EFFECT OF SOME MICRONUTRIENTS AND COMMERCIAL FOLIFERTILIZERS ON TOMATO YIELD AND FRUIT QUALITY

By

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ABSTRACT

The effect of foliar application of 3 commercial folifertilizers (Bayfolan, Irral or Fetrilon-combi) and 5 different micronutrients (Fe, Zn, Mn, Cu or B) at different concentrations on yield and fruit quality of tomato were studied during 1982 and 1983 summer seasons. Number of fruits per plant, early marketable and total fruit yield were significantly increased by spraying tomato plants 3 times with 400 ppm Fe, 100 ppm B, 0.1% Bayfolan, 0.2% Irral or 0.6% Fetrilon-Combi in both seasons and 200 ppm Zn or 25 ppm Mn in one season only. These increments reached about 11-49% for early yield, 24-76% for marketable yield, 29-72% for total yield over than the control. The physical characteristics of tomato fruits (i.e. length, diameter and fruit shape index) were improved slightly by micronutrients application. Moreover, T.S.S., vitamin C, titratable acidity as well as reducing, non-reducing and total sugars contents were increased as a result of micro-nutrients foliar application. The highest vitamin-C content of tomato fruit was found when plants sprayed with 0.1% Bayfolan, however fruit acidity was considerably increased by B, Zn, Fe and Irral application at 100, 100, 400 ppm and 0.2% respectively. Furthermore, all treatments increased reduced and/or non reduced sugars content of tomato fruit compared with control in both seasons.

INTRODUCTION

Tomato is one of the most important vegetable crops grown in A.R.E., for local markets, processing and exportation. In the past few years, great attention has been focussed on the possibility of using foliar application of some trace elements in order to improve both yield and quality of many vegetables.

The supply of micronutrients including Fe, Zn, Mn, Cu or B to vegetable crops became recently of a special importance after the construction of the High Dam which decreased the content of such elements in the water of River Nile. (Nabhan, 1966).

Application of some micronutrients was found to promote the productivity of tomato plants. Duffek (1972) on Mn, Ashour (1973) on Zn; Lukovnikova et al. (1975) on Cu; Mallick and Muthukrishana (1980) on Fe, Cu, or Zn and Amer (1981) on B, Zn or Mn, reported a favourable effect of micronutrients foliar application on tomato fruit yield and its components.

Concerning the effect of the commercial folifertilizers on fruit yield and quality of tomato, Hodossi (1973); Hodossi and Hamar (1976) and Balasa et al. (1977) trials on different compound folifertilizers, Tanev and Stanchev (1978) on 0.2% Bayfolan and El-Sawah (1981) on 0.3% Wuxal, all reported a favourable response in this respect.

According to the effect of micronutrients and commercial folifertilizers application on tomato fruit length, fruit diam and fruit shape index, Govidan (1950) on B and Genchev and Gyu (1975) on Zn, reported a favourable effect of micronutrients f iar application on fruit shape and size depending on the varie However, Woods and Nolan (1968) on Fe and Amer (1981) on B, Mn and Zn, mentioned that, spraying tomato plants with such micro- nutrients had no significant effect on either fruit length or diameter.

Regarding vitamin-C and titratable acidity content of toma fruit juice as affected by spraying plants with micronutrients, Verma et al. (1973) on B and Mallick and Muthukrishana (1980) c Fe, Zn, Mn or Cu found a promising response of such treatments this respect. Moreover, Balasa et al. (1977) found that, spray tomato plants with complex folifertilizers considerably increas vitamin-C content and titratable acidity of tomato fruit juice pared with the untreated ones. On the other hand, El-Sawah (19 did not find any significant differences in vitamin-C content o titratable acidity as a result of complete folifertilizer appl cation.

Concerning total soluble solids (T.S.S.) and total sugars tent of tomato fruits, it were also increased as a result of spr ing tomato plants with micronutrients (Verma et al., 1973 on B, Lukovnikova et al., 1975 on Cu, Mallick and Muthukrishana, 1980 Zn, Cu, Fe and Mn and Amer, 1981 on B, Zn or Mn). Moreover, usi commercial folifertilizers showed a positive response on these chemical constituents of tomato fruit (El-Sawah, 1981).

MATERIALS AND METHODS

This experiment was conducted at the Experimental Farm of t Faculty of Agriculture, Moshtohor, Zagazig University during the summer seasons of 1982 and 1983. Tomato seeds (Lycopersicon esculentum, Mill) cv. Strain-B were broadcasted in the nursery i February 7th 1982 and January 25th 1983. Uniform tomato seedlin were removed and then transplanted in the permanent field in Marc 29th and 21st in 1982 and 1983 respectively. Transplants were planted 30 cm apart on one side of ridges 100 cm width. All tre ments and control were fertilized with 99 kg N, 64 kg P_2O_5 and 4 kg K_2O per feddan. Fertilizers were applied as ammonium sulphat (33% N), Calcium superphosphate (16% P_2O_5) and potassium sulphat (48% K_2O) at four, two and three applications of N, P and K ferti lizers respectively. Time of fertilizers addition was at 21 day after transplanting and at 21 days intervals. The plot area was about 12 m^2. The complete randomized block design with four rep cates was followed in both seasons.

The 1982 experiment included 15 treatments as follows:

1. Bayfolan at 0.1%
2. " " 0.2%
3. " " 0.4%
4. Irral at 0.1%
5. " " 0.2%
6. " " 0.4%
7. Fetrilon-combi at 0.
8. " " 0.
9. " " 0.
10. Fe at 400 ppm.
11. Zn at 100 ppm
12. Mn at 50 ppm
13. Cu at 200 ppm
14. B at 100 ppm
15. The control treatment (sprayed with distillated water).

In 1983, extra five treatments of single micronutrient were also examined. They were, Fe at 800 ppm, Mn at 25 ppm, B at 200 ppm, Zn at 200 ppm or Cu at 100 ppm.

The chemical composition of the commercial folifertilizers are given in the following table.

Essential elements	Bayfolan	Irral (verde)	Fetrilon-combi
N%	11.0000	20.00	-
P%	8.0000	8.00	-
K%	6.0000	16.00	-
Mg%	---	1.00	4.0
Fe%	0.0185	0.03	1.0
Zn%	0.0060	0.10	0.5
Mn%	0.0160	1.00	1.5
B%	0.0113	0.50	0.3
Mo%	0.00095	--	-
Cu%	0.0080	0.10	0.5
Co%	0.0004	--	-

Tomato plants were sprayed three times, 2, 5 and 7 weeks after transplanting, with an aqueous solutions of Bayfolan, Irral, Fetrilon-combi, $FeSO_4.7(H_2O)$, $ZnSO_4.7(H_2O)$, $MnSO_4.H_2O$, $CuSO_4.5(H_2O)$ or $NaBO_7.10(H_2O)$ at the previously mentioned doses.

The experiment procedures were as follows:

1. Fruit yield and its components:

All harvested fruits from each experimental plot were used for determining the following data:

a) Average fruit weight (gm).
b) Number of fruits per plant.
c) Fruit yield per plant (kg).
d) Early yield; calculated as the fruit yield of the first three pickings (ton/feddan).
e) Total yield (ton/feddan).
f) Marketable yield (ton/feddan).

2. Fruit quality:

At each picking time a representative sample of 15-20 fruits of each experimental plot was taken for determining the following characteristics:

a. Physical characteristics:

1. Fruit length (cm).
2. Fruit diameter (cm).
3. Fruit shape index (L/D).

b. Chemical constituent:

1. Both of vitamin-C and titratable acidity fruit content were determined as mg/100 cm^3 juice, as the methods described in A.O.A.C. (1970).

2. Total soluble solids; It was determined in tomato sap using hand refractometer.

3. Reducing, non-reducing and total sugars; were determined colorimetrically by using the method described by Michel et al. (1956) and calculated as g sugar/100 g based on dry weight.

RESULTS AND DISCUSSION

1. Fruit yield and its components:

Data illustrated in Tables (1 and 2) clearly show that most of micronutrients or commercial folifertilizers treatments increased number of fruits per plant as well as early, marketable and total yield than the control.

However, average fruit weight was increased only as a result of spraying plants with 0.1% Irral or 0.4% Bayfolan in both seasons and 800 ppm Fe or 100 ppm Cu in the second season only. The favourable effect of micronutrients application on fruit weight have been reported by Genehev and Gyrov (1975) and Amer (1981) on tomato.

The most effective treatments on number of fruits per plant were; 400 ppm Fe, Fetrilon-Combi 0.6% or 100 ppm B in both seasons and 200 ppm Zn, 25 ppm Mn in the second season only. This result may be referred to the enhancing effect of micronutrients application on number of flowers per plant and fruit setting percentage. Obtained results are in confirmity with those of Amer (1981) and El-Sawah (1981).

Concerning fruit yield as kg/plant or ton/feddan results showed that spraying plants with either 100 ppm B, 400 ppm Fe, 0.1% Bayfolan, 0.2% Irral or 0.6% Fetrilon-combi were the most effective treatments which significantly increased total yield about 29-54% than the control in both seasons. In 1983, only the best treatments were 200 ppm Zn or 25 ppm Mn which increased total yield 62 or 72% than the control, respectively. This favourable effect of micronutrients application on fruit yield could be referred mainly to the increase in number of fruit produced per plant as shown in Tables 1 and 2. Obtained results here are in harmony with those of Verma et al. (1973); Duffek (1975), Mallick and Muthukrishana (1980) and Amer (1981) on treating tomato with single micronutrient and Hodossi (1973), Hodossi and Hamar (1976), Balan et al. (1977) on spraying tomato plants with different commercial folifertilizers.

Referring to the effect of micronutrients or commercial folifertilizers on early and marketable yield, data showed the same trend previously mentioned for total yield. It means that, not only the quantity but also the quality and earliness of tomato fruit yield were significantly increased by the foliar application of such treatments. These increments ranged from 11-49% for early yield and 24-76% for marketable yield by using Bayfolan 0.1 or 0.2% Irral 0.2%, Fetrilon-combi 0.6%, 400 ppm Fe, 100 ppm B for both seasons, and 25 ppm Mn or 200 ppm Zn for the second season only.

Table (1): Yield and its components of tomato as affected by foliar application of some micronutrients and commercial folifertilizers during summer season of 1982.

Treatments		Average fruit weight(g)	No. of fruits/ plant	Yield/ plant (kg)	Total yield Ton/fed.	Marketable yield Ton/fed.	Early yield Ton/fed.
Fertilizer	Concentration						
Bayfolan	0.1%	66	24.95	1.636	16.360	15.340	6.715
"	0.2%	66	20.48	1.342	13.420	12.855	6.240
"	0.4%	68	18.55	1.255	12.550	11.920	6.370
Irral	0.1%	71	19.25	1.377	13.770	13.010	6.515
"	0.2%	62	26.33	1.637	16.370	15.645	7.603
"	0.4%	64	21.55	1.385	13.850	13.150	7.165
Fetrilon combi	0.15%	65	21.50	1.387	13.870	13.198	7.065
" "	0.3%	66	22.30	1.460	14.600	13.568	7.215
" "	0.6%	63	26.98	1.689	16.890	16.290	7.678
Fe	400 ppm	65	27.68	1.793	17.930	16.695	8.108
Zn	100 ppm	61	25.63	1.574	15.740	14.793	6.715
Mn	50 ppm	59	21.63	1.278	12.780	11.678	6.445
Cu	200 ppm	66	24.75	1.621	16.210	15.240	6.700
B	100 ppm	67	25.85	1.724	17.240	16.085	7.895
Control		67	19.43	1.305	13.050	12.395	5.720
L.S.D. at 5%		0.9	0.45	0.234	2.346	2.592	0.610

Table (2): Yield and its components of tomato as affected by foliar application of some micronutrients and commercial folifertilizers during summer season of 1983.

Treatments		Average fruit weight(g)	No. of fruits/ plant	Yield/ plant (kg)	Total yield Ton/fed.	Marketable yield Ton/fed.	Early yield Ton/fed.
Fertilizer	concen-tration						
Bayfolan	0.1%	62	26.5	1.643	16.430	16.043	6.495
"	0.2%	64	22.8	1.455	14.550	14.460	5.065
"	0.4%	62	23.5	1.462	14.620	14.508	7.378
Irral	0.1%	65	23.3	1.510	15.100	14.665	5.348
"	0.2%	65	27.2	1.771	17.710	17.053	6.418
"	0.4%	57	21.4	1.218	12.180	11.735	4.153
Fetrilon-combi	0.15%	59	19.0	1.125	11.250	11.080	4.738
" "	0.3%	61	20.6	1.255	12.550	12.368	4.950
" "	0.6%	56	28.8	1.621	16.210	16.080	5.530
Fe	400 ppm	60	30.2	1.818	18.180	17.745	6.555
"	800 ppm	63	20.1	1.272	12.720	12.518	3.435
Zn	100 ppm	62	21.6	1.346	13.460	13.250	3.673
"	200 ppm	61	33.9	2.074	20.740	20.490	6.363
Mn	25 ppm	62	32.3	1.989	19.890	19.663	6.435
"	50 ppm	59	18.4	1.079	10.790	10.790	4.230
Cu	100 ppm	63	27.1	1.709	17.090	16.755	6.433
"	200 ppm	59	18.7	1.098	10.980	10.910	4.240
B	100 ppm	63	29.6	1.853	18.530	18.278	6.590
"	200 ppm	58	23.4	1.346	13.460	12.978	4.810
Control		58	20.9	1.205	12.050	11.660	4.950
L.S.D. at 5%		0.6	0.6	0.402	4.047	4.091	0.456

2. Tomato fruit quality:

2.a. Physical characteristics of tomato fruits:

Data presented in Table (3) clearly show that foliar application of Irral (0.1-0.4%), Bayfolan (0.1-0.4%), Fetrilon-combi (0.15-0.6%), 400 ppm Fe or 100 ppm B, significantly increased fruit length and fruit diameter which slightly affected fruit shape index compared with control treatment at both summer seasons of 1982 and 1983. Anyhow, fruit shape index ranged from 0.9-1.2 however variances were only significant in 1983 season. Moreover, the application of 200 ppm Zn, 25 ppm Mn or 100 ppm Cu significantly increased fruit length and diameter only in the second season of 1983.

These results are in harmony with those reported by Lukovnikova et al. (1975) on Cu and Mallick and Muthukrishana (1980) on Zn, Cu, Fe or Mn. However, Woods and Nolan (1968) on Fe, and Amer (1981) on B, Mn or Zn, mentioned that spraying tomato plants with such treatments had no significant effect on either fruit length or fruit diameter.

2.b. Chemical constituent of tomato fruits:

It is clearly evident, from Tables (4 and 5) that foliar application of many micronutrients and commercial folifertilizers significantly increased vitamin-C, titratable acidity, total soluble solids as well as reducing, non-reducing and total sugars content of tomato fruit than that of the control.

In this respect, the highest vitamin-C content was in fruits of plants treated with Bayfolan 0.1% in both seasons or 100 ppm B or 200 ppm Zn in the second season. Fruit acidity was greatly increased by 100 ppm B, 100 ppm Zn, 400 ppm Fe, or Irral 0.2% compared with other treatments.

T.S.S. % was considerably increased by the application of 100 or 200 ppm B and 400 ppm Fe compared with other treatments, however variances was significant only in the second season. This result may reflex the role of boron on sugar assimilation (Govidan, 1950). Concerning total sugars content of tomato fruit it was significantly increased by all treatments of micronutrients application than the control. The high sugars assimilation in treated plants compared with the untreated ones may be referred to the high chlorophyll content in leaves.

Regarding the effect of micronutrients on vitamin C and titratable acidity content of tomato fruits, similar results were reported by Verma et al. (1973) on B, and Mallick and Muthukrishana (1980) on Fe, Zn, Mn or Cu.

Concerning the effect of commercial folifertilizers on vitamin C and titratable acidity content of tomato fruits, obtained results confirm with those of Balasa et al. (1977).

The obtained results concerned with total soluble solids and total sugars content of tomato fruits are also in accordance with those of Verma et al (1973), Lukovnikova et al. (1975), Mallick and Muthukrishana (1980) and Amer (1981) who revealed that, foliar sprays of such micronutrients increased both total solible solids and total sugars content of tomato fruits.

Table (3): Physical characteristics of tomato fruits as affected by foliar application of some micronutrients and commercial folifertilizers.

Treatments		Season 1982			Season 1983		
Fertilizer	Concentration	Fruit length (cm)	Fruit diameter (cm)	Fruit index (L/D)	Fruit length (cm)	Fruit diameter (cm)	Fruit index (L/D)
Bayfolan	0.1%	5.6	5.7	1.0	5.6	5.8	1.0
"	0.2%	5.7	5.3	1.1	6.2	5.5	1.1
"	0.4%	5.6	4.9	1.2	5.9	5.5	1.1
Irral	0.1%	5.5	5.1	1.1	5.5	5.5	1.0
"	0.2%	5.3	5.3	1.0	5.4	5.4	1.0
"	0.4%	5.5	5.0	1.1	5.6	5.2	1.1
Fetrilon-combi	0.15%	5.5	5.0	1.1	5.6	5.7	1.0
" "	0.3%	5.5	5.2	1.1	5.3	5.6	1.0
" "	0.6%	5.6	5.3	1.1	5.8	5.7	1.0
Fe	400 ppm	5.5	5.3	1.0	6.0	5.8	1.0
"	800 ppm	---	---	---	5.6	5.1	1.1
Zn	100 ppm	5.4	5.3	1.0	5.3	5.2	1.1
"	200 ppm	---	---	---	5.7	5.6	1.0
Mn	25 ppm	---	---	---	5.9	5.5	1.1
"	50 ppm	5.3	5.1	1.1	5.2	5.3	1.0
Cu	100 ppm	---	---	---	5.7	5.5	1.1
"	200 ppm	5.3	5.2	1.0	5.7	5.2	1.1
B	100 ppm	5.5	5.2	1.1	5.7	5.7	1.0
"	200 ppm	---	---	---	5.5	5.2	1.0
Control		5.1	4.8	1.1	4.8	5.0	0.9
L.S.D. at 5%		0.3	0.4	n.s	0.5	0.3	0.1

Table (4): Chemical constituents of tomato fruit as affected by foliar application of some micronutrients and commercial folifertilizers during summer season of 1982.

Treatments		Vit. C mg/100 cm^3 juice	Titratable acidity mg/100 cm^3 juice	T.S.S. (%)	Reducing sugars	Non-reducing sugars	Total sugars
Fertilizer	Concentration				g/100 g dry weight		
Bayfolan	0.1%	39.5	695	5.2	4.1	1.7	5.8
"	0.2%	37.1	675	5.1	3.9	1.6	5.5
"	0.4%	37.1	659	5.0	3.7	1.6	5.3
Irral	0.1%	34.5	660	5.0	3.2	0.7	3.9
"	0.2%	37.9	697	5.1	3.4	0.9	4.3
"	0.4%	36.6	697	5.0	3.2	0.8	4.0
Fetrilon-combi	0.15%	36.6	656	4.9	3.6	1.6	5.2
" "	0.3%	37.1	675	4.9	3.1	1.3	4.4
" "	0.6%	37.1	690	5.1	4.0	1.7	5.7
Fe	400 ppm	36.0	696	5.1	3.2	1.5	4.7
Zn	100 ppm	34.6	692	4.2	4.1	1.3	5.4
Mn	50 ppm	37.6	694	5.2	3.9	1.3	5.2
Cu	200 ppm	32.5	682	5.0	4.0	1.4	5.4
B	100 ppm	35.0	701	5.1	3.8	1.5	5.3
Control		32.2	632	4.9	3.0	0.6	3.6
L.S.D. at 5%		2.6	8.1	n.s	0.1	0.1	0.1

Table (5): Chemical constituents of tomato fruit as affected by foliar application of some micronutrients and commercial folifertilizers during summer season of 1983.

Treatments		Vit. C mg/100 cm^3 juice	Titratable acidity mg/100 cm^3 juice	T.S.S. (%)	Reducing sugars	Non-reducing sugars	Total sugars
Fertilizer	Concentration				g/100 g dry weight		
Bayfolan	0.1%	37.9	686	6.3	4.7	1.4	6.1
"	0.2%	33.6	670	5.7	4.7	1.3	6.0
"	0.4%	35.0	669	6.1	4.5	1.2	5.7
Irral	0.1%	32.7	662	5.9	3.7	1.4	5.1
"	0.2%	35.1	732	6.4	3.9	1.8	5.7
"	0.4%	33.5	669	6.3	3.6	1.6	5.2
Fetrilon-combi	0.15%	32.9	682	5.6	4.1	1.0	5.1
" "	0.3%	34.1	683	6.1	4.3	1.5	5.8
" "	0.6%	35.5	689	6.3	4.7	1.7	6.4
Fe	400 ppm	33.3	730	7.1	4.5	2.3	6.8
"	800 ppm	31.9	710	6.2	4.2	1.4	5.6
Zn	100 ppm	32.3	706	5.9	4.4	1.8	6.2
"	200 ppm	38.4	731	6.3	4.6	1.9	6.5
Mn	25 ppm	36.3	718	7.0	4.7	1.5	6.2
"	50 ppm	32.5	705	6.1	4.1	1.4	5.5
Cu	100 ppm	34.6	692	6.3	4.8	1.6	6.4
"	200 ppm	32.1	687	6.1	4.7	1.6	6.3
B	100 ppm	32.9	747	7.1	4.3	1.6	5.9
"	200 ppm	32.3	714	6.9	4.1	1.5	5.6
Control		32.0	658	5.6	4.0	0.7	4.7
L.S.D. at 5%		0.7	18.2	0.2	0.04	0.1	0.1

Regarding the effect of commercial folifertilizers on total soluble solids and total sugars content of tomato fruits, El-Sawah (1981) found a positive relationship in this respect.

Finally, it could be concluded that, spraying tomato plants of cv. strain-B grown as summer crop under conditions similar to that of Kalubia province, with either 0.1% Bayfolan, 0.2% Irral, 0.6% Fetrilon-combi, 400 ppm Fe, or 100 ppm B 3-times is recommended. Such treatments proved to be of very economical value since they increased yielding ability and resulted in producing fruits of high quality and better nutritional value.

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تأثير بعض العناصر الصغرى والاسمدة الورقيه التجاريه على محصول وجودة ثمار الطماطم

أ.د / سعد عبد الرزاق شقشق
د. محمد ربيع جبل
أ.د / ابراهيم محمد عبد الله
د. توفيق عبد الحميد عابد
السيد / على عدنان جبل

اجريت هذه التجربه بمزرعه كليه الزراعه بمشتهر – جامعه الزقازيق – خلال الموسم الصيفى لعامى ١٩٨٢ ، ١٩٨٣ وذلك لدراسه استجابه نباتات الطماطم صنف " استرين ب " للرش بثلاث اسمدة ورقيه تجاريه هى البايفولان والايرال والفترولون كومبى وكذلك بخمسه عناصر مغذيه صغرى هى الحديد والزنك ، المنجنيز ، النحاس والبورون وذلك بتركيزات مختلفه على محصول وجودة الثمار فى الطماطم

وقد ادت معظم المعاملات المستخدمه الى زيادة عدد الثمار للنبات الواحد وكذلك المحصول المبكر والصالح للتسويق والمحصول الكلى للطماطم نتيجه للرش النباتات ثلاث مرات باستخدام التركيزات التاليه من كل من الحديد (٤٠٠ جزء فى المليون) والبورون بتركيز (١٠٠ جزء فى المليون) وكذلك الاسمدة الورقيه التجاريه بتركيزات ١ر٠ / من البايفولان ٢ر٠ / من الايرال ، ٦ر٠ / من الفترولون كومبى فى كلا الموسمين والرش بالزنك بمعدل (٢٠٠ جزء فى المليون) أو المنجنيز بمعدل (٢٥ جزء فى المليون) فى الموسم الثانى فقط وكانت الزيادة فى المحصول المبكر والصالح للتسويق والكلى تتراوح بين ١١ – ٤٩ / ، ٢٩ – ٧٢ / لكل منهما على التوالى نتيجه لتلك المعاملات مقارنه بمعامله الكنترول .

كما ادت معظم المعاملات الى تحسين صفات الجودة الطبيعيه للثمار معبرا عنها بطول وقطر وكذلك شكل الثمرة وعلاوة على ذلك تحسنت الصفات الكيميائيه للثمار من حيث محتواها من المواد الصلبه الذائبه الكليه وفيتامين ج والحموضه الكليه وكذلك السكريات المختزله والغير مختزله والسكريات الكليه . وقد كانت أفضل المعاملات التى ادت لاعلى زيادة فى محتوى الثمار من فيتامين ج هى الرش بالبايفولان بتركيز ١ر٠ / كما زادت حموضه الثمرة نتيجه رش النباتات بكل من البورون او الزنك او الحديد او الايرال بتركيز ١٠٠ ، ١٠٠ ، ٤٠٠ جزء فى المليون ، ١ر٠ / لكل منهما على الترتيب . كما زادت السكريات الكليه والسكريات المختزله والغير مختزله فى الثمار نتيجه الرش بجميع المعاملات المستخدمه مقارنه بالكنترول فى كلا الموسمين .