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EFFECT OF ATRAZINE AS SUBLETHAL AND ZINC AS WELL AS BORON ON SOME PARAMETERS OF SUGAR BEET

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ABSTRACT: Two field experiments were performed in El-Ayat Res. Agric Station, sugar and Integrated Industries company A.R.E during 2000-2001 and 2002-2003 growing seasons, to study the impact of atrazine as sublethal case (0.0, 100 and 200 ppm) and two trace elements i.e. B at the rate of (0.0, 50 and 100 ppm as Borax,) and Zn (0.0, 1500 and 2000ppm as Zinc sulphate) as foliar application on growth, yield and quality of Montibianco sugar beet variety. The above treatments were sprayed after 100 and 150 days from sowing date.

Results indicated that, the atrazine treatments as sublethal concentrations gave erratic effect during the two experimental season. During the first season spraying sugar beet by atrazine at the rate of 100 ppm led to an increase on top dry weight/plant, root diameter, root yield/fed., sucrose percentage, sugar yield /fed., as well as N and K % in juice. Some of the above mentioned characteristics did not take the same direction under the effect of the same application during the second season. B application increased top and plant dry weight and some yield components up to 50 ppm. On the contrary, sucrose percentage and sugar yield were reduced. Spraying sugar beet plants with Zn at 1500ppm increased significantly top dry weight, dry weight/plant, root yield and sugar yield/fed, whereas sucrose% and sodium % were reduced. Most of the first and second order interactions had significant influence on the above traits under study.

INTRODUCTION

Sugar beet " Beta vulgaris " is one of the most important sugar

crops, that had ability to compete sugarcane as an interesting source of sugar. For that, in the development countries i.e. Egypt many investigations focused to increase the cultivated area of other sugar crops, especially it had the ability to adapt with unsuitable environmental conditions i.e. raising of soil salinity or the reduction in the soil fertility. In most soils, the requirements of sugar beet for micronutriets are supplied from soil reserves, weathering or minerals , rainfall , lime ,fertilizers and foliar spray . Boron is byfar the most important of the trace elements needed by sugar beet because , without and adequate supply , the yield and quality of roots is severely depressed . Lugov kina and Bunin (1971), reported that sugar beet yield was increased by the application of boron at 18 to 22 leaf stage. On the other hand , Zinc has a remarkable effect on sugar beet crop , Panlea et al. (1971), demonstrated that , root yield quality was significant enhanced with Zinc application , Nadia et al. (1997), found that sugar yield was increased by adding zinc. Herbicide control or eradicate weed at concentrations lethal to plant growth and development. At sublethal concentrations, some of them are however, known to cause stimulatory effects on the growth and development processes of the plant, (Rao , 1963). He also indicated that, the sublethal effects of herbicides are characterized by an effective role on the growth and yields of crop, carbohydrate and nitrogen metabolism, moisture content and seed emergence. Rafia - Azmat (2005), reported that the third carbon plants are affected significantly by foliar spray with atrazine. A progressive reduction in photosynthesis, protein, amino acid contents and carbohydrate synthesis, were also detected. The objective of that research, is to study the impact of using atrazine as sub lethal substance and (boron and zinc) micronutrients as foliar spray on some vegetative properties, yield and quality characteristics of sugar beet crop.

MATERIALS AND METHODS

Two field experiments were carried on at El-Ayat Res. Station for Sugar and Integrated Industries Company through the two growing seasons 2000/2001 and 2002/2003, to discuss the effect of atrazine as sublethal substance at the rates of 0.0, 100 and 200 ppm, the two micronutrients i.e. Zn at the levels of 0.0, 1500 and 2000 ppm and B at the concentrations of 0.0, 50 and 100 ppm on some vegetative characters, yield and quality properties of Montebinco sugar beet variety. The above treatments were sprayed after 100 and 150 days from sowing date in the volume of 200L/fad. All the recommended soil preparation practices

(plowed and flatted) were achieved to provide satisfactory bed for planting. Sowing date was on the 4th and 3rd of November in the first and second season, respectively. Calcium super phosphate (15.5 % P_2O_5) and potassium sulphate (48.8% K_2O) were applied during land preparation at the rate of 100 Kg and 50Kg, respectively.

The experimental plot area was 24.79 m^2 (6.70 x 3.70m), there were 6 rows in each plot space 62 cm .The pervious crop in the experimental site was *Medicago satvia* L – in the first season and *Triforlium alexandrinum* in the second one. Soil samples were collected at depth of 0.0 -30 cm before sowing for mechanical and chemical analysis (A. O. A. C, 1965), results are presented in Table (1).

Table (1) Mechanical and chemical analysis of the experimental site

1- Mechanical analysis	
Sand %	: 20.3
Silt %	: 27.12
Clay %	: 52.58
Textural grade	: clay
2- Chemical analysis	
PH (1:2.5 , soil = water)	: 7.7
E.C. (mm has / cm at 25^0)	: 2.28
$Hco3^-$	: 1.44 ml/eq
Cl^-	: 0.76 ml/eq
$So4^{--}$	: 1.72 ml/eq
Ca^{++}	: 1.04 ml/eq
Mg^{++}	: 0.58 ml/eq
Available N mg/K.Soil	: 11.98
Available B mg/K.Soil	: 3.42
B	: 0.35 ppm
Zn	: 0.55 ppm
Mn	: 6.2 ppm

Complete randomized block design with factorial arrangement was used with four replicates , 27 plots in each one .

The studied characters :

Samples of five individual plants were taken randomly from the seasons to determine the following properties :-

A – Growth characteristics :

1- Top dry weight / plant (g).

2- Dry weight / plant (g) .
B – Yield characteristics :,
1- Root diameter / plant (cm) .
2- Root length / plant (cm) .
3- Root yield (ton / fad) .
C – Quality characteristics :
1- Sucrose percentage (%), it was determined as described by Le-Docte (1927) using Sacharimeter Pol – F (ISA – Biologi) on a lead basis .
2- Sugar yield (ton / fed) it was calculated according to this equation

$$= \frac{sucrose\% \times rootweight}{100}$$

3- Total nitrogen (N) percentage (%) in digested solution was determined by Micro kgidahle apparatus according to the method described by Pergl (1945).
4- Sodium (Na) and potassium (K) percentage % in digested solution were calculated according to Brown and lilliand (1964). It was estimated in the second season only (2000-2003).

Statistical analysis :

The analysis of variance was used according to Sndecor and Cochran (1981), the least significant difference. (L. S. D) test at 5% level of significance was used to indicate treatment differences.

RESULTS & DISCUSSION

A- Growth Characteristics :

Results recorded in Tables (4 and 5) it was revealed that, atrazine treatment had erratic effect on top and plant dry weight. As for, top dry weight/plant results during 2000,2001 and 2002,2003 in Table (4) indicated that atrazine at 100 ppm led to increase this character by 24.2% as compared by control (0.0 ppm) and by increasing the atrazine concentration to 200 ppm the increasing percentage declined significantly to be 16.99 % as compared by control . During 2002 – 2003season, atrazine decreased top dry weight / plant by 2.94% for 100 ppm and 5.68 % for 200 ppm significantly as compared with control.

As for dry weight / plant, results in Table 5 showed that atrazine applications at 100 ppm and 200 ppm increased dry weight / plant by 6.13 % and7.92% respectively compared by control during 2000 – 2001 season only. .

Table (2) Maximum and minimum temperatures, relative humidity % (RH), day length, and sun shine

Years	2000					2001					2002					2003				
Month	Max. Temp. (c)	Min Temp. (c)	RH%	Day Length (hr)	Sun Shine Duration	Max. Temp. (c)	Min Temp. (c)	RH%	Day Length (hr)	Sun Shine Duration	Max. Temp. (c)	Min Temp. (c)	RH%	Day Length (hr)	Sun Shine Duration	Max. Temp. (c)	Min Temp. (c)	RH%	Day Length (hr)	Sun Shine Duration
Jan.	21.5	9.4	52	103	8.4	23.9	9.1	52	10.4	8.7	17.2	5.3	63	10.4	9.8	21.7	6.2	46	10.4	8
Feb.	23.5	8.7	50	11	9.3	25.3	8.4	45	11	9.4	22.2	10.5	59	11	10.2	22	7.6	50	11	8.6
March	25.5	14	47	12	9.5	31.4	15.4	46	12	9.3	26.3	11.8	55	12	10.5	21.2	12.6	49	11.9	8
April	33.4	17.1	43	13	10.4	32.2	17.5	43	12.8	10.3	28.6	14.6	58	12.5	10.3	28.8	13.4	48	12.9	10.4
May.	35.7	20	44	13.5	11.6	36.8	21.8	46	13.4	11.9	32.5	17.6	52	13.6	12	34.2	17.9	42	13.4	12
June.	38.2	22.8	45	13.8	11.9	38.4	23.3	43	13.7	12	36.1	19.6	56	13.7	12	35.6	20.7	43	13.7	11.8
July	40.4	25.2	45	13.7	11.9	30.4	25.5	51	13.7	12.2	40.7	23.6	57	13.8	12	35.9	21.4	57	13.8	12.7
Aug.	38.2	24.8	49	13	11.3	36	22.9	56	13.1	11.2	35.4	25.7	56	13	11.4	35.4	22.5	51	13.1	11
Sep.	37.3	23.8	47	12.3	10.5	34.4	21.2	57	12.3	10.8	34.3	21.2	57	12.3	10.3	32.8	20.2	54	12.3	11.5
Oct.	33.3	20	51	11.5	9.2	29.9	17.3	59	11.4	9.3	29.3	17.8	34.2	11.2	9	30	18.1	42	11.3	10.4
Nov.	30.1	17.3	51	10.6	7.9	25.3	11.1	57	10.5	8.1	28.3	14.9	53	10.5	8.8	25.3	13.7	61	10.5	8.4
Doc.	24	12.6	57	10.2	8	20.6	7.4	58	10.2	7.8	20.8	7.2	44	10.2	8	22.1	9.6	61	10.2	7.4

Source : Climate laboratory, agriculture research center ministry of agric and land reclamation

Table (3) Total degrees of Phenol logy uring 2000 – 2001 and 2002-2003

Years	2000 - 2001					2002 -2003				
Month	Max. Temp.	Min Temp.	RH %	Day Length	Sun Shine	Max. Temp.	Min Temp.	RH %	Day Length	Sun Shine
Nov.	903	519	1530	318	237	849	447	1590	315	264
Dec.	744	390.6	1767	316.2	248	644.8	223.2	1364	316.2	248
Jan.	740.9	282.1	1612	3224	269.7	672.7	192.2	1426	341	266.6
Feb.	708.4	235.2	1260	3.8	263.2	635.1	226.2	1595	319	26907
March	973.4	477.4	1426	372	288.3	651	390.6	1519	368.9	248
April.	998.2	525	1290	384	309	864	402	1440	387	312
Ma	1140.8	675.8	1426	415.4	368.9	1060.2	554.9	1302	415.4	372
Total	6208.7	3105.1	10311	2436	1984.1	5376.8	2436.1	10236	2462.5	1980.3

Source : Climate laboratory, agriculture research center ministry of agric and land reclamation

These results may due to sublethal concentrations of atrazine which showed its favorably effect on both characters during 2000/2001 season. This is may be due to low concentration of nitrate nitrogen in soil as explained tweedy and Ries 1967, they found that sub lethal concentrations of simazine or atrazine increased plant dry weight when it was grown at low concentration of nitrate and visa-versa .

Boron application up to 50 ppm increased top dry weight/plant significantly during 2000/2001 and 2002/2003 seasons by 14.2 % and 9.3 % respectively as shown in Table (4) .

These results of dry weight/plant in Table(5) didn't follow a conspicuous trend, that is during the first season boron application at the rate of 100 ppm gave the greatest dry weight /plant, but the highest one was resulted by 50 ppm of boron in the second season. This results may be due to boron plays on important role in carbohydrate metabolism and cell division as reported by Tisdale and Nelson (1966). These results are in harmony with those recorded by Morsy and Taha (1986), they concluded that foliar spray with B increased dry matter in both top and root of sugar beet.

B- Yield Characteristics :

From Tables (6, 7 and 8), it was detected that, atrazine application had, in general, significant influence on root length, diameter and yield of sugar beet. Spraying sugar beet plants with atrazine at the rate of 100 ppm

recorded the highest averages 16.99 ton/fad., and 11.74 cm for root yield/fed and it's diameter, respectively, in the first season. Root length did not follow the same trend, during the two successive seasons. These results may be due to some of herbicides at sublethal concentrations had a remarkable effect on the growth and plant development as demonstrated by Rao, 1963.

Table (4) Effect of Atrazine, Zinc and Boron microelements on top dry weight / plant (g)during 2000 / 2001 and 2002/2003 seasons.

Atrazine Concentration ppm	Zinc ppm	2000 – 2001				2002 – 2003			
		Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means	Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means
0.00	000	178.500	145.850	132.367	152.239	188.457	304.272	211.535	234.755
	1500	168.750	232.183	179.250	193.394	240.651	123.517	194.690	186.286
	2000	144.233	145.700	152.667	147.533	211.796	210.014	259.380	227.063
	means	163.828	174.578	1543761	164.389	213.635	212.601	221.868	216.034
100	000	167.667	222.850	187.083	192.533	167.295	215.823	222.932	202.017
	1500	225317	188.333	267.833	227.161	245.959	228.039	210.963	228.320
	2000	170.125	184.050	225.500	193.225	160.952	184.333	250.693	198.659
	means	187.703	198.411	226.805	204.300	191.402	209.398	228.196	209.665
200	000	161583	333.100	150.267	214.983	225.784	184.656	171.239	193.894
	1500	180.417	201.900	159.325	180.547	177.452	304.008	228.843	236.778
	2000	120.000	182.167	242.167	181.445	185.486	171.732	184.441	180.553
	Means	154.000	239.056	183.920	192.325	196.242	220.132	194.841	203.742
Over all means	000	169.250	233.933	156.572	186.585	193.846	234.917	201902	210.222
	1500	191.495	207.472	202.136	200.367	221.454	218.521	211.499	212.158
	2000	152.864	170.639	206.778	176.760	172.997	189.556	231.505	198.019
	means	171.203	204.015	188.495	187.904	196.099	214.331	214.968	208.466

L.S.D at 5% level for :

* Atrazine (At)	= 21.876	Atrazine (At)	= 7.540
* Boron (B)	= 9.729	Boron (B)	= 9.178
* Zinc (Zn)	= 12.363	Zinc (Zn)	= 6.455
* Atxzn	= 19.427	Atxzn	= 24.571
* At xB	= 23.694	At xB	= 16.067
* Bx Zn	= 14.416	Bx Zn	= 18.344
* At xB x Zn	= 60.45 2	At xB x Zn	= 38.117

Significant effect was achieved for B element on the previous studied characters especially in 2002 – 2003season. Root length and diameter were enhanced as foliar spray with B up to 50 ppm. These results are in accordance with those reported by El-Shenawy (1993), who

explicated enhancing effect of B as foliar application on some growth traits such as fresh and dry weight of root, top and whole plant, crop growth rate as well as root dimension. Root yield was reduced significantly as spaying sugar beet plants with B up to 100 ppm. These results may be due to, high B levels are good for increasing chlorophyll content more than other growth or yield characters, as riddled by Reda et al. (1980). As for, zinc application, root yield and diameter were significantly affected by this treatment . Spraying sugar beet plants with 1500 ppm Zn enhanced root yield by 23.64 % in the first season and by 3.15 % in the second one. These results are similar to Kalimeri and Pellumbi (1982), they reported that spraying sugar beet plants with Zn increased root yield by 15% as compared with control.

Table (5) Effect of Atrazine m, Zinc and Boron microelements on dry weight/plant(m) during 2000 / 2001 and 2002 / 2003 seasons.

Atrazine Concen-tration ppm	Zinc ppm	2000 – 2001				2002 – 2003			
		Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means	Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means
0.00	000	457.95	366.867	401.500	408.772	518.658	812.683	533.278	621.540
	1500	310.908	328.533	406.625	3 48.689	578.432	452944	512.485	514.620
	2000	346.067	423.183	422.417	397.221	539.224	529.404	684558	584395
	mean	371.642	372.861	410.181	384.894	545.438	598.344	576.774	573.518
100	000	331.400	276.375	509.100	372.292	476.831	425.368	580.542	494.247
	1500	345.525	390.912	560.500	432.314	612.195	676.607	401.581	564.461
	2000	409.267	415.883	437.750	420.967	490.939	542.062	652.953	561.985
	mean	362.064	361.057	502.450	408.524	526.655	548.012	545.025	540.231
200	000	368.167	416.750	374.700	386.539	706.621	559.382	540.352	602.118
	1500	571.500	402.167	319.100	430.922	552.532	574.720	542.523	556.592
	2000	414.750	404.417	467.167	428.778	537.217	603.649	387.424	509.430
	Mean	451.472	407.779	386.989	415.413	598790	579.250	490.100	556.047
Over all means	000	385.839	353.331	428.433	389.201	567.37	599.144	551.391	572.632
	1500	409.311	373.872	466.016	403.975	581.053	568.090	485.530	544.891
	2000	390.028	414.494	442.445	415.655	522.460	558.372	574.978	551.937
	mean	395.059	380.566	445.631	402.944	556.961	575.202	537.300	556.487

L.S.D at 5% level for :

* Atrazine (At)	= 20.212	Atrazine (At)	= N.S
* Boron (B)	= 18.228	Boron (B)	= 26.482
* Zinc (Zn)	= 16.145	Zinc (Zn)	= 22.050
* Atxzn	= 38.665	Atxzn	= 71.485
* At xB	= 51.046	At xB	= 49.607
* Bx Zn	= 37.270	Bx Zn	= 44.277
* At x Bx Zn	= 70.830	At xBx Zn	= 185.426

Table (6) Effect of Atrazine, Zinc and Boron microelements on roots diameter during 2000 / 2001 and 2002 / 2003 seasons.

Atrazine Concentration ppm	Zinc ppm	2000 – 2001				2002 – 2003			
		Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means	Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means
0.00	000	13.517	10.147	10.630	11.431	11.267	10.817	11.833	11.306
	1500	12.033	9.037	10.257	10.442	9.533	11.400	11.633	10.855
	2000	10.320	11.943	11.977	11.413	10.367	11.900	10.800	11.022
	means	11.957	10.376	10.955	10.095	10.720	11.732	1.422	11.061
100	000	15.203	10.917	11.260	12.460	11.300	12.067	10.867	11.400
	1500	11.377	12.297	10.457	11.377	10.400	11.800	11.800	11.333
	2000	10.737	13.870	9.567	11.391	10.550	11.133	10.567	10.750
	means	12.439	12.361	10.428	11.743	10.750	11.934	11.078	11.165
200	000	10.077	11.040	10.397	10.505	11.850	11.733	11.700	11.761
	1500	9.487	10.627	12.500	10.871	9.900	11.067	11.867	10.945
	2000	9.270	10.270	9.157	9.566	11.267	11.300	11.300	11.411
	Means	9.611	10.646	10.685	10.314	11.006	11.367	11.745	11.372
Over all means	000	12.932	10.701	10.762	11.465	11.472	11.549	11.467	11.493
	1500	10.966	11.071	11.071	10.897	9.944	11.422	11.767	11.044
	2000	10.109	12.028	10.234	10.790	10.728	11.444	11.011	11.061
	means	11.336	11.267	10.689	11.051	10.715	11.472	11.415	11.199

L.S.D at 5% level for :

* Atrazine (At)	= .621	Atrazine (At)	= N.S
* Boron (B)	= N.S	Boron (B)	= 0.396
* Zinc (Zn)	= 0.511	Zinc (Zn)	= 0.286
* Atxzn	= 1.062	Atxzn	= N.S
* At xB	= 1.139	At xB	= 0.389
* Bx Zn	= 0.694	Bx Zn	= 0.684
* At x B x Zn	= N.S	At x B x Zn	= N.S

On the contrary, root diameter was decreased significantly as spraying the plants with Zn up to 2000 ppm, during the two growing seasons. These findings may be due to, sugar beet root increased in length, according to that enhancing in penetrating the soil, which led to decrease in root diameter. In both seasons, most of the first and second order interactions had significant for the studied yield characters.

(B x Zn) interaction , as example, showed that spraying sugar beet plants with Zn at the rate of 1500 ppm in the absence of B concentrations gave the greatest root yield during the two seasons, whereas adding 100 ppm B to 1500 ppm Zn gave the longest root. In the first season only meanwhile, the highest averages of root diameter attributed to control plants (0.0 B + 0.0 ppm Zn). With respect to, the second order interaction

(At x B x Zn) application, the longest root associated with spraying the plants with Zn at the rate of 1500 ppm + B at the rate of 100 ppm in the absence of At, in both seasons. The greatest yield of root (21.95 ton/fad.) attributed to treating the plants with (100 At + 0.0 B +1500 ppm Zn) in the first season , but in the second one spraying with Zn at 1500 ppm only in the absence of At and B (0.0At+0.0 ppm B) achieved the goal and gave the maximum average, (36.65 ppm ton / fed.) .

Table (7) Effect of Atrazine, Zinc and Boron microelements on root length (cm) of sugar beet roots during 2000 / 2001 and 2002 / 2003 seasons.

Atrazine Concentration ppm	Zinc ppm	2000 – 2001				2002 – 2003			
		Boron0 0 ppm	Boron1 50 ppm	Boron2 100ppm	means	Boron0 0ppm	Boron1 50ppm	Boron2 100ppm	means
0.00	0.00	40.500	31.170	35.000	35.560	26.330	44.670	36.250	35.750
	1500	32.500	29.000	46.500	36.000	38.000	33.500	39.330	36.940
	2000	41.080	27.920	37.370	35.460	36.670	35.000	37.000	36.220
	means	38.030	29.360	39.620	35.670	33.670	37.720	37.520	36.300
100	0.00	24.710	28.670	31.080	28.150	36.000	37.500	40.330	37.940
	1500	36.850	33.170	36.060	35.360	38.250	36.750	39.250	38.080
	2000	26.130	26.920	39.670	30.910	35.000	43.500	34.250	37.580
	means	29.230	29.580	35.600	31.470	36.420	39.250	37.940	37.870
200	0.00	32.250	34.840	34.670	33.920	33.000	39.000	34.500	35.500
	1500	33.330	35.440	34.150	34.310	34.330	39.170	33.000	35.500
	2000	38.670	34.330	33.500	35.500	33.500	35.750	40.580	36.610
	Means	34.750	34.870	34.110	34.580	33.610	37.970	36.030	35.870
Over all means	0.00	32.490	31.560	33.580	32.540	31.780	40.390	37.030	36.400
	1500	33.890	32.540	38.950	35.220	38.470	36.470	37.190	36.840
	2000	32.290	29.720	36.850	33.960	35.060	38.080	37.280	36.800
	means	32.890	31.270	36.440	33.910	35.100	38.310	37.170	36.680

L.S.D at 5% level for :

* Atrazine (At)	= 1.799	(AT)	= 1.415
* Boron (B)	= 2.247	(B)	= 1.816
* Zinc (Zn)	= N.S	(Zn	= N.S
* AtzZn	= 2.238	AtxZn	= 2.238
* At xB	= 2.594	At xB	= N.S
* Bx Zn	= 2.535	Bx Zn	= N.S
* At xBx Zn	= 5.429	At x B x Zn	= 9.393

Quality characteristics :

From tables (9 , 10 and 11) , it was obvious that , Atrazine as sublethal case had significant influence on sucrose %, sugar yield/ fed during the two growing seasons and general quality (K and Na%) only during 2002-2003 seasons . In general, treating sugar beet plants with At. up to 100 ppm enhanced the above traits 2001 season, but in 2002/2003

season the results were not in the same line . During 2002-2003 season spraying sugar beet plants by 100ppm of Atrazine led to decrease Na % by 15.70 % and increased K % by 4.9 % as compared by control .

Table (8) Effect of Atrazine, Zinc and Boron microelements on the roots yield of sugar beet(ton/fad) during 2000 / 2001 and 2002 / 2003 seasons

Atrazine Concentration ppm	Zinc ppm	2000 – 2001				2002 – 2003			
		Boron 0 0 ppm	Boron1 50 ppm	Boron 2 100 ppm	means	Boron0 0 ppm	Boron1 50 ppm	Boron2 100 ppm	means
0.00	000	16.800	11.910	13.130	13.950	23.990	26.050	32.760	27.600
	1500	17.120	20.110	14.390	17.210	36.650	32.340	22.260	30.420
	2000	15.800	11.300	11.030	12.710	20.690	22.470	19.110	20.760
	means	16.570	14.440	12.850	14.620	27.110	26.950	24.710	26.260
100	000	17.950	12.850	20.740	17.060	22.490	21.950	21.890	22.110
	1500	21.950	17.850	18.850	19.550	23.990	29.400	24.150	25.850
	2000	16.640	13.290	13.130	14.350	21.210	18.270	21.290	20.260
	means	18.750	14.670	17.570	16.990	22.560	23.210	22.440	22.740
200	000	9.450	14.330	14.180	12.650	30.050	24.990	23.980	26.340
	1500	19.580	15.750	16.280	17.200	20.480	19.160	26.880	22.170
	2000	15.650	12.600	12.700	13.650	29.090	28.330	21.150	26.190
	Means	14.890	14.230	14.390	14.500	26.54	24.160	24.000	24.900
Over all means	000	14.610	13.030	16.020	14.550	25.510	24.330	26.210	25.350
	1500	19.550	17.900	16.510	17.990	27.040	26.970	24.430	26.150
	2000	16.030	12.400	12.290	13.570	23.660	23.020	20.520	22.400
	means	16.730	14.440	14.940	15.370	25.400	24.770	23.720	24.630

L.S.D at 5% level for :

* Atrazine (At)	= 1.800	Atrazine (At)	= 0.950
* Boron (B)	= 0.820	Boron (B)	= 0.860
* Zinc (Zn)	= 0.909	Zinc (Zn)	= 0.940
* Atxzn	= 2.790	Atxzn	= 2.610
* At xB	= 2.630	At xB	= 3.270
* Bx Zn	= 2.880	Bx Zn	= 0.780
* At xB x Zn	= 7.440	At xB x Zn	= 4.210

Spraying sugar beet plants with B up to 50 ppm reduced significantly sucrose % and sugar yield (ton / fed.), in both studied seasons, whereas N% was enhanced , in the second season only. These results are in agreement with those reported by El-Shenawy (1993) .

Zinc application had significant impact on sucrose % ,sugar yield/fed and Na % in both seasons, as revealed in Table (10). Sugar yield (ton / fed.) was increased significantly with increasing Zn concentration up to 1500 ppm in the first season, but this enhancing was

insignificant in the second one. Sucrose % and sodium % were reduced generally as increasing Zn Concentration , in the second season .

Table (9) Effect of Atrazine, Zinc and Boron microelements on sucrose percentage of sugar beet roots 2000/2001 and 2002/2003 seasons.

Atrazine Concentration ppm	Zinc Zn ppm	2000 – 2001 Boron B0 0 ppm	Boron B1 50ppm	Boron B2 100 ppm	means ppm	2002 – 2003 Boron B0 0 ppm	Boron B1 50 ppm	Boron B2 100ppm	Means* ppm
0.00	00	13.87	12.58	14.98	13.81	15.65	14.69	14.35	15.23
	1500	12.41	12.93	15.99	13.78	17.02	14.23	15.08	15.44
	2000	13.72	11.77	13.03	12.84	15.76	13.67	14.10	15.51
Mean		13.33	12.43	14.67	13.48	16.14	14.20	14.84	15.06
100	00	13.11	13.17	14.95	13.74	16.33	15.74	14.66	15.58
	1500	15.65	12.76	14.98	14.46	16.37	14.93	13.85	14.38
	2000	17.14	16.20	13.43	15.59	15.05	14.79	16.12	15.32
Mean		15.30	14.04	14.45	14.60	15.25	15.15	14.88	15.09
200	00	14.26	15.72	14.92	14.97	14.87	13.78	16.74	15.13
	1500	16.29	14.35	14.01	14.88	15.86	16.36	14.38	15.53
	2000	13.20	12.83	14.04	13.36	13.29	13.67	13.12	13.36
Mean		14.58	14.83	14.32	14.40	14.67	14.60	14.75	14.67
Over all means	00	13.75	13.82	14.95	14.17	15.62	14.74	15.85	15.31
	1500	14.78	13.35	14.57	14.23	15.75	15.17	14 43	15.12
	2000	14.35	13.85	13.50	14.07	14.70	14.04	14.45	14.40
Mean		14.29	13.67	14.34	14.16	15.36	14.65	14.82	14.94

L.S.D at 5% level for :

* Atrazine (At)	= 0.629	Atrazine (At)	= 0.380
* Boron (B)	= 0.516	Boron (B)	= 0.300
* Zinc (Zn)	= N.S	Zinc (Zn)	= 0.240
* Atxzn	= 1.400	Atxzn	= 0.770
* At xB	= 0.792	At xB	= 0.860
* Bx Zn	= 1.460	Bx Zn	= 0.420
* At xBx Zn	= 1.780	At xBx Zn	= 1.700

Most of the first and second order interactions had significant influence on the above traits, during the two seasons, i.e. (At xZn) interaction effect indicated that, spraying sugar beet plants with 100 ppm Atrazine in the presence of 2000 ppm Zn gave the highest average of sucrose % (15.59 %), in the first growing season. On the other hand, sugar yield also was effected significantly by the second order interaction (At x B x Zn) . 6.24 ton / fed . was the highest average that attributed to spray the plants with (0.0 At + 0.00 B +1500 Zn ppm) as recorded in the second season . The highest nitrogen percentage (2.32 %) was obtained as treating the plants with (200 At + 100 B+ 2000 Zn ppm) as shown in Table (11) .

Table (10) Effect of Atrazine, Zinc and Boron microelements on sugar yield (ton/fed) of sugar beet roots during 2000/ 2001 and 2002/ 2003 seasons.

Atrazine Concentration ppm	Zinc Zn ppm	2000 – 2001 Boron B0 0ppm	Boron B1 50ppm	Boron B2 100ppm	means ppm	2002 – 2003 Boron B0 0ppm	Boron B1 50ppm	Boron B2 100ppm	Means Ppm*
0.00	00	2.331	1.571	1.869	1.924	3.736	3.831	5.015	4.194
	1500	2.141	2.602	2.304	2.399	6.238	4.588	3.354	4.730
	2000	2.152	1.325	1.425	1.634	3.265	3.073	2.685	3.008
Mean		2.208	1.833	1.866	1.969	4.413	3.834	3.685	3.977
100	00	2.314	1.984	3.101	2.436	3.673	3.453	3.218	3.448
	1500	3.44	2.268	2.593	2.767	3.449	4.369	3.353	3.724
	2000	2.684	2.616	1.747	2.349	3.194	2.704	3.419	3.106
Mean		2.813	2.259	2.480	2.517	3.439	3.509	3.330	3.426
200	00	1.353	2.284	2.119	1.919	4.459	3.831	4.007	3.970
	1500	3.243	2.253	2.333	2.610	3.253	4.599	3.683	3.416
	2000	2.285	1.618	1.796	1.900	3.859	3.073	2.777	3.507
Mean		2.294	2.052	2.083	2.143	3.857	3.834	3.549	3.631
Over all means	00	1.999	1.850	2.363	2.071	3.956	3.453	4.080	3.871
	1500	2.941	2.374	2.410	2.575	4.313	4.369	3.523	3.957
	2000	2.374	1.853	1.656	1.961	3.439	2.704	2.960	3.207
Mean		2.438	2.026	2.143	2.202	3.903	3.610	3.521	3.878

L.S.D at 5% level for :

* Atrazine (At)	= 0.280	Atrazine (At)	= 0.160
* Boron (B)	= 0.140	Boron (B)	= 0.160
* Zinc (Zn)	= 0.150	Zinc (Zn)	= 0.130
* Atxzn	= 0.480	Atxzn	= 0.400
* At xB	= 0.350	At xB	= 0.520
* Bx Zn	= 0.390	Bx Zn	= 0.480
* At xBx Zn	= 1.210	At xBx Zn	= 0.860

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Table (11) Effect of Atrazine and two microelements (B and Zn) on the quality of sugar beet roots at 2002 – 3003

Atrazine Concentration ppm	Zinc ppm	Nitrogen (N) %				Sodium (Na) %				Potassium (K) %			
		Boron1 0.0 0ppm	Boron1 0.00 ppm	Boron1 0.00 ppm	Mean ppm	Boron1 0.00 ppm	Boron1 50 ppm	Boron2 100 ppm	Means	Boron1 0.00 ppm	Boron1 50 ppm	Boron2 100 ppm	means
0.00	000	1.257	0.707	0.607	0.857	3.203	3.160	2.943	3.102	7.410	6.410	6.540	6.790
	1500	1.487	1.560	1.990	1.679	2.087	2.807	2.723	2.539	5.780	6.670	5.890	6.110
	2000	2.310	1.767	1.570	1.852	5.177	5.110	4.800	5.029	6.380	6.890	6.680	6.650
	means	1.685	1.345	1.389	1.463	3.489	3.692	3.489	3.557	6.523	6.660	6.370	6.520
100	000	1.333	2.113	2.283	2.000	4.307	3.250	3.667	3.741	7.180	7.260	6.920	7.120
	1500	1.705	1.625	1.430	1.587	3.575	2.810	2.507	2.964	6.110	6.770	7.090	6.660
	2000	0.730	2.165	0.607	1.167	2.443	2.383	2.050	2.292	6.800	6.880	6.500	6.730
	means	1.256	1.968	1.440	1.585	3.442	2.814	2.741	2.999	6.700	6.970	6.840	6.840
200	000	1.885	1.913	1.815	1.871	4.193	2.730	2.443	3.122	6.390	6.460	6.330	6.390
	1500	0.370	0.647	2.127	1.048	3.163	2.640	3.733	3.179	6.780	6.650	6.340	6.590
	2000	1.597	1.560	2.317	1.825	3.625	3.737	4.153	3.838	6.750	6.640	7.410	6.930
	Means	1.284	1.373	2.086	1.581	3.660	3.036	3.443	3.480	6.640	6.580	6.690	6.640
Over all means	000	1.492	1.578	1.568	1.576	3.901	3.047	3.018	3.322	7.000	6.710	6.600	6.770
	1500	1.187	1.277	1.849	1.438	2.942	2.752	2.988	2.894	6.220	6.700	6.440	6.450
	2000	1.546	1.831	1.498	1.615	3.748	3.743	3.668	3.720	6.640	6.640	6.530	6.600
	means	1.408	1.562	1.638	1.543	3.530	3.181	3.225	3.312	6.620	6.680	6.520	6.610

L.S.D at 5 % level for

Nitrogen (N)		Sodium (Na)		Potassium (K)	
* Atrazine (At)	= N.S	* Atrazine (At)	= 0.340	* Atrazine (At)	= 0.208
* Boron (Bo)	= 0.133	* Boron (Bo)	= 0.168	* Boron (Bo)	= N.S
* Zinc (Zn)	= N.S	* Zinc (Zn)	= 0.357	* Zinc (Zn)	= N.S
* Atx Zn	= 0.230	* Atx Zn	= 0.455	* Atx Zn	= 0.543
* At XB	= 0.421	* At XB	= 0.431	* At XB	= N.S
* Bx Zn	= 0.312	* Bx Zn	= N.S	* Bx Zn	= 0.307
* At x B x Zn	= 0.795	* At x B x Zn	= 0.980	* At x B x Zn	= 0.398

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تأثير الأترازين والبورون والزنك على بعض القياسات فى بنجر السكر

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** شركة السكر والصناعات التكاملية المصرية

تجربتين حقليتين تم تطبيقهما بمحطة أبحاث العياط التابعة لشركة السكر والصناعات التكاملية المصرية خلال موسمى النمو ٢٠٠٠/٢٠٠١، ٢٠٠٢/٢٠٠٣ وذلك لدراسة تأثير الرش بمادة الاترازين كمادة منشطة عند تركيزات (صفر ،١٠٠، ٢٠٠ جزء فى المليون) وكذا التسميد الورقى بعنصر البورون عند تركيزات (صفر ،٥٠ ، ١٠٠ جزء فى المليون) فى صورة(بوركس)وكذا عنصر الزنك عند تركيزات (صفر ، ٢٠٠٠، ١٥٠٠ جزء فى المليون فى صورة(كبريتات الزنك) على بعض صفات النمو والمحصول وجودة بنجر السكر صنف مونت بيانكو المستورد حيث يتم تطبيق معاملات الرش بعد ١٥٠، ١٠٠ يوم من ميعاد الزراعة .

وقد أوضحت النتائج أن المعاملة بمادة الأترازين كمادة منشطة أعطت نتائج متذبذبة خلال موسمى الزراعة حيث أدى الرش بمعدل ١٠٠ جزء فى المليون من تلك المادة إلى زيادة فى متوسط وزن العرش الجاف للنبات ووزن النبات الجاف وقطر الجذر ومحصول الجذور للفدان ونسبة السكر ومحصول السكر للفدان وبعض صفات الجودة مثل نسبة الازوت والبوتاسيوم وخلال الموسم الثانى للزراعة بعض من الصفات السابق الاشاره إليها سابقا لم تأخذ نفس الاتجاه تحت تأثير نفس المعاملة .

أدت المعاملة بالبورون عند تركيز ٥٠ جزء فى المليون إلى زيادة فى وزن العرش الجاف للنبات وكذا الوزن الجاف للنبات وبعض صفات مكونات المحصول . وعلى النقيض نقص محصول السكر للفدان ونسبة السكر. أدت المعاملة بالزنك عند تركيز ١٥٠٠ جزء فى المليون إلى زيادة معنوية فى وزن العرش الجاف والوزن الجاف للنبات ومحصول الجذور والسكر للفدان بينما اخفضت نسبة السكر والصوديوم .

معظم التفاعلات عند المستوى الاول والثانى كانت لها تأثيرات معنوية على الصفات قيد الدراسة .