generally, flowering density of olive trees is differed according to cultivar, in this concern **Shahin *et al.*, (1982) ; Fouad *et al.*, (1992) ; Hassan (1996); Abd – Ella (1999) ; Abdel – Naeem (2000) ; Nouman *et al.*, (2000) and Aly (2005)** reported that olive cultivars varied significantly in number of inflorescences / meter of shoot length .

As for the specific effect of bio-mineral fertilizers foliar spray solely or combined with soil added fertilizers treatments, it is clear as shown from **Table (29)** that number of inflorescences / shoot was significantly increased by various inrestigated bio mineral treatments as compared to control (ordinary program) . However, Biomagic foliar spray solely was the most effective from the statistical point of view, followed in a descending order by Biomagic foliar spray + T6 from 1st experiment and Nofaterin foliar spray + T4 from 1st experiment during both seasons. Both treatments of (Nofaterin foliar spray + the T6 from 1st experiment) and (Biomagic foliar spray + T4 from 1st experiment) came in fourth class. Moreover, Nofaterin and NPK foliar spray treatments appeared to be less effective than the obovementioned ones .

Generally, all bio-mineral fertilizers treatments, improved flowering density as compared with control trees. These results agree with **Emtithal *et al.*, (2002)** who mentioned that, increasing N and K fertigation rate significantly increased number of inflorescences per one meter of Manzanillo olive shoot. This may be due to the essentiality of potassium in nearly all processes needed to sustain plant growth and reproduction **(Bob 2001) .**

The positive effect of Micro- Organisms (EM) may be due to its effect in improving physical, chemical and biological environments of the soil and suppreses soil borne pathogens and pests as suggested by **Higa (1994) .**

Also, **Kilany and Kilany (1990)** observed that, soil nitrogen application (250 or 500 g N / tree) induced significant increase the number of inflorescences/ shoot of olive cv. Picual as compared with the control.

B- Interaction effect :

Table (29) displays that variances in response of number of inflorescences / shoot to interaction effect of different combinations between two investigated factors were more pronounced and reached level of significance with comparing such combinations each other .

Anyhow, Coronaiki olive trees foliar sprayed with Biomagic had the greated increase in number of inflorescences / shoot during both seasons. On the other hand, sprayed Manzanillo olive trees with NPK solution had the lowest increase in number of inflorescences as compared to control during two seasons of study. In addition, other combinations were in between the above mentioned two extremes during 2002 / 2003 and 2003 / 2004 seasons.

IV. II. 2.2. Number of flowers per inflorescence :

A. Specific effect :

Concerning the specific effect of the two factors involved in this study i.e. olive cultivar and biofertilizer treatments on number of flowers / inflorescence, data obtained in **Table (29)** showed that Coronaiki olive cultivar had statistically the higher number of flowers / inflorescence than Manzanillo olive cultivar during both seasons of study .

As for the specific effect of bio-NPK fertilizers treatments, data in **Table (29)** clearly show that 7 bio- fertilizers treatments increased significantly the number of flowers / inflorescence as compared to the ordinary fertilization program (control), however, Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2So_4 soil fertilized) had the highest increase in

number of flowers / inflorescence followed in descending order by (Nofaterin foliar spray + T6 from 1st experiment) and (Biomagic foliar spray solely) during 1st and 2nd seasons.

The Biomagic foliar spray + T4 from 1st experiment treatment cam in the fourth class; meanwhile, the other treatments (Nofaterin foliar spray + T4 from 1st experiment, Nofaterin and NPK foliar spray) appeared to be less effective than the above mentioned ones, during 2002 / 2003 and 2003 / 2004 experimental seasons .

The present results are in agreement with those obtained by **Wange and Patil, (1994)** who observed that applying 100kg N / ha alone or inoculating with *Azotobacter* and *Azospirillum* mixtures significantly increased the number of flowers per stalk and the number of flower stems produced by *Polianthes tuberosa* cv. Single in pot experiments.

Abd El-Hameed (2002) found that nitrogen fertilizer significantly increased number of flowers per inflorescence and the number of inflorescences / shoot .

B- Interaction effect :

Table (29) reveals that, there were a significant variances in number of flowers / inflorescence due to different combinations between olive cultivar and bio-NPK fertilizer treatments. Anyhow, Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment showed significantly the greatest value of increase in number of flowers / inflorescence. In addition, the reverse was true with Manzanillo olive trees received NPK foliar spray treatments, where the lowest increase were detected during

Table (29): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Number of inflorescence/ shoot and Number of flowers/ inflorescence during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Number of inflorescence/ shoot						Number of flowers/ inflorescence					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 m	0.00 m	0.00 **G**	0.00 l	0.00 l	0.00 **G**	0.00 o	0.00 o	0.00 **H**	0.00 o	0.00 o	0.00 **H**
(T_2) NPK	3.88 l	4.35 k	**4.12 F**	4.01 k	4.49 j	**4.25 F**	12.82 n	13.73 l	**13.27 G**	13.55 n	14.50 l	**14.03 G**
(T_3) Nofaterin	4.31 k	5.05 e	**4.68 E**	4.45 j	5.21 e	**4.83 E**	13.80 m	14.06 k	**13.93 F**	13.82 m	14.87 k	**14.35 F**
(T_4) Biomagic	4.97 f	5.74 a	**5.36 A**	5.12 f	5.93 a	**5.53 A**	15.39 h	17.15 c	**16.27 C**	16.26 h	18.13 c	**17.20 C**
(T_5) Nofaterin + (T_4) from 1st expe.	4.74 h	5.48 c	**5.11 C**	4.89 h	5.66 c	**5.28 C**	14.74 j	16.32 e	**15.53 E**	15.59 j	17.26 e	**16.42 E**
(T_6) Nofaterin + (T_6) from 1st expe.	4.66 i	5.40 d	**5.03 D**	4.71 i	5.57 d	**5.14 D**	15.90 g	17.56 b	**16.73 B**	16.80 g	18.56 b	**17.68 B**
(T_7) Biomagic+ (T_4) from 1st expe.	4.54 j	5.48 c	**5.01 D**	4.69 ij	5.66 c	**5.18 D**	15.26 i	16.74 d	**15.20 D**	16.13 i	17.69 d	**16.91 D**
(T_8) Biomagic+ (T_6) from 1st expe.	4.85 g	5.61 b	**5.23 B**	5.01 g	5.79 b	**5.40 B**	16.02 f	17.69 a	**16.86 A**	16.94 f	18.71 a	**17.83 A**
Mean*	**3.99 B**	**4.64 A**		**4.11 B**	**4.79 A**		**12.99 B**	**14.15 A**		**13.64 B**	**14.67 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively.

Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

two seasons of study. Moreover, other combinations were in between the above mentioned two extremes.

IV. II. 2.3. Sex expression percentage:

A- Specific effect :

Regarding the specific effect of two factors involved in this study i.e. olive cultivar and different bio-NPK fertilizer treatments on sex expression percentage, **Table (30)** clearly shows that Manzanillo olive trees exceeded statistically Coronaiki olive trees in this concern during 2002 / 2003 and 2003 / 2004 experimental seasons. This result agreed with **Brooks (1948); Elant and Proraoran (1950)**; **Hartmann and Opitze (1966) ; Hegazi and Stino, (1982); Fouad *et al.*, (1992) and Laze, (1993)** who indicated that sex expression in olive was affected by cultivar.

Like wise **Girgis (2005)** reported that sex expression of four olive cultivars can be arranged in a descending order as follows: Aggizi , Manzanillo, Coronaiki and Picual, i.e. Aggizi was the superior cv. had the highest perfect flower percentage .

With respect to the specific effect of bio-NPK fertilizer treatments, it is cleare as shown from **Table (30)** that sex expression % was significantly affected by different bio-NPK fertilizer treatments. In this regard, sex expression % increased with all seven bio-NPK fertilize treatments during two seasons of study. The Biomagic foliar spray + T6 from 1st experiment exhibited significantly the highest Value of sex expression %, followed in a descending order by Biomagic foliar spray + T4 from 1st experiment; Nofaterin foliar spray + T6 from 1st experiment, and / or (Nofaterin foliar spray + T4 from the 1st experiment). Biomagic foliar spray solely and Nofaterin foliar spray alone. However, NPK

foliar spray treatment appeared to be the least effective than the above mentioned ones during two seasons of study. These results agreed with findings of **Emtithal *et al.*, (2002)** who reported that adding potassium to soil, significantly enhanced the sex expression percentage .

Also, the same trend was found by **Aly, (2005)** who found that adding N, P, K, Mg , NF and EM each at two levels significantly enhanced the sex expression % of "Aggizi shamie" "Manzanillo and Kalamata olive trees as compared to control trees. As for the effect of EM on flowering , **Higa (1994)** cleared that EM promotes flowering and fruiting in plants. Also, it improves physical, chemical and biological environments of the soil and suppresses soil borne .

B. Interaction effect :

Results in **Table (30)** showed the effect of interaction between olive cultivar and different bio-NPK fertilizer treatments on sex expression percentage. It is quite clear that the highest increase in sex expression % was exhibited significantly by such combination between Manzanillo crs. X (Biomagic foliar spray + T6 from 1st experiment) while Coronaiki olive trees foliar sprayed with NPK solution, showed the lowest increases of sex expremion % during two seasons of study. Other combinations were in between the aforesaid two extremes .

IV. II. 2.4. Fruit set percentage :

A. Specific effect :

With regard to the specific effect of olive cultivar, **Table (30)** reveals that Manzanillo olive trees showed significantly higher fruit set percentage, than Coronaiki olive trees during both 2002 /

2003 and 2003 / 2004 seasons. These results go in paralled with those of sex expression. These results are in the same line with **Hartman (1953); Hassan (1980) ; Hassan (1996); Ibrahim (1997) ; Abd Ella (1999) Abd El-Naeem (2000) ; Nouman *et al.*, (2000); El- Khawaga (2001) and Aly (2005).** Moreover, **Morettini (1951) ; Hegazi (1997) and Fouad *et al.*, (1992)** found that fruit set was correlated with the percentage of perfect flowers and abortion of some pistle flowers. In addition, **Laz (1993)** noted that cultivars of higher number of inflorescences per meter have higher values of sex expression and fruit set .

Referring the specific effect of bio-NPK fertilizers within cultivar it is quite clear that all the seven bio NPK fertilizer treatments (NPK, Nofaterin, Biomagic each sprayed solely or combined with T4 or T6 treatments from 1st experiment) resulted in an obvious increase in fruit set % as compared to control in both 2002 / 2003 and 2003 / 2004 experimental seasons. The Biomagic foliar spray + T6 from 1st experiment treatment resulted in in highest fruit set percentage followed in descending order by Biomagic foliar spray + T4 from 1st experiment soil fertilized treatment, Nofaterin foliar spray + T6 from 1st experiment and both Nofaterin foliar spray + T4 from 1st experiment and Biomagic foliar spray solely treatments, where two leather treatments were equally the same from statistical standpoint from one hand and ranked fourth from the other.

In addition, Nofaterin or NPK foliar spray treatments appeared to be less effective than the above mentioned ones during two seasons of study.

Similarly, **Frega *et al.*, (1995)** found that foliar application of potassium sulphate either combined with urea or diammonium phosphate increased fruit set in leccino olive cultivar. , Also, **Akl *et al.*, (1997)** who showed that, phosphoren and active dry yeast coused highly significant increase in berry set of Red Roomy grape vines. Moreover, similar observation were also recorded by **Mansour, (1998)** who showed that, all biofertilizers (phosphorene, active dry yeast and Nitrobein) were very effective in improving yield of Anna apple trees. **Amit – Jasrotia *et al.*, (1999)** stated that fruit set and crop yield of olive trees cv. Frontoio increased significantly as the nitrogen application rate increased from 250 - 1000 g / tree .

Abd El-Hameed (2002) found that fruit set % was significantly increased by nitrogen fertilization , Also, **Aly (2005)** demonstrated that all soil nutrient treatments improved both initial and fruit set as compared with control. Moreover, potassium followed by EM had the superiority in this concern .

B. Interaction Effect :

Regarding the interaction effect of various combinations between investigated factors, data in **Table (30)** display that fruit set percentage was significantly influenced. However, Manzanillo olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment showed statistically the highest value of fruit set percentage as compared with other combinations. Meanwhile, Coronaiki olive trees sprayed with the NPK foliar spray treatment had the least fruit set % during two seasons of study. In addition, other combinations were in between the obovementioned two

Table (30): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on sex expression % and Fruit Set % during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Sex expression %						Fruit Set %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 m	0.00 m	0.00 **G**	0.00 o	0.00 o	0.00 **G**	0.00 m	0.00 m	0.00 **G**	0.00 m	0.00 m	0.00 **G**
(T_2) NPK	24.27 f	17.97 l	**21.20 F**	22.25 f	18.32 n	**20.29 F**	13.24 k	11.55 l	**12.39 F**	13.66 k	11.50 l	**12.58 F**
(T_3) Nofaterin	27.91 e	20.66 k	**24.28 E**	25.59 e	21.07 m	**23.33 E**	16.77 hi	14.11 i	**15.44 E**	17.30 i	14.57 j	**15.94 E**
(T_4) Biomagic	30.33 d	22.46 j	**26.40 D**	27.81 d	22.91 k	**25.36 D**	19.93 d	16.91 h	**18.42 D**	20.67 d	17.42 i	**19.04 D**
(T_5) Nofaterin + (T_4) from 1st expe.	30.82 c	22.82 i	**26.82 C**	28.26 c	23.27 j	**25.77 C**	19.86 d	16.73 i	**18.30 D**	20.48 e	17.24 i	**18.86 D**
(T_6) Nofaterin + (T_6) from 1st expe.	31.55 b	23.36 h	**27.45 B**	28.92 b	23.82 h	**26.37 B**	20.40 c	17.19 g	**18.80 C**	21.03 c	17.72 h	**19.37 C**
(T_7) Biomagic+ (T_4) from 1st expe.	31.66 b	22.99 i	**27.33 B**	28.98 b	23.45 i	**26.22 B**	20.68 b	17.43 f	**19.06 B**	21.46 b	17.98 g	**19.72 B**
(T_8) Biomagic+ (T_6) from 1st expe.	32.03 a	23.72 g	**27.88 A**	29.37 a	24.19 g	**26.78 A**	21.42 a	18.05 e	**19.74 A**	22.10 a	18.60 f	**20.35 A**
Mean*	**26.07 A**	**19.25 B**		**23.90 A**	**19.63 B**		**16.54 A**	**14.00 B**		**17.09 A**	**14.38 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

extremes during the study. In this respect, **Abd El-Hameed (2002)** found simlar trend.

IV. II. 2.5. Fruit retention percentage :

Results pertaining the specific and interaction effects of olive cultivar and different bio-NPK fertilizer treatments as well as their combinations on fruit retention % are presented in **Table (31)**

A – Specific effect :

Regarding the specific effect of olive cultivar and different bio-NPK fertilizers treatments on fruit retention % , **Table (31)** clearly shows that Coronaiki olive trees had statistically higher value of fruit retention % than Manzanillo olive trees during both seasons .

Similar result was found by **Girgis (2005)** as fruit retention percentage of Coronaiki; Aggizi cv.; picual and the Manzanillo olive. cvs. were compared in this respect.

With respect to the specific effect of different bio-NPK fertilizer treatments on fruit retention % of olive trees, it could be noticed that fruit retention % was statistically varied from one treatmente to other during 2002 / 2003 and 2003 / 2004 seasons. In this respect, Biomagic foliar spray + T6 from 1st experiment soil exhibited significantly the highest value of fruit retention %, followed in a descending order- by Biomagic foliar spray + T4 from 1st experiment; Nofaterin foliar spray + T6 and T4 from 1st experiment, then both (Nofaterin + T4 from 1st experiment) and Biomagic Nofaterin foliar spray solely; meanwhile NPK solution foliar spray appeared to be less effective than the obove mentioned ones. In this concern, **Abd El-Hameed (2002)** mentioned that

retained fruits % was significantly increased by nitrogen fertilization, however, 100% N gave the highest percentage followed by 75% N and 50% N; respectively in Manzanillo olive trees. In addition, the retained fruits percentage was increased with BF.

B. Interaction Effect :

As for the interaction effect of the two investigated factors i.e. olive cultivar and different bio-NPK fertilizer treatments on fruit retention %, data obtained showed obviously the variable response of olive trees to the different combinations used during the two seasons of study. The higher increase in fruit retention % was significantly detected by Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment, while the least fruit retention % was detected by Manzanillo olive trees received NPK solution foliar spray treatment during two seasons of study. In this concern, **Abd El-Hameed (2002)** found that the interaction between 100% N and BF gave the highest fruits retained % .

IV. II. 2.6. Fruit drop percentage :

A. Specific effect :

It is obvious from the results of **Table (31)** that Manzanillo cvs. had significantly higher fruit drop %, than Coronaiki cv. in both seasons. In this concern, **Girgis (2005)** mentioned that Picual and Manzanillo olive trees exhibited the highest fruit drop percentage while the least fruit drop % appeared in Coronaiki cv. In both seasons.

From these results, it could be noticed that fruit drop % increased with all seven sprayed bio-NPK fertilizer during two seasons of study. In this concern, NPK solution foliar spray olive

trees appeared to contain fruit drop % usually higher than those of other bio-NPK fertilizers treatments during both seasons of study followed in a descending order by Biomagic foliar spray . In addition, Nofaterin foliar spray either solely or combined with T4 from 1st experiment came in the 3rd class; meanwhile , both Nofaterin foliar spray + T6 from 1st experiment and Biomagic foliar spray + T4 from 1st experiment soil as well as Biomagic foliar spray + T6 from 1st experiment showed the least drop than the above mentiones ones.

B. Interaction effect :

Concerning the interaction effect of the investigated two factors i.e. olive cultivar and different bio-NPK fertilizer treatments on fruit drop % , date obtained in **Table (31)** showed obviously the significant variances in this concern during 1st and 2nd seasons . Herein, the trened of reoponse took the other way around as compared to that previously detected with fruit retention % during both seasons of study.

IV. II. 3. Response of fruit physical and seed (stone) characteristics :

IV. II. 3.1. Fruit physical characteristics :

Fruit dimentions (height and diameter); shape index (hight: diameter); weight ; volume; flesh weight; flesh thiikness; and flesh weight: fruit weight were the evaluated fruit physical characteristics pertaining the response to the specific and interaction effects of the various variables of the two investigated factors, olive cultivar and bio-NPK fertilizer treatments) and their combinations.

Table (31): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on fruit retention % and Fruit drop % during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Fruit retention %						Fruit drop %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 l	0.00 l	0.00 **F**	0.00 n	0.00 n	0.00 **G**	0.00 l	0.00 l	0.00 **F**	0.00 n	0.00 n	0.00 **G**
(T_2) NPK	15.73 k	22.92 f	**19.32 E**	17.22 m	25.12 h	**21.17 F**	84.28 a	77.08 f	**80.68 A**	82.78 a	74.88 f	**78.83 A**
(T_3) Nofaterin	19.11 h	24.18 e	**21.65 CD**	20.22 j	25.75 g	**22.99 D**	80.74 d	75.82 g	**78.28 C**	79.75 d	74.25 g	**77.00 C**
(T_4) Biomagic	17.20 j	24.29 e	**20.74 D**	18.68 l	26.11 f	**22.40 E**	82.78 b	75.74 g	**79.26 B**	81.32 b	73.89 h	**77.60 B**
(T_5) Nofaterin + (T_4) from 1st expe.	17.96 i	24.97 d	**21.47 CD**	19.41 k	27.11 d	**23.26 D**	82.04 c	75.03 h	**78.54 BC**	80.59 c	72.89 j	**76.74 C**
(T_6) Nofaterin + (T_6) from 1st expe.	18.37 i	25.65 b	**22.01 C**	20.14 j	27.77 c	**23.95 C**	81.63 c	74.35 i	**77.99 C**	79.85 d	72.23 k	**76.04 D**
(T_7) Biomagic+ (T_4) from 1st expe.	21.69 g	28.38 b	**25.03 B**	23.08 i	30.42 b	**26.75 B**	78.31 e	71.62 j	**74.97 D**	76.92 e	69.58 l	**73.25 E**
(T_8) Biomagic+ (T_6) from 1st expe.	25.42 cd	31.79 a	**28.60 A**	26.74 e	33.74 a	**30.24 A**	74.58 hi	68.21 k	**71.40 E**	73.26 i	66.26 m	**69.76 F**
Mean*	**16.94 B**	**22.77 A**		**18.19 B**	**24.50 A**		**70.54 A**	**64.73 B**		**69.31 A**	**63.00 B**	

M = Manzanillo cv.. C. = Coronaiki cv,

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

Data obtained during both 2002/2003 and 2003 / 2004 seasons are presented in **Tables (32, 33, 34 and 35) .**

IV. II. 3.1. a. Fruit height and diameter (cm) .

A. Specific effect :

Regarding the specific effect of different factors involved in this study i.e. olive cultivar and bio-NPK fertilizer treatments (NPK, Nofaterin, Biomagic each sprayed solely or combined with either T4 or T6 from 1st experiment) on fruit height and diameter, data obtained are presented in **Table (32).** It was clearly evident that Manzanillo olive fruits had higher values of both average fruit height and diameter (cm), than the analogous ones of Coronaiki olive fruits during two seasons of study. Differences between two olive cultivars were significant.

The present results are in an agreement with those found **by Fouad *et al.*, (1992) and Aly (2005)** who noticed that both fruit length and width differed according to cultivar.

Also the same trend was reported by **Girgis (2005)** who mentioned that Aggizi cv exhibited the highest values of both fruit height and diameter in reverse to Coronaiki olive cultivar, in the meantime Picual and Manzanillo were in between.

Concerning the specific effect of bio-NPK fertilizer treatments (NPK **Table (32)** revealed that Nofaterin, Biomagic each sprayed solely or combined with either T4 or T6 from 1st experiment soil fertilized treatments) on fruit height and diameter, data obtained in significantly increased two fruit parameters as compared to NPK foliar spry. However, (Biomagic foliar spray + T6 from 1st experiment Kotengin + Biofertilizer + K_2SO_4). was

statistically the superior followed in descending order by (Biogamic foliar spray + T4 from 1st experiment i.e., Kotengin + phosphorene + Rhizobacterin + K_2SO_4); (Nofaterin foliar spray + either T6 or T4 from 1st experiment); Biomagic foliar spray solely; Nofaterin solely and NPK foliar spray treatments during two seasons of study. In this respect, **Abd El – Hameed (2002)** found that nitrogen fertilizer significantly increased fruit length and diameter of Manzanillo olive fruits. In addition, **Aly (2005)** reported that potassium treatments significantly increased the elongation of Aggizi, Manzanillo and Kalamata olive cultivars. Also, phosphorous and EM had an effective effect.

B. Interaction effect :

Referring the interaction effect of various combinations between the two investigated factors, olive cultivars and bio-NPK fertilizer treatments on both average fruit height and diameter, data obtained in **Table (32)** showed obviously a variable response Herein, combination represented Manzanillo olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + biofertilizer + K_2SO_4) exhibited statistically the highest values increase of both fruit parameters during study. On the contrary , Coronaiki olive trees sprayed with solution of NPK foliar spray treatment exhibited the lowest values of fruit height and diameter during two seasons of study.

In addition, other combinations showed intermediate values of fruit height and diameter as compared to the aforesaid two extremes. In this concern, **Abd El-Hameed (2002)** on Manzanillo olive trees found similar trend.

Table (32): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average fruit dimenations (cm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Fruit length (cm)						Fruit diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 l	0.00 l	0.00 **G**	0.00 m	0.00 m	0.00 **G**	0.00 n	0.00 n	0.00 **G**	0.00 n	0.00 n	0.00 **G**
(T_2) NPK	2.77 g	2.41 k	**2.59 F**	2.86 h	2.49 l	**2.68 F**	2.03 g	1.33 m	**1.68 F**	2.07 g	1.35 m	**1.71 F**
(T_3) Nofaterin	2.91 f	2.48 j	**2.70 E**	3.01 f	2.57 k	**2.79 E**	2.07 f	1.34 m	**1.71 F**	2.11 f	1.36 m	**1.74 EF**
(T_4) Biomagic	2.95 e	2.50 i	**2.73 E**	3.06 e	2.56 k	**2.81 E**	2.11 e	1.37 l	**1.74 E**	2.13 e	1.39 l	**1.76 E**
(T_5) Nofaterin + (T_4) from 1st expe.	3.05 d	2.56 h	**2.80 D**	3.15 d	2.69 j	**2.92 D**	2.18 d	1.41 k	**1.79 D**	2.22 d	1.43 k	**1.82 D**
(T_6) Nofaterin + (T_6) from 1st expe.	3.11 c	2.57 h	**2.84 C**	3.21 c	2.74 i	**2.97 C**	2.28 c	1.47 j	**1.88 C**	2.32 c	1.50 j	**1.91 C**
(T_7) Biomagic+ (T_4) from 1st expe.	3.27 b	2.80 g	**3.04 B**	3.38 b	2.89 g	**3.14 B**	2.38 b	1.54 i	**1.96 B**	2.42 b	1.57 i	**2.00 B**
(T_8) Biomagic+ (T_6) from 1st expe.	3.41 a	2.92 f	**3.16 A**	3.52 a	3.01 f	**3.27 A**	2.48 a	1.61 h	**2.04 A**	2.53 a	1.63 h	**2.08 A**
Mean*	**2.68 A**	**2.28 B**		**2.77 A**	**2.37 B**		**1.94 A**	**1.26 B**		**1.98 A**	**1.28 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

IV. II. 3.1.b. Fruit shape index :

A. Specific effect :

Concerning the fruit shape index (fruit height : fruit diameter ratio) of olive cultivar as influenced by the investigated bio – NPK fertilizers treatments (NPK , Nofaterin, Biomagic each sprayed solely or combined with T4 or T6 from 1st experiment), data in **Table (33)** revealed that Coronaiki olive fruits had significantly higher value of fruit shape index than Manzanillo olive fruits. Difference were significant during both seasons. The results are in harmony with the finding of **Aly (2005)** who mentioned that significant differences in shape index (Length /diameter) of olive cultivars under investigation "Kalamata" fruits were more elongated, followed by Aggizi shami, then Manzanillo fruits .

Referring the specific effect of bio-fertilizers treatments, it is quite clear that, the trend was not so firm during both seasons, In spite of the fruits tended relatively to be more prolonged by both Nofaterin or Biomagic foliar spray solely as well as Nofaterin foliar spray + T4 from 1st experiment (kotengin + phosphorene + Rhizobacterin + K_2SO_4) during both seasons of study. Differences in fruit shape index could be logically discussed on such fact resulted by the paralleled response of both fruit dimensions to a given bio-fertilization treatment. In this respect, **Abd El-Hameed (2002)** found that nitrogen fertilizer significantly increased fruit shape index (Length / diameter) of Manzanillo olive trees.

B. Interaction effect :

Regarding the response of fruit shape index (fruit height : fruit diameter) in response to the interaction effect of various combinations between two investigated factors i.e. olive cultivar and bio-NPK fertilizer treatments, data presented in **Table (33)** display that specific effect of olive cultivar was more pronounced than different fertilization treatments which directly reflected on their possible combinations. Herein, the highest fruit shape index was generally coupled with those Coronaiki olive trees regardless, of applied fertilizeation treatments during two seasons.

IV. II. 3.1.c. Fruit weight (gm) and size (cm^3) .

Concerning the specific and interaction effects of two investigated factors (olive cultivar and bio-NPK fertilized treatments) and their combinations on fruit weight (gm) and fruit size (cm^3), data obtained during both 2002 / 2003 and 2003 / 2004 seasons are presented in **Table (34)** .

A. Specific effect :

With regard to the specific effect of cultivar, data obtained during two seasons displayed that the response of both parameters (fruit weight and size) followed typically the same trend. Whereas, Manzanillo cvs. exceeded statistically the in this concern during two seasons. These results agreed with **Hassan (1980) ; Fouad *et al.*, (1992) , Abde-Ella (1999) Nouman *et al.*, (2000) ; El Khawaga (2001) and Aly (2005)** who reported that cultivar differed in their fruit weight and size .

Table (33): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on fruit shape index during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Fruit length/ diameter					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 d	0.00 d	0.00 **C**	0.00 c	0.00 c	0.00 **B**
(T_2) NPK	1.36 c	1.82 a	**1.59 B**	1.38 b	1.84 a	**1.61 A**
(T_3) Nofaterin	1.40 c	1.86 a	**1.63 A**	1.42 b	1.89 a	**1.66 A**
(T_4) Biomagic	1.41 c	1.85 a	**1.63 A**	1.42 b	1.88 a	**1.65 A**
(T_5) Nofaterin + (T_4) from 1st expe.	1.40 c	1.85 a	**1.63 A**	1.42 b	1.88 a	**1.65 A**
(T_6) Nofaterin + (T_6) from 1st expe.	1.36 c	1.74 b	**1.55 B**	1.38 b	1.83 a	**1.61 A**
(T_7) Biomagic+ (T_4) from 1st expe.	1.38 c	1.82 ab	**1.60 A**	1.39 b	1.85 a	**1.62 A**
(T_8) Biomagic+ (T_6) from 1st expe.	1.37 c	1.83 a	**1.60 A**	1.39 b	1.84 a	**1.62 A**
Mean*	**1.21 B**	**1.60 A**		**1.23 B**	**1.63 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

As for the specific effect of bio-NPK fertilized treatments, data obtained revealed that any of the seven bio-NPK fertilized treatments varied obviously in their effect on both fruit weight and fruit size during 2002 / 2003 and 2003 / 2004 experimental seasons. On the other hand, the Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer+ K_2SO_4) resulted significantly in the greatest value of both fruit weight and size followed in a descending order by Biomagic foliar spray + T4 from 1st experiment (Kotengin + phosphorene + Rhizobacterin + K_2SO_4). The Nofaterin foliar spray + either the T4 or T6 from the 1st experiment soil applied came in third class ; meanwhile both Biomagic and Nofaterin as well as NPK fertilized foliar spray treatments appeared to be less effective than the above mentioned ones. These observations are in accordance with those obtained by **Haggag, (1996)** who observed that, all nitrogen application of treatments increased both fruit weight and size of olive (cv. Picual) as compared with control trees. Also, **Abd El-Hameed (2002)** found that nitrogen fertilizer significantly increased fruit weight and values. In addition, **Aly (2005)** mentioned that fruit weight were increased in treated trees with potassium and EM. The benefical effect of potassium may be due to its roles could be reflected on different factors affecting some physiological processes and consequently on fruit size shape and other fruit quality measurements (**Bob, 2001**) Moreover, the effect of EM may be due to its role to improve physical, chemical and biological environments of the soil (**Higa, 1994**) .

On the other hand, **Martin *et al.*, (1997) and Fernadez *et al.*, (1999)** suggested that, treated olive trees with nitrogen (0 to 1 kg / tree) did not show any response on fruit size. Moreover, **Jeeva *et al.*, (1988)** reported that, inoculation of banana cv. Povan with *Azospirillum* plus the highest N rate (100%) increased bunch weight as compared with the non-inoculated control receiving 100% N.

B. Interaction effect :

Regarding the interaction effect of the investigated two factors i.e. olive cultivar and bio-NPK fertilizers treatments on fruit weight and fruit size, **Table (34)** shows a considerable and statistical effect in both seasons of study , where the most increase in both fruit weight and fruit size was in closed relationship to Manzanillo olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2So_4 soil applied) as compared with their combinatios during two seasons of study. **Abd El-Hameed (2002)** found similar trend on Manzanillo olive cv.

IV. II. 3.1.d. Flesh weight (gm) and flesh thickness (cm) .

The average fleash weight (gm) and flesh thickness (cm) in response to specific effect of olive cultivar and bio-NPK fertilized treatments as well as interaction effect of their combinations were investigated. Data obtained during both 2002/ 2003 and 2003 / 2004 experimental seasons are presented in **Table (35)** .

Table (34): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average fruit weight (g) and volume (cm^3) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Fruit weight (g)						Fruit volume (cm^3)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 m	0.00 m	0.00 **F**	0.00 m	0.00 m	0.00 **F**	0.00 m	0.00 m	0.00 **G**	0.00 m	0.00 m	0.00 **F**
(T_2) NPK	5.32 g	1.78 l	**23.55 E**	5.30 g	1.77 l	**3.54 E**	5.03 g	1.68 l	**3.36 E**	5.07 g	1.69 l	**3.80 E**
(T_3) Nofaterin	5.41 f	1.79 l	**3.60 E**	5.39 f	1.78 l	**3.59 E**	5.12 f	1.69 l	**3.40 E**	5.16 f	1.70 l	**3.43 E**
(T_4) Biomagic	5.55 e	1.88 k	**3.72 D**	5.54 e	1.88 k	**3.71 D**	5.25 e	1.78 k	**3.52 D**	5.29 e	1.79 k	**3.54 D**
(T_5) Nofaterin + (T_4) from 1st expe.	5.79 d	1.95 j	**3.87 C**	5.77 d	1.94 j	**3.86 C**	5.48 d	1.84 j	**3.66 C**	5.52 d	1.85 j	**3.69 C**
(T_6) Nofaterin + (T_6) from 1st expe.	5.87 c	1.98 ij	**3.93 C**	5.87 c	1.97 ij	**3.92 C**	5.57 c	1.87 ij	**3.72 C**	5.61 c	1.88 ij	**3.75 C**
(T_7) Biomagic+ (T_4) from 1st expe.	6.03 b	2.02 i	**4.03 B**	6.02 b	2.02 i	**4.02 B**	5.70 b	1.91 i	**3.81 B**	5.75 b	1.93 i	**3.84 B**
(T_8) Biomagic+ (T_6) from 1st expe.	6.22 a	2.08 h	**4.15 A**	6.20 a	2.08 h	**4.14 A**	5.89 a	1.97 h	**3.93 A**	5.93 a	1.99 h	**3.96 A**
Mean*	**5.03 A**	**1.69 B**		**5.01 A**	**1.68 B**		**4.75 A**	**1.59 B**		**4.79 A**	**1.61 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

A. Specific effect :

Table (35) displays that both parameters responded specifically to olive cultivar, whereas, Manzanillo was the superior while Coronaiki was the inferior. The response was pronounced with both average flesh weight and flesh thickness, whereas, difference were significant as two cultivars were compared each other during both 2002 / 2003 and 2003 / 2004 experimental seasons. In this respect, **Girgis (2005)** found similar trend with Aggizi, Coronaiki, Picual and Manzanillo olive cvs.

Referring the specific effect of bio- NPK fertilizeres treatments, obtained data exhibited that both flesh weight (gm) and thickness of olive fruits followed typically the same trend of response. Anyhow , it was quite clear that all the seven investigated bio-NPK fertilizers treatments varied significantly regarding their effect on both flesh weight and thickness during 1^{st} and 2^{nd} seasons of study. On the other hand, the Biomagic foliar spray + T6 from the 1^{st} experiment (Kotengin + Biofertilizer + K_2So_4 soil applied) treatment was statistncally the most effective followed in descending order by Biomagic foliar spray + T4 from the 1^{st} experiment (Kotengin + Phosphorene + Rhizobacterin + K_2SO_4); Nofaterin foliar spray + T6 from 1^{st} experiment; Nofaterin foliar spray + T4 from 1^{st} experiment soil applied; Biomagic foliar spray solely treatments. However both Nofaterin solaly and NPK solution appeared to be less effective and ranked last during 1^{st} and 2^{nd} seasons of study .

B. Interaction Effect :

Referring the interaction effect of the investigated two factors i.e. olive cultivar and bio-NPK fertilizers treatments on the average flesh weight and thickness of olive fruits, data obtained in **Table (35)** showed the most increase in both parameters was coupled with such combination represented fertilized Manzanillo olive trees with Biomagic foliar spray + T6 from 1st experiment, whereas, the highest increase in flesh weight and flesh thickness were resulted. On the other hand, the leart values of both flesh weight and thickness of olive fruits were detected by Coronaiki olive trees fertilized with NPK solution foliar spray during 1st and 2nd seasons. Moreover, other combinations were in between the aforesaid two extremes.

In this respect, **Abd El-Hameed (2002)** reported similar trend.

IV. II. 3.2 Seed (stone) characters :

IV. II. 3.2.a. Stone dimensions (length & diameter):

Data obtained during both 2002 / 2003 and 2003/2004 experimental seasons regarding the specific and interaction effects of two investigated factors (olive cultivar and bio-NPK fertilized treatments) , as well as their combinations are presented in **Table (36)** .

A. specific effect :

With regard to the specific effect of olive cultivar, tabulated data in **Table (36)** revealed that both dimensions followed typically the same trend, where Mazanillo fruits surpassed statistically those

Table (35): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average flesh weight (g) and thickness (cm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Flesh weight (g)						Flesh thickness (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 m	0.00 m	0.00 **F**	0.00 m	0.00 m	0.00 **F**	0.00 j	0.00 j	0.00 **E**	0.00 k	0.00 k	0.00 **E**
(T_2) NPK	4.55 g	1.36 l	**2.95 E**	4.50 g	1.33 l	**2.92 E**	1.08 de	0.75 i	**0.92 E**	1.05 e	0.77 ij	**0.91 E**
(T_3) Nofaterin	4.62 e	1.36 l	**2.99 E**	4.56 ef	1.32 l	**2.94 E**	0.93 g	0.75 i	**0.84 E**	1.05 e	0.78 ij	**0.92 E**
(T_4) Biomagic	4.84 e	1.44 k	**3.14 D**	4.70 e	1.42 k	**3.06 D**	1.09 e	0.78 i	**0.93 D**	1.15 d	0.79 j	**0.97 D**
(T_5) Nofaterin + (T_4) from 1st expe.	4.97 d	1.50 j	**3.24 D**	4.90 d	1.40 k	**3.15 D**	1.14 d	0.81 i	**0.97 D**	1.15 d	0.82 i	**0.98 D**
(T_6) Nofaterin + (T_6) from 1st expe.	5.04 c	1.53 i	**3.28 C**	4.98 c	1.49 ij	**3.24 C**	1.23 c	0.87 h	**1.05 C**	1.24 c	0.88 h	**1.06 C**
(T_7) Biomagic+ (T_4) from 1st expe.	5.18 b	1.56 i	**3.37 B**	5.13 b	1.54 i	**3.33 B**	1.32 b	0.93 g	**1.12 B**	1.33 b	0.94 g	**1.14 B**
(T_8) Biomagic+ (T_6) from 1st expe.	5.36 a	1.62 h	**3.49 A**	5.30 a	1.59 h	**3.44 A**	1.41 a	0.99 f	**1.20 A**	1.42 a	1.00 f	**1.21 A**
Mean*	**4.32 A**	**1.30 B**		**4.26 A**	**1.26 B**		**1.03 A**	**0.74 B**		**1.05 A**	**0.75 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

Coronaike fruits during both 2002 / 2003 and 2003 / 2004 experimental seasons .

Concerning the specific effect of bio-NPK fertilizers treatments, data obtained revealed that, however two seed dimensions followed generally similar but both didn't coincide regarding their response to the investigated bio- mineral fertilizers treatments.

Anyhow, two investigated fertilization treatments of foliar spray with Biomagic + either T6 or T4 of the 1st experiment were statistically the most effective for increasing two stone dimensions during both seasons of study. However, both fertilizers treatments of Nofaterin spray combined with either T6 or T4 from 1st experiment came second. Differences were more pronounced with stone length than in its diameter, whereas reached level of significance with former dimension (length) but with later one (diameter) were not too enough to be significant as two categories were compared each other during both seasons. On the contrary, foliar spray with NPK fertilizers (T2) was statistically the foliar during two seasons of study. In addition, two other fertilization treatments (T3 and T4) i.e., foliar spray with either Nofaterin or Biomagic each solely were in between the aforesaid two extremes, from the statistical point of view during two seasons of study. However, such two intermediate fertilization treatments were statistically of the same effectiveness with stone length but Biomagic was significantly mere effective than Nofaterin for stone diameter.

B- Interaction effect:

Table (36) shows that specific effect of each investigated factor was reflected directly on its combinations. Herein, the tallest and thickest fruit stones were statistically coupled with Manzanillo trees treated with Biomagic + T6 from 1st experiment followed by those of the same cultivar supplied with either T7 (Biomagic + T4 of 1st experiment or T6 (Nofaterin + T6 of 1st experiment) on the contrary fruits of Coroniaki olive trees treated with either NPK or Nofaterin solely had statistically the shortest and thinnest stones.

In addition, other combinations were in between the aforesaid two extremes during two seasons of study as both seed (stone) dimensions were concerned.

IV. II. 3.2. C. Seed length : diameter ratio (stone shape index):

Data obtained during both 2002 / 2003 and 2003 / 2004 seasons are presented in **Table (37)**

A. Specific effect :

Concerning the specific effect of the different factors involved in this study i.e. olive cultivars; and bio-NPK fertilizers treatments on seed length: seed diameter ratio, data obtained in **Table (37)** showed that Coronaiki olive seeds had statistically higher value of seed length : seed diameter ratio i.e. more oblonged stone in their shape than those of Manzanillo. Such trend was true during two seasons of study regarding the response of seed shape index, whereas, variances were significant during two seasons as both cultivars compared each other.

Table (36): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on average seed dimenations (cm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Seed length (cm)						Seed diameter (cm)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 l	0.00 l	0.00 **F**	0.00 l	0.00 l	0.00 **F**	0.00 i	0.00 i	0.00 **E**	0.00 i	0.00 i	0.00 **E**
(T_2) NPK	1.67 f	1.25 k	**1.46 E**	1.68 f	1.26 k	**1.47 E**	0.91 e	0.53 h	**0.72 D**	0.94 e	0.54 h	**0.74 D**
(T_3) Nofaterin	1.74 e	1.29 j	**1.52 D**	1.75 e	1.30 j	**1.52 D**	0.98 d	0.55 h	**0.76 C**	1.00 d	0.56 h	**0.78 C**
(T_4) Biomagic	1.76 d	1.31 j	**1.54 D**	1.78 d	1.32 j	**1.55 D**	1.03 c	0.59 g	**0.81 B**	1.06 c	0.60 g	**0.83 B**
(T_5) Nofaterin + (T_4) from 1st expe.	1.86 c	1.38 i	**1.62 C**	1.87 c	1.39 i	**1.63 C**	1.04 bc	0.60 fg	**0.82 AB**	1.07 bc	0.61 fg	**0.84 AB**
(T_6) Nofaterin + (T_6) from 1st expe.	1.88 b	1.40 hi	**1.64 BC**	1.89 b	1.41 hi	**1.65 BC**	1.05 a-c	0.60 fg	**0.83 AB**	1.08 bc	0.62 fg	**0.85 AB**
(T_7) Biomagic+ (T_4) from 1st expe.	1.90 b	1.41 gh	**1.66 AB**	1.91 b	1.42 gh	**1.67 AB**	1.06 ab	0.61 fg	**0.84 AB**	1.09 ab	0.63 fg	**0.86 AB**
(T_8) Biomagic+ (T_6) from 1st expe.	1.92 a	1.43 g	**1.68 A**	1.94 a	1.44 g	**1.69 A**	1.07 a	0.62 f	**0.84 A**	1.10 a	0.63 f	**0.87 A**
Mean*	**1.59 A**	**1.19 B**		**1.60 A**	**1.19 B**		**0.89 A**	**0.51 B**		**0.92 A**	**0.53 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively.

Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

Referring the specific effect of bio-NPK fertilizers treatments , it is quite evident that all seven investigated bio-NPK fertilizers treatments (NPK, Nofaterin, Biomagic each sprayed solely or combined with T4 or T6 from the 1st experiment soil applied) didn't significantly differ except when compared to T4 (Biomagic foliar spray solely).

In other words, the least value of fruit shape index (stone length: its diameter ratio) was significantly in closed relationship to the foliar spray with Biomagic solely as compared to other six investigated fertilization treatments which equally the same effectiveness in this respect from statistical point of view during two seasons of study. Such trend could be explained by such factor depending upon the response of each parameter (length and diameter) individually to the investigated treatments, where both trend and rate of response exhibited in one parameter by a given fertilization treatment is paralled to the analogous ones in second one.

B. Interaction Effect :

Regarding the interaction effect of the investigated two factors i.e. olive cultivars and different bio-NPK fertilized treatments on seed shape index (seed length: seed diameters) , data in **Table (37)** showed obviously that the more pronounced response to olive cultivars than that to fertilization treatments was directly reflected on the interaction effect of various combinations between two olive cultivars from one hand and seven fertilization treatments from the other. Hence, the either combinations of Coronaiki olive cv. had statistically higher stone length : diameter ratio as compared to the analogous either combinations of Manzanillo cv. during to

seasons of study. However, NPK; Nofaterin solely or combination with T6 of 1st experiment and Biomagic + T6 of 1st experiment sprayed Coronaiki tree were statistically the superior, while those of Biomagic solely sprayed Manzanillo trees were the inferior during two seasons.

IV. II. 3.2.d. Average seed weight (gm) :

A. Specific effect :

Concerning the specific effect of two factors involved in this study i.e. olive cultivars and different bio-NPK fertilizers treatments on average seed weight (gm) data as shown in **Table (37)** revealed that Manzanillo fruits had statistically heavier seed weight than Coronaiki cv. in both seasons.

Hassan (1980) ; Fouad *et al.*, (1992) Abde-Ella (1999) Nouman *et al.*, (2000) ; El-Khawaga (2001) and **Aly (2005)** who reported that olive cultivars differed in their seed weight. Also **Girgis (2005)** found that Aggizi cv. exhibited the highest value of seed weight followed by Picual, Manzanillo and Coroniaki in a descending order in both seasons of study .

With respect to the specific effect of different bio-NPK fertilizers treatments, **Table (37)** displays that seed weight to seven bio-NPK fertilizers treatments.

In this respect, Biomagic foliar spray + T4 or T6 from the 1st experiment soil applied and Nofaterin foliar spray + T6 from the 1st experiment soil applied exhibited the highest value of seed weight followed in descending order by Nofaterin foliar spray + T4 from 1st experiment soil applied treatment.

Both Nofaterin and Biomagic each solely foliar spray came in the third class; meanwhile NPK foliar spray induced fruits with the lightest stone weight during two seasons of study.

B. Interaction effect :

As for the interaction effect of the investigated two factors i.e. olive cultivar x bio-NPK fertilized treatments on seed weight, data obtained in **Table (37)** showed that the different combinations of Manzanillo olive tress induced fruits with heavier seeds than those of Coronaiki cv. The increase was significant during two seasons, where there combinations of Manzanillo trees treated with Biomagic + either T6 or T4 treatments from 1st experiment as well as Nofaterin + T6 from 1st experiment were statistically the superior. On the contrary, Coronaiki trees treated with either NPK or Biomagic, Nofaterin solely were statistically the inferin.

IV. II. 4. Response of leaf and shoot chemical composition :

In this regard photosynthetic pigments (chlorphyll A & B and carotenes) , total free amino acids and mineral composition of olive leaves, as well as shoot nitrogen content, total carbohydrates and C / N ratio were concerned .

IV. II. 4.1. Leaf photosynthetic pigments.

Leaf chlorophyll (A&B) and carotenes contents of olive trees in response to specific and interaction effects of two studied factors were investigated. Data obtained during both 2002 / 2003 and 2003 / 2004 experimental seasons are presented in **Tables (38 and 39).**

Table (37): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on seed length/ seed diameter and weight (g) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Seed length/ seed diameter						Seed weight (g)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.00 h	0.00 h	0.00 **C**	0.00 f	0.00 f	0.00 **C**	0.00 i	0.00 i	0.00 **E**	0.00 i	0.00 i	0.00 **E**
(T_2) NPK	1.83 e	2.37 a	**2.10 A**	1.78 d	2.32 a	**2.05 A**	0.77 d	0.42 h	**0.60 D**	0.81 e	0.44 h	**0.62 D**
(T_3) Nofaterin	1.78 f	2.36 ab	**2.07 A**	1.74 d	2.31 ab	**2.03 A**	0.79 cd	0.43 gh	**0.61 CD**	0.83 cd	0.45 h	**0.64 CD**
(T_4) Biomagic	1.72 g	2.23 d	**1.97 B**	1.68 e	2.19 c	**1.94 B**	0.80 bc	0.44 f-h	**0.62 CD**	0.84 bc	0.46 gh	**0.65 CD**
(T_5) Nofaterin + (T_4) from 1st expe.	1.79 ef	2.31 c	**2.05 A**	1.75 d	2.27 b	**2.00 A**	0.82 b	0.45 e-g	**0.64 BC**	0.86 b	0.48 fg	**0.67 BC**
(T_6) Nofaterin + (T_6) from 1st expe.	1.79 ef	2.33 a-c	**2.06 A**	1.76 d	2.28 ab	**2.02 A**	0.85 a	0.45 e-g	**0.65 A**	0.90 a	0.48 fg	**0.69 A**
(T_7) Biomagic+ (T_4) from 1st expe.	1.79 ef	2.32 bc	**2.06 A**	1.76 d	2.27 b	**2.01 A**	0.85 a	0.46 ef	**0.66 A**	0.90 a	0.48 fg	**0.69 A**
(T_8) Biomagic+ (T_6) from 1st expe.	1.80 ef	2.33 a-c	**2.07 A**	1.76 d	2.29 ab	**2.02 A**	0.86 a	0.47 e	**0.67 A**	0.92 a	0.49 f	**0.70 A**
Mean*	**1.56 B**	**2.03 A**		**1.53 B**	**1.99 A**		**0.72 A**	**0.39 B**		**0.76 A**	**0.41 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively.

Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

IV. II. 4.1.a. Leaf chlorophyll A & B contents :

A. Specific effect :

Referring the specific effect of olive cultivar **Table (38)** reveals that Manzanillo olive trees had statistically higher leaf chlorophyll A & B contents than Coroniaki olive trees during two 2002 / 2003 and 2003 / 2004 experimental seasons .

These results confirmed that reported by **Girgis (2005)** who mentioned that Manzanillo cv. yielded higher leaf chlorophyll A & B, in Contrast to Coroniaki olive leaves.

Concerning the Specific effect of different bio-NPK fertilizer treatments, data obtained revealed that, leaf chlorophyll (A & B) contents responded significantly to seven bio-NPK fertilizers treatments as compared each other. In this respect, Biomagic foliar spray + T6 from the 1st experiment gave the highest value of leaf chlorophyll A & B, descendingly followed by Biomagic foliar spray + T4 from 1st experiment; Nofaterin foliar spray + either T6 or T4 from 1st experiment; Biomagic foliar spray solely; Nofaterin solely and NPK, foliar spray, respectively.

The previous present results agree with early findings of **Jackson and Volk (1968) and Weaver, (1976)**. The increase in chlorophyll "B" may be due to the increase in chlorophyll "A" because chlorophyll "A" is a precursor for the synthesis of chlorophyll "B" **Smith and French (1963), Castelfranco and Beale, (1983)** Moreover, **Aly (2005)** found that soil applied with N, P, K, Mg & EM increased the leaf chlorophyll "A" and "carotene" Contents, while leaf chlorophyll "B" content showed no significant differences due to different treatments.

B. Interaction effect :

Referring the interaction effect of the different combinations between two investigated factors on leaves chlorophyll (A & B) contents of olive leaves, data obtained in **Table (38)** showed obviously a variable response during two seasons. The richest leaves chlorophyll (A & B) contents was exhibited by such combinations representative of fertilized Manzanillo olive trees with Biomagic foliar spray + T6 from 1st experiment descendingly followed by treated trees of the same cultivar with Biomagic + T4 from 1st experiment and Nofaterin + T6 or 1st experiment. On the contrary sprayed Coronaiki trees with NPK solution induced statistically the poorest leaves in their chlorophyll A and B contents. Other combinations are in between the aforesaid two extremes.

IV. II. 4. 1.b. Leaf carotene content :.

A. Specific effect :

Concerning the specific effect of two factors involved in this study i.e. olive cultivar and different bio-NPK fertilizers treatments on leaf carotein content, **Table (39)** shows that Coronaiki olive trees had statistically richer leaf carotin content than Manzanillo olive trees during two seasons of study. In this respect, **Hasan (2005)** found that leaf carotenoids content was generally the richest in Coronaiki transplants followed in a descending order by those of Aghizi and Manzanillo cvs.

Regarding the specific effect of different bio-NPK fertilizers treatments on carotein content, data revealed an obvious sesponse in this concern.

Table (38): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on leaf Chlorophyll (A) and (B) content (mg/100 gm. F.W.) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Chlorophyll (A) content (mg/100 gm. F.W.)						Chlorophyll (B) content (mg/100 gm. F.W.)					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.06 m	0.85 h	**0.95 H**	1.33 n	1.07 o	**1.20 H**	0.46 k	0.36 l	**0.41 H**	0.58 k	0.46 l	**0.52 H**
(T_2) NPK	1.30 i	1.04 m	**1.17 G**	1.64 j	1.31 n	**1.48 G**	0.57 h	0.46 k	**0.51 G**	0.73 h	0.58 k	**0.65 G**
(T_3) Nofaterin .	1.44 f	1.15 l	**1.30 F**	1.81 g	1.45 m	**1.63 F**	0.64 f	0.51 j	**0.58 F**	0.81 f	0.64. j	**0.73 F**
(T_4) Biomagic	1.52 d	1.21 k	**1.37 E**	1.91 e	1.52 l	**1.72 E**	0.67 e	0.54 i	**0.61 E**	0.85 e	0.68 i	**0.77 E**
(T_5) Nofaterin + (T_4) from 1st expe.	1.58 c	1.26 j	**1.42 D**	1.99 d	1.59 k	**1.79 D**	0.73 d	0.58 h	**0.65 D**	0.92 d	0.74 h	**0.83 D**
(T_6) Nofaterin + (T_6) from 1st expe.	1.59 c	1.33 h	**1.46 C**	2.09 c	1.68 i	**1.89 C**	0.76 c	0.61 g	**0.69 C**	0.97 c	0.77 g	**0.87 C**
(T_7) Biomagic+ (T_4) from 1st expe.	1.75 b	1.40 g	**1.57 B**	2.20 b	1.76 h	**1.98 B**	0.80 b	0.64 f	**0.72 B**	1.02 b	0.82 f	**0.92 B**
(T_8) Biomagic+ (T_6) from 1st expe.	1.86 a	1.48 e	**1.67 A**	2.33 a	1.87 f	**2.10 A**	0.85 a	0.68 e	**0.77 A**	1.09 a	1.09 e	**0.98 A**
Mean*	**1.51 A**	**1.22 B**		**1.91 A**	**1.53 B**		**0.69 A**	**0.55 B**		**0.87 A**	**0.70 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

Anyhow, the richest leaves carotes content was always in concomitant to both Biomagic and Nofaterin foliar spray each combined with T6 from 1st experiment during both 2002 / 2003 and 2003 / 2004 seasons, followed in a decreasing order by both Biomagic and Nofaterin foliar spray + T4 from 1st experiment.

On the contary NPK solution foliar spray was statistically the least effective as compared to control.

B. Interaction effect :

Regarding the interaction effect between olive cultivars and different bio-NPK fertilizer treatments on carotein content of the two olive cultivars, data obtained in **Table (39)** showed that leaf carotein content of all fertilized olive trees with seven bio mineral NPK fertilizers were significantly increased as compared with control during the study. The highest level of leaf carotein content was always in closed relationship to such combination representing Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + biofertilizer+ K_2So_4). On the other hand, the lowest increase in leaves carotein content over control was exhibited by Manzanillo olive trees fertilized with NPK solution foliar spray during two seasons of study. In addition, other combinations were in between the aforesaid two extremes.

IV. II.4.2 Leaf total free amino acids content :

Total free amino acids levels in fresh leaves of two olive cultivars under study in response to different bio-NPK fertilized treatments (NPK, Nofaterin, Biomagic each solely foliar spray or combined with one of the T6 and T4 from 1st experiment) were investigated. Data obtained are tabulated in **Table (40)** .

Table (39): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on carotene content (mg/100 gm. F.W.) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Carotene content (mg/100 gm. F.W.)					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.33 l	0.41 k	**0.37 G**	0.37 i	0.46 h	**0.42 G**
(T_2) NPK	0.42 j	0.52 gh	**0.47 F**	0.47 h	0.59 e	**0.53 F**
(T_3) Nofaterin	0.47 i	0.58 e	**0.53 E**	0.52 g	0.65 d	**0.59 E**
(T_4) Biomagic	0.49 i	0.61 d	**0.55 DE**	0.55 g	0.67 d	**0.61 DE**
(T_5) Nofaterin + (T_4) from 1st expe.	0.52 gh	0.65 c	**0.58 BC**	0.59 e	0.72 c	**0.65 BC**
(T_6) Nofaterin + (T_6) from 1st expe.	0.55 fg	0.67 b	**0.61 AB**	0.60 d	0.76 b	**0.68 AB**
(T_7) Biomagic+ (T_4) from 1st expe.	0.52 h	0.64 c	**0.58 BC**	0.57 f	0.71 e	**0.64 BC**
(T_8) Biomagic+ (T_6) from 1st expe.	0.57 ef	0.70 a	**0.63 A**	0.63 d	0.79 a	**0.71 A**
Mean*	**0.48 B**	**0.60 A**		**0.55 B**	**0.67 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

A. Specific effect :

With regard to the specific effect of olive cultivar **(Table, 40)** displays that total free amino acids content responded obviously. Herein, leaves of Manzanillo olive trees were significantly richer than those of Coronaiki olive trees. These results are in agreement with the findings of **Hasan (2005)** on olive cultivars .

Referring the specific effect of bio-NPK fertilizer treatments, **Table (40)** reveals that the seven bio-NPK fertilizer treatments resulted in an obvious increase in leaf total free amino acids of olive trees during 1st and 2nd seasons. Such increase was significant as compared to those of tap water foliar spray (control) olive trees. On the other hand, it could be noticed that the highest levels for total free amino acid content were always in concomitant to leaves of olive trees subjected to the Biomagic foliar spray + T6 from the 1st experiment descendingly followed by those received Biomagic foliar spray + T4 from the 1st experiment; Nofatering foliar spray + T6 and / or T4 from the 1st experiment, respectively. Biomagic foliar spray treatment came it the fifth class; meanwhile, while both Nofaterin and NPK solution foliar spray treatments appeared to be less effective than the above mentioned ones as compound to control during two seasons of study .

B. Interaction effect :

As for the interaction effect of two investigated factors involved in this study i.e. olive cultivar and different bio – NPK fertilizers treatments on leaf total free amino acids content, data presented in **Table (40)** showed obviously the variable response of olive trees to the different combinations used during two seasons.

Table (40): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Total free amino acids (mg/100 g F.W.) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Total free amino acid mg/100 g F.W.					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.17 i	1.09 j	**1.13 G**	1.18 j	1.10 k	**1.14 G**
(T_2) NPK	1.35 g	1.25 h	**1.30 F**	1.36 g	1.33 i	**1.35 F**
(T_3) Nofaterin	1.43 f	1.30 h	**1.37 F**	1.43 f	1.36 h	**1.40 F**
(T_4) Biomagic	1.48 e	1.37 g	**1.43 E**	1.49 e	1.39 g	**1.44 E**
(T_5) Nofaterin + (T_4) from 1st expe.	1.55 d	1.44 f	**1.49 D**	1.56 d	1.45 f	**1.51 D**
(T_6) Nofaterin + (T_6) from 1st expe.	1.61 c	1.49 e	**1.55 C**	1.62 c	1.50 e	**1.56 C**
(T_7) Biomagic+ (T_4) from 1st expe.	1.68 b	1.55 d	**1.62 B**	1.69 b	1.57 d	**1.63 B**
(T_8) Biomagic+ (T_6) from 1st expe.	1.76 a	1.63 c	**1.70 A**	1.78 a	1.65 c	**1.71 A**
Mean*	**1.50 A**	**1.39 B**		**1.52 A**	**1.42 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

The highest values of leaf total free amino acids were detected by that combination between Manzanillo trees fertilized with the Biomagic foliar spray + the T6 from 1st experiment (Kotengin + biofertilizer + K_2SO_4) However the lowest increase in leaf total free amino acids content was detected by Coronaiki olive trees received NPK solution foliar spray treatments during the two seasons of study. Moreover other combinations were in between the aforesaid two extremes.

IV.II.4.3. Leaf mineral composition :

Leaf N, P, K, Ca, Mg, Fe, Mn, Zn and Cu contents in response to specific and interaction effects of olive cultivar; different bio-NPK fertilizer, treatments and their possiple combinations were investigated. Data obtained during both 2002 / 2003 and 2003 / 2004 experimental seasons are presented in **Tables (41, 42, 43, 44 and 45)**

IV. II. 4.3.1. Leaf nitrogen content :

A. Specific effect :

Table (41) displays that leaf – N % responded specifically to each of two investigated factors, Hence Coronaiki had statistically richer leaf in its nitrogen content, than Manzanillo olive trees during the 1st and 2nd seasons These results are similar to those obtained by **Hasan (2005)** who stated that Coronaiki olive cultivar exceeded statistically both Manzanillo and Aghizi olive treansplants as their leaves N% was compared. Moreover, **Girgis (2005)** found that, olive cultivars, can be arranged according to its

nitrogen content in the following decreasing order, Picual, Aggizi , Manzanillo and Coronaiki olive tress.

With respect to the specific effect of different bio-NPK fertilizers treatments (NPK, Nofaterin, Biomagic each sprayed solely or combined with T4 or T6 from 1st experiment soil applied) on leaf nitrogen content of olive cultivars, it is obvious from **Table (41)** that leaf nitrogen % increased significantly any of the seven investigated treatments as compared to those of control (tap water spray).

However, Biomagic foliar spray + T6 from 1st experiment exhibited significantly the highest value of leaf nitrogen content. Moreover, four fertilization treatments of foliar spray with Biomagic solely or combined with T4 of 1st experiment and foliar spray with Nofaterin + T4 or T6 from 1st experiment ranked statistically 2nd, followed in descending order by Nofaterin spray solely; NPK foliar spray and control which ranked 3rd , 4th and last, respectively during both experimental seasons. In parallel to these findings, **Sharaf *et al.*, (1984) Khamis *et al.*, (1984); Perica *et al.*, (1994); Shen *et al.*, (1995); Martin *et al.*, (1997); Abbas (1994) and Emtithal *et al.*, (2002)** all stated that adding nitrogen and / or potassium increased leaf nitrogen content. Concerning to EM, **Higa (1995)** mentioned that EM improves physical, chemical and biological environments of the soil and suppresses soil borne pathogens and pests.

In addition similar results were obtained by of **Fernandez *et al.*, (1998)** who stated that , leaf – N concentration of olive trees was higher when N was applied to soil (0 – 1kg/ tree) and leaves than when applied to soil only . In addition, **Abd El-Hameed**

(2002) mentioned that, leaf N content was significantly increased by nitrogen fertilization, the highest significant leaf content of N obtained with BF+BS .

In addition, **Ismail, (2000)** observed that, using Biomagic gave the highest value of N of pea plants.

B. Interaction effect :

Regarding the interaction effect of the two investigated factors i.e. olive cultivar and different bio-NPK fertilizers treatments on leaf nitrogen content, date obtained in **Table (41)** showed obviously that the highest leaf N % statistically ditected by Coronaiki trees sprayed with Biomagic foliar + T6 soil applied from 1st experiment (Kotengin + biofertilzer + K_2So_4) during two seasons of study . Moreover, the lowest value of increase in leaf– N content over control (tap water spray) was detected by Manzanillo trees fertilized with NPK foliar spray during 2002/ 2003 and 2003 / 2004 seasons. On the other hand, other combinations were in between in this concern.

Abd El-Hameed (2002) found that the interaction between 100% N and BF + BS recorded the highest significant leaf content of N.

IV.II.4.3.2. Leaf phosphorus content:

A- Specific effect:

Regarding the specific effect of the two factors involved in this study i.e., olive cultivar and different bio- NPK fertilizer treatments on leaf- P content, **Table (42)** clearly shows that Coronaiki trees had significantly richer leaf- P content than Manzanillo olive cv. during 2002/ 2003 and 2003/ 2004

Table (41): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on leaf N content (%) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf N%					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.40 g	1.72 f	**1.56 E**	1.47 i	1.81 h	**1.64 E**
(T_2) NPK	1.69 f	2.09 c	**1.89 D**	1.79 h	2.19 de	**1.99 D**
(T_3) Nofaterin	1.76 ef	2.17 de	**1.97 C**	1.86 gh	2.28 cd	**2.07 C**
(T_4) Biomagic	1.83 de	2.26 b	**2.05 B**	1.93 fg	2.37 bc	**2.15 B**
(T_5) Nofaterin + (T_4) from 1st expe.	1.86 de	2.29 b	**2.08 B**	1.96 cd	2.41 bc	**2.19 B**
(T_6) Nofaterin + (T_6) from 1st expe.	1.90 d	2.34 b	**2.12 B**	2.00 de	2.46 b	**2.23 B**
(T_7) Biomagic+ (T_4) from 1st expe.	1.89 d	2.33 b	**2.11 B**	1.99 f	2.45 b	**2.22 B**
(T_8) Biomagic+ (T_6) from 1st expe.	2.03 c	2.50 a	**2.27 A**	2.14 e	2.63 a	**2.39 A**
Mean*	**1.80 B**	**2.21 A**		**1.89 B**	**2.33 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

experimental seasons. These results are in harmony with those reported by **Hasan (2005)** who mentioned that Coronaiki tansplants had the highest value of leaf P content followed in a descending order by Manzanillo and Aghizi olive cultivars during study. Moreover, **Girigs (2005)** reported that Coronaiki cv. has the highest phosphorus content followed by both Picual and Aggizi cvs. and Manzanillo trees.

With respect to the specific effect of different bio- NPK fertilizer treatments, it is clear as shown from **Table (42)** that leaf phosphorus level was significantly affected by all seven bio- NPK fertilizers treatments (NPK, Nofaterin, Biomagic each solely foliar spray or combined with T4 or T6 from 1st experiment soil applied). In this regard, both Nofaterin and Biomagic each foliar spray solely or combined with the T4 or T6 from 1st experiment, exhibited statistically the richest phosphorous level where these superior treatments didn't significantly differ during two seasons. Meanwhile the NPK foliar spray treatment appeared to be less effective than the above mentioned ones. The present result agrees with finding of **Sharaf *et al.*, (1984)** who stated that phosphorous foliar sprays increased leaf- P in olive and guava plants. Also, **Abbas (1999)** observed that phosphorus soil application resulted in an increase in leaf phosphorus concentration in Manzanillo olive seedlings. In addition, these results are also in agreement with those of **Ahmed *et al.*, (1999)** who demonstrated that, applying phosphorus improved P uptake by the Chemlali olive seedlings in comparison to the phosphate fertilizer alone. Moreover; **Haggag *et al.*, (1994)** observed that; inoculation of guava seedlings with phosphorene (at 1.5 kg/pot) increased significantly the P plant

content compared with superphosphate treatments. Also, **Ismail, (2000)** observed that using Biomagic gave the highest value of pea leaf P content. **Abd El-Hameed (2002)** found that leaf content of P was significantly increased by nitrogen fertilization while, BF or BF + BS significantly increased leaf content of P .

B. Interaction effect:

Results in **Table (42)** showed that the interaction effect of the various combinations between olive cultivar and different bio-NPK fertilizer treatments on leaf phosphorus content. The results revealed that leaf- P content exhibited significantly the highest levels by such combination between Coronaiki cv x both Biomagic and Nofaterin each solely foliar sprays or combined with the T6 or T4 from 1st experiment soil applied treatments. On the contrary, Manzanillo cvs x tap water foliar spray (control) treatment has the lowest leaf- P value during two seasons of study. Other combinations were in between the aforesaid two extremes. In this respect, **Abd El-Hameed (2002)** found that the interaction between 100 % N and BF + BS gave the highest significant leaf- P content.

IV.II. 4.3.3. Leaf Potassium content:

A- Specific effect:

It is obvious from tabulated results in **Table (42)** that Coronaiki cvs. had statistically higher leaf- K % content than Manzanillo cvs. during both seasons. This result is similar to that reported by **Girgis (2005)** and **Hasan (2005)** on olive cultivars.

From these results, it could be noticed that K leaf % increased significantly with different bio - NPK fertilizer treatments as compared with control during both seasons. In this concern, Biomagic foliar spray + T6 from 1st experiment soil applied

treatment induced significantly the richest leaf- K% content, followed in a descending order by Biomagic foliar spray + T4 from 1st experiment, Nofaterin foliar spray + T6 from and Nofaterin foliar spray +T4 from 1st experiment. The Biomagic foliar spray solely came in the fifth class followed in a descending order by Nofaterin foliar spray solely and NPK solution foliar spray which appeared to be less effective than the above mentioned ones during two seasons of study.

Similar results were obtained by **El- Shanshoury *et al.*, (1989)** who demonstrated that, inoculation of Luxor tomato with *A. Chroococcum* increased shoot - K content compared with uninoculated plants, and **Ismail (2000)** who observed that, using Biomagic gave the highest value of pea plants. Moreover, **Abd El-Hameed (2002)** found that leaf K content was significantly increased by nitrogen fertilization, 100% N gave the highest contents in this respect followed by 75% N, 50% N, respectively. In addition, BF + BS gave the highest leaf- K content .

B. Interaction effect:

Concerning the interaction effect of the investigated two factors i.e., olive cultivar and different bio- NPK fertilizers treatments on leaf- K content, data obtained in **Table (42)** showed obviously the significant variances in this concern, during 2002/ 2003 and 2003/2004 seasons. The most increase in leaf- K content was detected by that combination of Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment soil applied treatments. Moreover, the least increase in leaf- K content over control was detected by Manzanillo olive trees received NPK solution foliar spray during 1st and 2nd seasons. Other combinations

Table (42): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on P and K content (%)during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf P %						Leaf K %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.12 f.	0.15 e	0.14 **C**	0.14 g	0.17 ef	0.16 **C**	0.65 m	0.85 k	0.75 **H**	0.69 m	0.91 k	0.75 **H**
(T_2) NPK	0.14 e	0.18 c	**0.16 B**	0.17 f	0.22 ab	**0.19 B**	0.80 l	1.04 h	**0.92 G**	0.85 l	1.13 h	**0.93 G**
(T_3) Nofaterin	0.16 Ce	0.19 b	**0.17 AB**	0.18 ef	0.22 ab	**0.20 AB**	0.87 k	1.13 g	**0.20 F**	0.92 k	1.20 g	**1.06 F**
(T_4) Biomagic	0.16 c-e	0.20 ab	**0.18 AB**	0.18 ef	0.23 a-c	**0.21 AB**	0.94 j	1.22 e	**1.10 E**	1.00 j	1.31 e	**1.16 E**
(T_5) Nofaterin + (T_4) from 1st expe.	0.17 c-e	0.20 ab	**0.18 AB**	0.19 bc	0.23 a-c	**0.21 AB**	1.00 i	1.30 d	**1.15 D**	1.06 i	1.39 d	**1.15 D**
(T_6) Nofaterin + (T_6) from 1st expe.	0.16 c-e	0.20 ab	**0.18 A**	0.19 bc	0.24 a-c	**0.22 A**	1.03 h	1.34 c	**1.19 C**	1.10 h	1.44 c	**1.19 C**
(T_7) Biomagic+ (T_4) from 1st expe.	0.17 c-e	0.20 ab	**0.19 A**	0.20 bc	0.24 a-c	**0.22 A**	1.12 g	1.46 b	**1.29 B**	1.19 g	1.56 b	**1.29 B**
(T_8) Biomagic+ (T_6) from 1st expe.	0.18 cd	0.22 a	**0.20 A**	0.20 bc	0.26 a	**0.23 A**	1.18 f	1.54 a	**1.36 A**	1.26 f	1.65 a	**1.36 A**
Mean*	**0.16 B**	**0.19 A**		**0.18 B**	**0.23 A**		**0.95 B**	**1.23 A**		**1.01 B**	**1.32 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

were in between the abovementioned two extents as leaf-K content was concerned. In this respect, **Abd El-Hameed (2002)** found that the interaction between 100% N and BF+ BS gave the highest significant leaf- K content.

IV.II.4.3.4. Leaf calcium content:

Results pertaining the specific and interaction effects of olive cultivar, different bio- NPK fertilizers treatments and their combinations on leaf- Ca % are presented in **Table (43)**.

A- Specific effect:

Regarding the specific effect of olive cultivar and different bio- NPK fertilizer treatments on leaf- Ca % content, **Table (43)** clearly shows that Coronaiki olive leaves had statistically higher Ca content, than Manzanillo olive trees during both seasons. This might be due to according to **Girigs (2005)** who found that Coronaiki olive cv. has the highest value of leaf - Ca content during the two growing seasons. Reversely, Manzanillo has the least significant in both seasons. In addition, **Hasan (2005)** showed that Aghizi olive leaves had statistically the highest value of Ca content, while the reverse was true with Coronaiki transplants during both seasons.

With respect to the specific effect of different bio- NPK fertilizers treatments on leaf calcium % of olive trees, it could be noticed that leaf- Ca concentration on dry weight basis increased significantly by any of the seven investigated bio-NPK fertilizers treatment. In this concern, Nofaterin foliar spray had significantly the highest value of leaf- Ca content, followed in a descending order by NPK solution foliar spray and Nofaterin foliar spray + either T6 or T4 from 1st experiment soil applied treatments. The

Biomagic foliar spray solely or combined with the T4 from 1st experiment soil applied came in the third class; meanwhile, Biomagic foliar spray + T6 from 1st experiment soil applied appeared to be less effective than the above mentioned ones. In this respect, **Aly (2005)** found that adding phosphorous, nitrogen and magnesium resulted in significant increase in the leaves calcium content as compared with control trees, but K application had slight or no effect.

B. Interaction effect:

As for the interaction effect of the two investigated factors i.e., olive cultivar and different bio- NPK fertilizers treatments, on leaf- Ca % content, data obtained in **Table (43)** showed obviously the variable response of olive trees to the different combinations used during two seasons of study. The higher increase in leaf- Ca% was detected by that combination between Coronaiki olive trees x Nofaterin foliar spray solely, while the lowest increase in leaf- Ca content was detected by Manzanillo olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment soil applied as compared to those sprayed with tap water (control) during both 2002/2003 and 2003/ 2004 experimental seasons. Other Combinations were in between the above-mentioned two extents as leaf- Ca content was concerned.

IV.II.4.3.5. Leaf magnesium content:

The specific and interaction effects of olive cultivar, different bio- NPK fertilizers treatments and their combinations on leaf- Mg level of olive trees, data obtained during both experimental seasons are presented in **Table (43)**.

A- Specific effect:

With respect to the specific effect of the two factors involved in this study i.e., olive cultivar and different bio- NPK fertilizers treatments, on the leaf- Mg content, data as shown in **Table (43)** revealed that Coronaiki cvs. had significantly higher leaf- Mg content then Manzanillo cv. during two growing seasons. The same trend was reported by **Girgis (2005) and Hasan (2005)** on olive trees.

Concerning the specific effect of different bio- NPK fertilizers treatments, on leaf- Mg content, data obtained revealed that all the seven investigated bio- NPK fertilizer treatments, resulted in increasing leaf- Mg content of olive trees over control during two seasons of study. Such increase was significant as compared to those sprayed with tap water (control) trees. On the other hand, the Biomagic foliar spray + either T6 or T4 from the 1st experiment soil applied induced significantly the highest leaf- Mg content followed in a descending order by Nofaterin foliar spray + T6 from 1st experiment soil applied, The Nofaterin foliar spray + T4 from 1st experiment soil applied and Biomagic foliar spray treatments came 4th. Meanwhile, both Nofaterin and NPK solution foliar spray treatments appeared to be less effective than the abovementioned ones during two seasons of study.

B. Interaction effect:

As for the interaction effect of the different combinations between two investigated factors i.e., olive cultivar and different bio- NPK fertilizers treatments, on leaf- Mg content, data obtained in **Table (43)** showed obviously the variable response during 2002/ 2003 and 2003/ 2004 experimental seasons. The highest increase in

Table (43): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Ca and Mg content (%) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf Ca %						Leaf Mg %					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	1.26 m	1.55 g	**1.41 F**	1.32 l	1.61 g	**1.46 F**	0.43 l	0.54 j	**0.48 F**	0.49 m	0.61 k	**0.56 F**
(T_2) NPK	1.39 i	1.70 c	**1.55 C**	1.45 i	1.77 c	**1.61 BC**	0.51 k	0.63 fg	**0.57 E**	0.58 l	0.73 gh	**0.65 E**
(T_3) Nofaterin	1.58 f	1.93 a	**1.76 A**	1.65 f	2.01 a	**1.83 A**	0.53 j	0.66 e	**0.60 DE**	0.61 k	0.76 f	**0.68 E**
(T_4) Biomagic	1.35 j	1.66 d	**1.51 D**	1.41 j	1.72 d	**1.57 CD**	0.56 i	0.70 d	**0.63 CD**	0.64 j	0.80 e	**0.72 D**
(T_5) Nofaterin + (T_4) from 1st expe.	1.43 h	1.75 b	**1.59 B**	1.49 h	1.82 b	**1.65 B**	0.59 h	0.73 c	**0.66 C**	0.67 i	0.83 d	**0.75 C**
(T_6) Nofaterin + (T_6) from 1st expe.	1.40 i	1.72 c	**1.56 BC**	1.46 hi	1.78 c	**1.62 B**	0.62 g	0.77 b	**0.70 B**	0.71 h	0.88 c	**0.80 B**
(T_7) Biomagic+ (T_4) from 1st expe.	1.33 k	1.63 e	**1.48 B**	1.38 jk	1.69 e	**1.54 DE**	0.64 e-g	0.80 a	**0.72 AB**	0.73 gh	0.91 b	**0.82 AB**
(T_8) Biomagic+ (T_6) from 1st expe.	1.30 l	1.51 f	**1.45 E**	1.36 k	1.66 ef	**1.51 EF**	0.65 ef	0.82 a	**0.74 A**	0.75 fg	0.93 a	**0.84 A**
Mean*	**1.38 B**	**1.69 A**		**1.44 B**	**1.76 A**		**0.57 B**	**0.71 A**		**0.65 B**	**0.81 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

leaf- Mg content was exhibited by such combination of Coronaiki trees fertilized with Biomagic foliar spray + T6 from 1st experiment soil applied, while the least increase in leaf- Mg content was detected by Manzanillo olive trees fertilized with NPK solution foliar spray as compared with control during two seasons of study. Other combinations were in between the aforesaid two extremes.

IV.II.4.3.6. Leaf iron content :

Results presented in **Table (44)** show the specific and interaction effects of olive cultivars, different bio- NPK fertilizer treatments and their combinations on leaf- Fe content in olive trees.

A- Specific effect:

Concerning the specific effect of olive cultivar on leaf- Fe content, **Table (44)** clearly shows that Coronaiki olive trees had significantly higher leaf- Fe content, than Manzanillo cv. during two seasons of study. The same trend was obtained by **Hasan (2005)** who found that Coronaiki transplants had the highest leaf- Fe content, while both Manzanillo and Aghizi cvs. showed least value of leaf- Fe content. On the contrary, **Girgis (2005)** reported that, Picual cv. had the richest leaf Fe content while Coronaiki cv had the least value.

With respect to the specific effect of different bio- NPK fertilizers treatments on leaf- Fe content, obtained results indicated generally that all investigated seven bio- NPK fertilizers treatments had significant effect on leaf- Fe content. It is also clear that all seven treatments (NPK, Nofaterin, Biomagic foliar spray solely or combined with either T6 or T4 from 1st experiment) resulted in an

obvious increase in leaf- Fe content over control during 2002/2003 and 2003/ 2004 seasons. Such increase was significant as compared to those of tap water foliar spray olive trees (control). In this concern, Biomagic foliar spray + T6 from 1st experiment had the highest value of leaf- Fe content , followed in a - descending order by Biomagic foliar spray + T4 from the 1st experiment, then Nofaterin foliar spray + T6 or T4 from 1st experiment soil applied treatments, respectively. The Biomagic foliar spray solely came in the 5th class , followed by Nofaterin foliar spray solely; meanwhile, the NPK solution foliar spray was the least effective. These observations are in accordance with those obtained by **Gordara *et al.*, (1996)** who reported that, significant increase in leaf- Fe contents of peach seedlings were recorded with *G. fasciulatum* and with dual *VAM* and *Azotobacter* and with *VAM* and *Azotobacter* inoculation. Moreover, **Ismail (2000)** observed that , using Biomagic gave the highest leaf Fe content in pea plants. In addition, **Abd El-Hameed (2002)** found that leaf- Fe content was significantly increased by nitrogen fertilization, in Manzanillo olive trees. In addition, BF + BS increased leaf Fe content slightly in Manzanillo olive trees.

B. Interaction effect:

Table (44) shows that different combinations of two factors investigated factors can act together in affecting Fe level in olive leaves during 2002/2003 and 2003/2004 experimental seasons. In addition, pattern of Fe distribution showed that leaves of Coronaiki trees fertilized with Biomagic foliar spray + T6 from 1st experiment had the highest leaf- Fe content when compared not only with sprayed plants with water (control) or other inrestinated

combinations during two seasons of study. On the other hand, the least leaf- Fe content was detected by water sprayed Manzanillo plants and those of the same cultivar fertilized with NPK solution foliar spray during 1st and 2nd seasons. Other combinations were in between the aforesaid two extremes. These results agreed the findings of **Abd El-Hameed (2002)** on Manzanillo olive trees.

IV.II.4.3.7. Leaf manganese content :

The effect of olive cultivars, different of bio- NPK fertilizer treatments and their combination on leaf- Mn content of olive trees are shown in **Table (44)**.

A- Specific effect:

Regarding the specific effect of olive cultivar, on leaf- Mn content, **Table (44)** clearly shows that Coronaiki olive trees had significantly richer leaf- Mn content than Manzanillo trees during 2002/ 2003 and 2003/2004 experimental seasons. The same finding was obtained by **Hasan (2005)** who found that Coronaiki cultivar exceeded statistically the two Manzanillo and Aghizi cultivars.

Concerning the specific effect of different bio- NPK fertilizer treatments, data obtained in **Table (44)** revealed that all the seven investigated bio- NPK fertilizers treatments increased significantly leaf- Mn content over control during 1st and 2nd seasons. In this concern, both Nofaterin and Biomagic each foliar spray+ T6 from 1st experiment exhibited the highest value of leaf- Mn content descendingly followed by either Nofaterin or Biomagic foliar spray each combined with T4 from 1st experiment during two seasons of study. The Nofaterin and Biomagic foliar spray treatments came in the third-class; meanwhile; the NPK foliar spray

treatment appeared to be less effective than the above mentioned ones.

The present results are in agreement with those obtained by **Ismail (2000)** who observed that, using Biomagic increased leaf-Mn content of pea plants. On the other hand, **Abd El-Hameed (2002)** found that leaf content of Mn of Manzanillo olive trees was significantly increased by nitrogen fertilization.

B. Interaction effect:

Regarding the interaction effect of different combinations between the two investigated factors i.e., olive cultivar and different bio- NPK fertilizers on leaf- Mn content, data obtained in **Table (44)** showed obviously a variable response during 2002/ 2003 and 2003/ 2004 experimental seasons.

Herein, the highest value of leaf- Mn content was detected by the Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2So_4) soil applied treatment while the reverse was true with tap water foliar spray Manzanillo trees.Other combinations were in between the aforesaid two extremes. In this respect, **Abd El-Hameed (2002)** reported similar trend.

IV.II.4.3.8. Leaf Zinc content:

A- Specific effect:

Concerning the specific effect of olive cultivars on leaf Zn content, data obtained in **Table (45)** showed that Coronaiki cvs. trees had significantly richer leaf- Zn content than Manzanillo cvs during two seasons of study. This confirms the earlier findings reported by **Hasan (2005)** on olive transplants.

Table (44): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Fe and Mn content (ppm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Leaf Fe ppm						Leaf Mn ppm					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	34.0 n	42.67 k	38.33 **G**	38.00 o	47.67 l	42.83 **H**	24.33 j	28.67 hi	26.50 **F**	26.67 g	30.33 f	28.50 **F**
(T_2) NPK	37.33 m	46.67 i	**42.00 F**	41.33 n	51.67 j	**46.50 G**	25.33 j	32.67 fg	**29.00 E**	27.00 g	35.33 e	**31.17 E**
(T_3) Nofaterin	41.00 l	51.67 g	**46.33 E**	45.67 m	57.67 h	**51.67 F**	29.67 i	37.33 d	**33.50 D**	32.67 f	41.00 c	**36.83 D**
(T_4) Biomagic	44.67 j	56.00 e	**50.33 D**	50.00 k	62.33 f	**56.17 E**	30.67 hi	38.33 d	**34.50 CD**	33.33 f	42.00 c	**37.67 CD**
(T_5) Nofaterin + (T_4) from 1st expe.	49.67 h	59.33 d	**54.50 C**	52.67 j	66.33 d	**59.50 D**	31.67 gh	40.00 c	**35.83 BC**	35.00 e	44.00 b	**39.50 BC**
(T_6) Nofaterin + (T_6) from 1st expe.	49.33 h	62.00 c	**55.67 C**	55.33 i	69.33 c	**62.33 C**	33.67 ef	42.00 b	**37.83 AB**	36.33 e	46.00 a	**41.39 AB**
(T_7) Biomagic+ (T_4) from 1st expe.	53.33 f	67.00 b	**60.17 B**	59.67 g	74.67 b	**67.17 B**	32.67 fg	41.00 bc	**36.83 BC**	35.33 e	44.33 b	**39.83 BC**
(T_8) Biomagic+ (T_6) from 1st expe.	57.00 e	71.67 a	**64.33 A**	63.67 e	79.33 a	**71.50 A**	34.67 e	43.67 a	**39.17 A**	38.00 d	47.33 a	**42.67 A**
Mean*	**45.79 B**	**57.13 A**		**50.79 B**	**63.63 A**		**30.33 B**	**37.96 A**		**33.04 B**	**41.70 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

Regarding the specific effect of bio- NPK fertilizers treatments, data in **Table (45)** clearly show that leaf Zn concentration of olive resporded trees significantly to different bio-NPK fertilizer treatments (NPK, Nofaterin, Biomagic each sprayed solely or combined with T6 or T4 from 1st experiment) during 2002/2003 and 2003/2004 seasons. On the other hand, the most increase was always in significant concomitant to the Biomagic foliar spray + the T6 or T4 from 1st experiment; Nofterin foliar spray + T6 from 1st experiment and Nofterin foliar spray + T4 from 1st experiment during two seasons of study. However, both Nofterin and Biomagic foliar sprayed each solely came in the third class; while NPK foliar spray treatment appeared to be less effective than the above mentioned ones and came last just before control (tap water foliar spray).

These observations are in accordance with those obtained by **Godara *et al.*, (1996)** who reported significant increase in leaf -Zn content of peach seedlings were recorded with *G. fascicultaum;* VAM and *Azatabacter* inculation, and **Ismail, (2000)** who observed that, using Biomagic increased leaf- Zn content of pea plants. Moreover, **Abd El-Hameed (2002)** mentioned that leaf Zn content was significantly increased by nitrogen fertilization, and BF+ BS treatment.

B. Interaction effect:

Referring the interaction effect of two investigated factors i.e., olive cultivar and different bio- NPK fertilizers treatments, on leaf- Zn content, data obtained in **Table (45)** showed obviously the variable response of olive trees to the different combinations during

2002/2003 and 2003/ 2004 seasons . It could be noticed that the most increase in leaf- Zn content was detected by such combination represented Coronaiki olive trees fertilized with the Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2SO_4, soil applied). On the other hand, the least increase in leaf- Zn content was detected by Manzanillo olive trees sprayed with NPK solution treatment as compared to control (tap water foliar spray) during both seasons of study. Other combinations were in between the aforesaid two extremes. This results is similar to that achieved by **Abd El-Hameed (2002)** who mentioned that the interaction between N fertilization and BF + BS increased significantly leaf Zn content of Manzanillo olive trees.

IV.II.4.3.9. Leaf copper content:

The specific and interaction effects of olive cultivar, different bio- NPK fertilizers treatments and their combinations on leaf- CU content of olive trees are presented in **Table (45)**.

A- Specific effect:

With regard to the specific effect of the different factors involved in this study i.e., olive cultivar and different bio- NPK fertilizers treatments on leaf- Cu content, data as shown in **Table (45)** revealed that Manzanillo olive leaves had significantly higher Cu content than Coronaiki cvs during two seasons of study.

Concerning the specific effect of different bio- NPK fertilizers treatments, data obtained revealed that all seven investigated bio- NPK fertilizers treatments, resulted in increasing leaf- Cu content of olive trees during two seasons of study. Such increase was significant as compared to those of tap water foliar sprayed trees (control). On the other hand, the Biomagic or

Nofaterin foliar spray each combined with one of both T6 and T4 from 1st experiment beside Biomagic spray solely sesulted significantly in the highest value of leaf- Cu content during the two seasons of the study. Both Nofaterin foliar spray solely treatment came second while, NPK foliar spray appeared to be less effective than the above mentioned ones and ranked third just before control.

These observations are in accordance with those obtained by **Godara *et al.*, (1996)** who reported that, significant increase in leaf- Cu content of peach seedlings were recorded with *G.fasciculatum*, dual VAM and *Azotobacter* inoculation, and **Ismail (2000)** observed also that, using Biomagic increased leaf- Cu content of pea plants. On the other hand, **Abd El-Hameed (2002)** found that leaf- Cu content was significantly increased by nitrogen fertilization, the highest significant leaf content of Cu was obtained with BF+ BS on Manzanillo trees.

B. Interaction effect:

As for the interaction effect of the different combinations between two investigated factors i.e., olive cultivar and different bio-NPK fertilizers, on leaf- Cu content, data obtained in **Table (45)** showed obviously the variable response during 2002/ 2003 and 2003/2004 experimental seasons. The highest increase in leaf- Cu content was significantly exhibited by three combinations represented Manaznillo trees fertilized with either (Biomagic foliar spray + T6 or T4 from 1st experiment) or (Nofaterin foliar spray + T6 from 1st experiment), while the least leaf- Cu content was detected by either tap water or NPK sprayed Coronaiki trees during two seasons of study. Other combinations were in between the

Table (45): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on Zn and Cu content (ppm) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Zn ppm						Cu ppm					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	17.00 j	21.33 h	**19.17 E**	19.33 i	24.33 gh	**21.83 E**	10.00 g-i	8.67 j	**9.33 D**	12.13 g	10.10 i	**11.12 D**
(T_2) NPK	18.00 j	22.33 f-h	**20.17 E**	20.33 i	25.33 fg	**22.83 E**	11.43 gh	9.35 ij	**9.89 C**	12.33 g	11.00 h	**11.67 C**
(T_3) Nofaterin	20.00 i	25.33 d	**22.67 D**	23.00 h	29.00 d	**26.00 D**	11.67 de	9.67 hi	**10.67 B**	14.33 de	13.00 fg	**13.67 B**
(T_4) Biomagic	21.33 h	27.00 c	**24.17 CD**	24.67 g	30.67 c	**27.67 CD**	12.00 c-e	10.67 fg	**11.33 AB**	14.7 c-e	13.30 fg	**14.00 AB**
(T_5) Nofaterin + (T_4) from 1st expe.	22.00 gh	27.67 c	**24.83 BC**	25.00 g	31.67 bc	**28.33 BC**	12.33 b-d	10.67 fg	**11.50 AB**	15.33 b-d	13.67 ef	**14.50 AB**
(T_6) Nofaterin + (T_6) from 1st expe.	23.33 ef	29.00 ab	**26.17 AB**	26.67 ef	33.00 ab	**29.83 AB**	13.00 ab	11.33 ef	**12.17 A**	16.00 ab	14.33 de	**15.17 AB**
(T_7) Biomagic+ (T_4) from 1st expe.	22.67 e-g	28.00 bc	**25.33 A-C**	25.67 e-g	31.67 bc	**28.67 A-C**	12.67 a-c	10.67 fg	**11.67 AB**	15.67 a-c	14.00 ef	**14.83 AB**
(T_8) Biomagic+ (T_6) from 1st expe.	23.67 e	29.67 a	**26.67 A**	27.00 e	34.00 a	**30.50 A**	13.33 a	11.67 de	**12.50 A**	16.67 a	14.67 c-e	**15.67 A**
Mean*	**21.00 B**	**26.29 A**		**23.96 B**	**29.96 A**		**11.93 A**	**10.34 B**		**14.65 A**	**13.01 B**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

aforesaid two extremes. Similar results were obtained by **Abd El-Hameed (2002)** who found that the interaction N fertilization and BF+ BS gave the highest significant leaf Cu content of Manzanillo olive trees.

IV.II.4.4. Shoot nitrogen, total carbohydrates content and C/N ratio:

Shoot total nitrogen percentage, total carbohydrates and C/N ratio of olive trees as influenced by specific and interaction effects of olive cultivar, different bio- NPK fertilizer treatments and their combinations were investigated. Data obtained during both 2002/2003 and 2003/2004 seasons are presented in **Table (46 and 47).**

IV.II.4.4.1. Shoot nitrogen content:

A- Specific effect:

Concerning the specific effect of two factors involved in this study i.e., olive cultivar and bio- NPK fertilized treatments on the shoot nitrogen content data as shown in **Table (46)** revealed that Coronaiki cv. had statistically richer than Manaznillo olive cv during both seasons.

Regarding the specific effect of different bio- NPK fertilizers treatments on shoot nitrogen content of olive trees it , is quite obvious as shown from data presented in **Table (46)** that any of bio- NPK fertilizer treatments resulted in significant increase in shoot- N content as compared to control treatment. In this concern, the Biomagic foliar spray + T6 from 1st experiment had significantly the highest shoot nitrogen content descendingly followed by the Biomagic foliar spray + T4 from 1st experiment;

Nofaterin foliar spray+ either T6 or T4 from 1st experiment; Biomagic foliar spray solely; Nofaterin solely and NPK solution foliar spray treatments which appeared to be less effective and ranked statistically just before control. In this regard **El-Shanshoury *et al.*, (1989)** demonstrated that, inoculation of Luxor tomato with *A.chroococcum* increased shoot- N compared with uninoculated plants. Moreover, **Ismail, (2000)** observed that, using Biomagic increased shoot N of pea plants.

B. Interaction effect:

With regard to the interaction effect, data obtained during both seasons as shown from **Table (46)** displayed that the more pronounced response to specific effect of bio- NPK fertilization treatments rather than that exhibited by olive cultivar was obviously reflected on the influence of their various combinations. Herein, the highest shoot- N content was significantly in closed relationship to Coronaiki olive trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2So_4 soil applied) during both seasons of study.

On the contrary, the least increase in shoot- N% content was usually in concomitant to Manzanillo olive trees fertilized with NPK solution foliar spray as compared with control during 1st and 2nd seasons. In addition, other combinations were in between the abovementioned two extremes.

IV.II.4.4.2. Shoot total carbohydrates content:

Total carbohydrates content in shoots dry matter of olive trees as influenced by specific and interaction effects of olive cultivar, bio- NPK fertilizers treatments and their combinations

Table (46): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on shoot N (%) during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Shoot N%					
	2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	0.48 l	0.55 k	**0.52 H**	0.49 m	0.56 l	**0.53 H**
(T_2) NPK	0.78 j	0.87 i	**0.83 G**	0.79 k	0.89 k	**0.84 G**
(T_3) Nofaterin	0.92 i	1.06 h	**0.99 F**	0.94 j	1.06 i	**1.00 F**
(T_4) Biomagic	1.06 h	1.20 g	**1.13 E**	1.09 i	1.23 h	**1.16 E**
(T_5) Nofaterin + (T_4) from 1st expe.	1.33 f	1.48 e	**1.40 D**	1.35 g	1.51 f	**1.43 D**
(T_6) Nofaterin + (T_6) from 1st expe.	1.50 e	1.64 d	**1.57 C**	1.53 f	1.67 d	**1.60 C**
(T_7) Biomagic+ (T_4) from 1st expe.	1.59 d	1.80 b	**1.70 B**	1.63 e	1.84 b	**1.73 B**
(T_8) Biomagic+ (T_6) from 1st expe.	1.69 c	1.91 a	**1.80 A**	1.73 c	1.95 a	**1.84 A**
Mean*	**1.17 B**	**1.32 A**		**1.19 B**	**1.34 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4

were investigated. Data obtained during both 2002/2003 and 2003/ 2004 experimental seasons are presented in **Table (47)**.

A- Specific effect:

Regarding the specific effect of olive cultivars, **Table (47)** displays that shoot total carbohydrates content in Coronaiki were significantly higher than Manzanillo olive cultivar during two seasons of study. Such trend is in agreement with that obtained by **Hasan (2005)** on olive transplants.

With regard to the specific effect of different bio- NPK fertilizers treatments, data obtained displayed that, stem total carbohydrates increased significantly by any of seven bio- NPK fertilizers treatments comparing with control (tap water foliar spray) during two seasons of study. Moreover, differences between bio-NPK treatments were significant. In this respect, Biomagic foliar spray + T6 from 1st experiment soil applied treatment had the highest value of stem total carbohydrates followed in a descending order by both Nofaterin foliar spray + the T6 from 1st experiment and Biomagic foliar spray + T4 from 1st experiment during the study. The Nofaterin foliar spray + T4 from 1st experiment soil treatment came in the 3rd class, followed by Biomagic foliar spray, solely; Nofaterin foliar spray, and NPK solution foliar spray treatment which ranked statistically just before control. The benefician effect of nitrogen is in agree ment with findigs of **Papric (1991); Eid (1978); El- Garhy (1990) and Ahmed (1991).** In regard to the effect of potassium on total carbohydrate, it had been reported by **Yagodin (1984) and Tisdal *et al.*, (1985)** that potassium intensifies carbohydrates, accumulation since K activating anumber of enzymes which catalyse the formation and

translocation of carbohydrates. Moreover, K is essential to regulate opening of stomata which encourages photosynthesis process **Jackson and Volk (1968) and Lousi and Frederick, (1985)** can give good reasons for the enhancing effect of potassium on total carbohydrates, which consequently resulted in relative higher C/N ratio.

B. Interaction effect:

Concerning the interaction effect of the two investigated factors i.e., olive cultivar and bio- NPK fertilizers treatments, on total carbohydrates content, data obtained in **Table (47)** showed obviously significant response during 2002/2003 and 2003/2004 seasons. The most increase in shoot total carbohydrates content were exhibited by that combination between Coronaiki trees fertilized with Biomagic foliar spray + T6 from 1st experiment (Kotengin + Biofertilizer + K_2SO_4) during 1st and 2nd seasons. On the contrary the least shoots total carbohydrates content was significantly in closed relation ship to tap water foliar sprayed olive trees of both Manzanillo and Coronaiki cvs, especially farmer one during two experimental seasons. In addition, other combinations were in between the aforesaid two extremes.

IV.II.4.4.3. Shoot C/N ratio :

A- Specific effect:

Regarding the specific effect of the different factors involved in this study i.e., olive cultivar and different bio- NPK fertilizer treatments, on C/N ratio, **Table (47)** clearly shows that Coronaiki olive trees had significantly higher shoot C/N ratio than Manzanillo olive cv. during 2002/2003 and 2003/2004 experimental seasons.

With respect to the specific effect of different bio- NPK fertilizer treatments, it is clear as shown from **Table (47)** that shoot C/N ratio level was significantly affected by different bio- NPK fertilizer treatments. In this regard, C/N ratio level increased significantly with all seven bio- NPK fertilizer treatments. Biomagic foliar spray + T6 or T4 from 1st experiment soil applied, as well as Nofaterin foliar spray + T6 from 1st experiment induced significantly shoots with the highest C/N ratio descedingly, followed by both Biomagic and Nofaterin foliar spray combined with the T4 and T6, respectively from 1st experiment. Moreover, NPK solution foliar spray treatment appeared to be less effective than the above mentioned ones.

B. Interaction effect:

Results in **Table (47)** showed the effect of interaction between olive cultivar and bio- NPK fertilizer treatments on shoot C/N ratio content. The results revealed that shoot C/N ratio exhibited significantly the highest level by such combination between Coronaiki cv trees fertilized with Biomagic foliar spray + T6 from 1st experiment. On the contrary, Manzanillo trees. sprayed with tap water had statistically the least shoot C/N ratio during two seasons of study. Other combinations were in between the aforesaid two extremes.

Table (47): Specific and Interaction effect of olive cultivars, same bio- mineral fertilizer (soil, foliar application solely or together) and there combinations on shoot total carbohydrates (mg/100 g D.W.) and C/N Ratio during both 2002-03 and 2003-04 eseperimental seasons

Treatments	Shoot total carbohydrates (mg/100 g D.W.)						Shoot C/N Ratio					
	2002- 2003			2003- 2004			2002- 2003			2003- 2004		
	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**	M.	C.	Mean**
(T_1) Control	5.58 o	6.98 n	**6.28 F**	5.87 k	7.33 k	**6.60 F**	11.57 j	12.79 i	**12.18 G**	11.90 j	13.19 i	**12.55 G**
(T_2) NPK	11.31 m	14.18 l	**12.74 E**	11.91 j	14.88 i	**13.39 E**	14.58 h	16.26 g	**15.42 F**	15.08 h	16.73 g	**15.91 F**
(T_3) Nofaterin .	14.65 k	18.32 j	**16.48 E**	15.40 i	19.25 h	**17.33 D**	16.01 g	17.64 f	**16.83 E**	16.46 g	18.19 f	**17.33 E**
(T_4) Biomagic	19.08 i	23.82 h	**21.45 D**	20.29 h	25.08 g	**22.68 D**	17.98 f	19.84 e	**18.91 D**	18.69 f	20.47 e	**19.58 D**
(T_5) Nofaterin + (T_4) from 1st expe.	25.94 g	32.47 f	**29.21 C**	27.31 f	34.11 e	**30.71 C**	19.83 e	22.00 d	**20.92 C**	20.49 e	22.66 d	**21.58 C**
(T_6) Nofaterin + (T_6) from 1st expe.	35.10 e	38.38 d	**36.74 B**	36.98 d	42.17 c	**39.58 B**	21.44 d	23.45 c	**22.44 B**	22.08 d	25.26 b	**23.67 B**
(T_7) Biomagic+ (T_4) from 1st expe.	35.15 e	43.96 b	**39.56 B**	36.98 d	46.18 b	**41.58 B**	22.10 d	24.42 b	**23.36 B**	22.76 d	25.18 b	**23.97 B**
(T_8) Biomagic+ (T_6) from 1st expe.	39.06 c	48.84 a	**43.95 A**	41.09 c	51.36 a	**46.22 A**	24.50 b	25.58 a	**25.04 A**	23.78 c	26.37 a	**25.07 A**
Mean*	**23.23 B**	**28.37 A**		**24.47 B**	**30.05 A**		**18.50 B**	**20.25 A**		**18.91 B**	**21.01 A**	

M = Manzanillo cv.. C. = Coronaiki cv.

* and ** refer to specific effect of olive cultivars and combination between foliar spray and soil fertilized treatments respectively. Means fallowed by the same letter/s either specific effect or interaction effect in each season didn't significantly differ at 5% level.

T_4 1st experiment was Kotengin+ Phoshorene + Rhizobacterin +K_2SO_4

T_6 1st experiment was Kotengin+ Biofertilizer +K_2SO_4