J. Soil Sci. and Agric. Eng., Mansoura Univ., Vol. 3 (1): 63 - 93, 2012

EFFECT OF IRRIGATION INTERVALS, PHOSPHORUS LEVELS AND ANTIOXIDANTS OF FOLIAR ASCORBIC AND CITRIC ACID (ASCOBIN) APPLICATION ON MAIZE AND WHEAT CROPS AND SOME SOIL PROPERTIES

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ABSTRACT

Field experiments were carried out on clay soil at El-Gemmeiza Agricultural Research Station, El-Gharbia Governorate, during two consecutive growing seasons, summer season 2010 and winter season 2010/2011.

The experiment was designed using a randomized complete block design as split-split plot with three replicates to study the effect of three irrigation intervals with phosphorus application to soil and foliar spray of ascobin (ascorbic and citric acids) to plants on growth and yield of maize, wheat crops and some soil properties. Furthermore economical analysis was done by calculating the net income for every treatment.

The obtained results could be summarized as follows:-

1- Increasing irrigation intervals significantly increased values of soil bulk density and water use efficiency, while total soil porosity, hydraulic conductivity, soil moisture content just before harvesting and water consumption take the opposite direction during the two growing seasons.
2- Decreasing irrigation intervals significantly decreased soil pH, electrical conductivity (EC), soluble cations and anions, total soluble salts (TSS) and sodium adsorption ratio (SAR) and significantly increased available nutrients N, P, K, Fe, Mn, Zn and Cu in the soil.
3- Increasing phosphorus applications rate significantly increased water consumption, water use efficiency, yield and its components, electrical conductivity (EC), availability of macro and micronutrients of the soil and its concentrations and uptake in grains in both seasons.
4- Foliar application of ascobin significantly increased water consumption, water use efficiency, concentrations and uptake of macro and micronutrients N, P, K, Fe, Mn, Zn and Cu of maize and wheat grains and yield and its components. While foliar application with ascobin had no effects on soil physical or chemical properties.
5- Cost benefit analysis revealed that the most valuable combination is irrigation every two weeks in the first season (maize plants) and every four weeks in the second one (wheat plants) at 100% of the recommended dose of phosphorus in both seasons with ascobin foliar application.

Keywords: Irrigation intervals, phosphorus levels and antioxidants foliar (ascorbic and citric acid)

INTRODUCTION

Water is the limiting factor of agriculture production in arid and semiarid regions. Also, it considered as an important element in the dynamics of plant and soil physical and chemical properties. Ghaly and El-Sodany (2009) found that three weeks irrigation intervals for *Nigella sativa L* resulted in significant

increases of total porosity, hydraulic conductivity, water consumption and soil moisture content just before harvesting as compared with 4 and 5 weeks irrigation intervals. Meanwhile, the values of soil bulk density, water use efficiency, soil pH and electrical conductivity take the opposite trend.

Mohamed *et al.,* (1995) reported that the consumptive use of water increased as the available soil moisture increased, whereas water use efficiency increased under dry soil condition compare with wet condition. El-Tawil (2003) found that the greatest seed and straw yield and the highest consumptive use of broad bean were obtained when irrigation every fifteen days. While, the highest water use efficiency was obtained with irrigation every thirty days coupled with P application for all soils under investigation. Ziadah *et al.,* (2000) reported that irrigation intervals 15/15 days of cotton increased significantly water consumptive use, while it decreased significantly water use efficiency compared with the other tested irrigation treatments which were 30/15, 15/30 and 30/30 days during vegetative and fruiting stages, respectively. Soomro *et al.,* (2001) found that irrigation intervals on seed cotton yield at 14 days interval resulted in significant greater cotton yield as compared to 7 and 21 days intervals. They detected little increases in soil pH values, decreasing trend in ECe, ESP, and SAR was noted in the samples collected after harvest as compared to those collected before sowing.

Khamis (1987) showed that increasing soil moisture content caused a highly significant increase in concentration and uptake of NPK by broad bean seeds and shoots. El-Naggar *et al.,* (1991) stated that concentration and uptake of micro elements in grain and straw of wheat increased as soil moisture stress decreased.

Refaat and Saleh (1997) studied the effect of irrigation intervals of 7, 14 or 28 days on sweet basil plant. They reported that the plant growth was reduced by increasing interval between irrigation treatments. Kandeel (2001) on *Rosmarinus officinalis L*. revealed that the irrigation intervals every 7 or 14 days significantly increased the plant height compared with irrigation every 21 days. The irrigation every 14 days significantly increased the (most cases) number of branches/plant, fresh weight of herb/plant, fresh weight of roots/plant and yearly yield of fresh and dry herb/plant as compared with the other two intervals.

Although phosphorus (P) is an essential nutrient for crop production, but it does not occur as abundantly in soils as nitrogen (N) and potassium (K). Total (P) in surface soils varies between about 0.005 and 0.15% (Havlin *et al.,,* 1999).

Nimje and Seth (1986) found that phosphorus application increased organic C, total (N) and available (P) status of the soil. It is also improved bulk density and water-holding capacity of the soil. Sultani *et al.,* (2007) found that phosphorus application showed meagre positive impact on various soil physical properties but did not significantly increased porosity or reduced bulk density. El-Sodany *et al.,* (2009) found that the soil bulk density and consumptive water use were decreased, while total soil porosity, void ratio, settling percentage, pore size distribution, hydraulic conductivity, water use efficiency and yield quantity and quality were positively increased by

application organic matter and inorganic phosphorus. El-Sodany and El-Maddah (2009) reported that the use of organic matter and inorganic phosphorus lead to a slightly decreases in soil pH and progressive increases in soil salinity (EC), soluble ions (Ca, Mg, Na, HCO_3, Cl and SO_4), total soluble salts (TSS) and sodium adsorption ratio (SAR).

Hanna *et al.,* (1996) found that the consumptive use of water, water use efficiency and NPK concentration and its uptake in broad bean seeds and straw increased due to phosphorus application to soil. Barsoom (1998) showed that the dry matter weight and phosphorus uptake are increased by increasing the levels of phosphorus. Meanwhile, uptake of Zn and Cu increased at low phosphorus addition. Fouda *et al.,* (2005) found that the concentration of heavy metals in the soil and dry matter production of alfalfa increased with application of phosphatic fertilizers. whereas, Zn, Mn, Pb and Cd uptake of alfalfa were reduced significantly.

Hussain *et al.,* (2008) found a progressive increase in grain yield of wheat with the increment of (P) from 60 to 120 kg ha^{-1}. Various crop traits such as number of fertile tillers, 1000-grain weight and number of grains per spike were significantly influenced by sowing dates and phosphorus application. Alias *et al.,* (2003) in study of the effect of various levels of phosphorus on the yield and yield components of two maize cultivars, found that leaf area per plant, number of grains per cob and 1000- grains weight was significantly increased by increasing levels of (P).

Ascobin as a foliar fertilizer, contains some activator hormones and organic acids as ascorbic and citric acids, had a promotion effect on growth and active constituents compounds on various plants such as fenugreek plant, (Mohamed and Naguib, 2002), Plantago species, (Ezz El-Din and Khalil, 2003) and on faba bean, maize and pea plants, (Ahmed, 1998).

Sheteawi (2007) found that ascobin increased salt tolerance by enhancing the accumulation of nontoxic metabolites (sugars, amino acids, proline and protein) and improving the levels of NPK. He reported that, ascobin spray could be adopted as a potential growth regulator or antioxidant to improve growth, yield and nutrient utilization particularly under moderate NaCl salinity levels on soybean. Abd El-Aziz *et al.,* (2006) reported that all growth parameters of Khaya senegalensis (i.e. stem length, stem diameter, root length, leaves number/plant, leaf area and fresh and dry weight of all plant organs) and chemical constituents (i.e. the percentage and uptake of N,P and K) tended to increase by increasing the concentration of ascorbic acid up to 400 ppm as compared to the untreated ones. El-Bassiouny *et al.,* (2005) indicated that, foliar spray with ascorbic acid of antioxidants on faba bean plants significantly increased plant height, number of branches, pods and seeds/plant, seed yield(g)/plant, 100 seed weight as well as seed and straw yield (ton/fed). They added that, total carbohydrate, crude protein, K, P and Ca contents in dry seeds were significantly increased. Talaat (2003) on sweet pepper detected that foliar application of ascorbic acid increased the content of macronutrients (N, P and K).

The present experiments were conducted to study the effect of irrigation intervals with phosphorus as soil application and foliar spray with

ascobin (ascorbic and citric acids) on growth and yield of wheat and maize plants and some soil properties at El-Gharbia Governorate.

MATERIALS AND METHODS

Two successive field experiments were carried out at El-Gemmeiza Agricultural Research Station, El-Gharbia Governorate, for two seasons. Summer season 2010 using maize plants (Zea mays) and winter season 2010/2011 using wheat (Triticum aestivum) plants to study the effect of irrigation intervals, phosphorus levels and antioxidants foliar (ascorbic and citric acid) application on plant characteristics and some soil properties under El-Gharbia Governorate conditions. Initial physical and chemical properties of the experimental soil are presented in Table (1).

The area of the experiment was divided into 72 plots, where each plot was 6 m^2 (2 m in width and 3 m in length). A randomized complete block design as split-split plot with three replicates was used in both seasons.

Ascobin is consider as growth activator and plant nutrient which consists: 62% organic materials and ascorbic and 38% citric acids.

The three irrigation intervals were conducted as the main plots, the irrigation was executed every 1, 2 and 3 weeks during summer season 2010 and every 3, 4 and 5 weeks during the winter season of 2010/2011.

Superphosphate (15.5% P_2O_5) was added at the ratios of 0, 50, 75 and 100 % of the recommended dose of each crop as sub plots and applied to the surface soil before sowing in the first and second seasons. The recommended dose of P_2O_5 for maize crop 31 Kg/fed while it is 15.5 Kg/fed for wheat crop.

Table (1): The initial characteristics of the used soil.

Soil depth, cm		0-30	Soil depth, cm	0-30
Soil physical properties				
Particle size distribution, %	Sand	18.45	Bulk density (Db, g cm^{-3})	1.19
	Silt	34.05	Total porosity (E, %)	55.00
	Clay	47.50	Hydraulic conductivity (Kh, cm hr^{-1})	0.70
Texture class		Clayey		
Soil chemical properties				
Soluble ions, meq l^{-1}			**Soil pH, 1:2.5 (suspension)**	7.74
Ca^{++}		8.80	Soil EC, dSm^{-1}	2.65
Mg^{++}		7.07	TSS, %	0.10
Na^{+}		10.17	SAR	3.61
K^{+}		0.35	$CaCO_3$, %	4.29
CO_3^{--}		0.00	Organic matter (O.M., %)	2.67
HCO_3^{-}		4.94	Organic carbon (O.C., %)	1.55
CL^{-}		12.50	Total nitrogen (T.N., %)	0.155
SO_4^{--}		8.95	C/N ratio	10.01
DTPA- extractable micronutrients (ppm)			Total P (T.P., %)	0.032
Fe		4.77	Total K (T.K., %)	0.517
Mn		4.10	Available N, mg Kg^{-1}	35.15
Zn		4.86	Available P, mg Kg^{-1}	11.44
Cu		1.83	Available K, mg Kg^{-1}	382.45

The sub-sub-plots were assigned to two foliar ascobin application: S_0 : spraying 150 L water/fed. (control or without ascobin), S_1 : two foliar spraying by ascobin at the rate of 200g/150L water/fed in each spraying as follows: In the first season. The first spray was after thinning of maize plants and the second was three weeks after. While, in the second season, the first spray of ascobin was after one month of wheat sowing and the second was added one month later, as well as the control (untreated soil).

In summer season 2010, maize grains (Zea maize, three-way cross-321) were planted at the rate of 15 kg/fed. during the first week of June 2010. while in winter season 2010/2011 wheat grains (Sakha 69) were planted at the rate of 60 Kg/fed. during the third week of November 2010.

During the two seasons, the basel doses of N and K were applied according to the recommendations dose for each crop in the form of ammonium nitrate (33.5% N) and potassium sulphate (48 % K_2O). The other usual agricultural practices were carried out as usual for each crop according to the recommendations of El-Gemmeiza Research Station.

At harvesting of each growing season, soil samples (0-30cm depth) were collected from each plot. The collected soil samples were air-dried, ground and passed through 2 mm sieve and stored for chemical analysis.

Soil bulk density (Db, g/cm^3) was determined using the core methods (Vomocil, 1986). Total porosity (E, %) was calculated using the following equations:-

$$E,\ \% = \left(1 - \frac{Db}{Dr}\right) \times 100$$

Where: Db = the bulk density, g/cm^3

Dr = the real density, taken as 2.65 g/cm^3

Hydraulic conductivity (cm/hr) was determined using undisturbed soil cores using a constant water head according to Richards (1954). Soil moisture content (Θw,%) were determined using the method outlined by Stakman (1969). Water consumption (CU) was determined by collecting soil samples from each plot before and after 48 hours of every irrigation and computed according to the Israelsen and Hansen's equation (1962)

$$Water\ consumption,\ cm = \frac{\theta_2 - \theta_1}{100} \times Db \times D$$

Where:

θ_2 = Soil moisture percentage on weight basis after 48 hours from irrigation.

θ_1 = Soil moisture percentage before irrigation.

Db = Bulk density, g/cm^3

D = Soil depth, cm

Water use efficiency (WUE) was calculated by dividing the yield crop (kg/fed.) by water consumptive use (cm) according to Jensen's equation (1983):

$$WUE,\ \text{kg fed}^{-1}\ \text{cm}^{-1} = \frac{Grain\ yield,\ (kg\ fed^{-1})}{Water\ consumption\ (cm)}$$

Soil pH in soil water suspension (1:2.5) and soil electrical conductivity (EC, dSm^{-1}) in soil paste extract were measured. Soluble cations and anions were determined in soil paste extract using the methods described by Page *et al.,* (1982).

Sodium Adsorption Ratio (SAR) was calculated as:

$$SAR = \frac{Na \ meq/l}{\sqrt{\frac{Ca + Mg \ meq/l}{2}}}$$

Total soluble salts, % were calculated according to the following equation:

$$T.S.S., \% = \frac{EC \ dSm^{-1} \times 0.064 \times SP}{100}$$

where: SP = Saturation percentage

Total and available NPK of the soil were determined according to Hesse (1971). Total N by macro-Kjeldahel, total P by ascorbic acid molybdenum blue method and total K by flame photometer method.

Available N (extracted by 2M KCl) determined using the micro-kjeldahel method, available P (extracted by 0.5N $NaHCO_3$ solution at pH 8.3) determined using ascorbic acid method and available K (extracted by ammonium acetate solution at pH 7.0) was determined using a flame photometer.

The concentration of macronutrients in grain samples were determined according to Hesse (1971) and Cottenie (1980). Nitrogen was determined by Kjeldahel method, Phosphorus by Vanadomolybdate yellow method according to Jakson (1973) and Potassium by flame photometer method.

The concentration of micronutrients (Fe, Mn, Zn and Cu) in soil and plant (grains) were determined by DTPA- method as described by Lindsay and Norvell (1978) measured by an Atomic Absorption Spectrophotometer (AAS).

At harvesting time of each crop, total yield of maize or wheat for each plot was separately harvested, and most of growth characters were recorded.

The collected data were statistically analyzed according to the procedure outlined by Snedecor and Cochran (1981).

Cost benefit analysis was done to compare between different treatments to state which treatment is more reliable. The test was executed according to the price of the yield (1500 LE/Ton) maize in the first season and (1500 LE/Ton) grain of wheat and (800 LE/Ton) straw of wheat in the second one, as well as the cost of different treatments was calculated considering conventional method of both fixed and variable costs.

RESULTS AND DISCUSSION

Effect of different treatments on some soil physical properties.

Soil bulk density (Db) and total porosity (E).

Results in Tables (2 and 3) indicate that soil bulk density (Db) and total porosity (E) values were significantly changes for all different treatments at the end of the two seasons as compared with the control. The lowest values of (Db) was recorded by added 100% of recommended dose of superphosphate with irrigation intervals every one week in the first season and every 3 weeks in the second one and without spraying ascobin, where the decrease were 10.08 and 11.02 % in the first and second seasons, respectively, under the control. On the contrary, total porosity take the opposite direction where the highest values was recorded by the same treatment where the increases were 8.31 and 8.73 % in the first and second seasons, respectively, compared with control.

Concerning irrigation intervals, the results show that the (Db) values were significantly increased by increasing irrigation intervals, the values of (Db) were differed between 1.12 and 1.23, 1.09 and 1.23 gm/cm^3 in the first and second seasons for one and three weeks irrigation intervals in the first season and for three to five weeks in the second one, respectively. On the other hand, the values of (E) were significantly decreased by increasing irrigation intervals, differed between 57.83 and 53.54, 58.75 and 53.68 % in the first and second seasons for the same irrigation intervals, respectively. Similar results were obtained by Ghaly and El-Sodany (2009), who reported that soil bulk density significantly decreased and total porosity significantly increased by irrigation intervals every three weeks for *Nigella sativa L*. as compared with 4 and 5 weeks.

Data in Tables (2 and 3) indicate that the values of (Db) or (E) were not significantly affected by superphosphate application. The same conclusion was obtained by Sultani *et al.,* (2007), who found that phosphorus application did not significantly increased porosity or reduced bulk density.

Concerning spraying ascobin, data reveal that there is no wide variation between treatments for its effects on (Db) or (E) in the first and second seasons.

Soil hydraulic conductivity (Kh) and soil moisture content (Ɵw) just before harvesting.

Regarding the irrigation intervals, the results illustrated in Tables (2 and 3) show that the (Kh) and (Ɵw) values were significantly decreased with increasing irrigation intervals, the values of (Kh) and (Ɵw) were ranged from 0.81 to 0.61, 0.85 to 0.64 cm/hr and 22.14 to 17.73, 25.41 to 20.23 % in the first and second seasons, respectively. Similar results were obtained by Ghaly and El-Sodany (2009), who found that three weeks irrigation intervals for *Nigella sativa L*. resulted in a significantly increases of hydraulic conductivity and soil moisture content just before harvesting as compared with the other intervals.

However, results reveal that irrigation intervals every one or three weeks with the application of 100% of superphosphate of recommended

dose and spraying ascobin gave the highest values of (Kh) and (Θw, %) just before harvesting in the first and second seasons, respectively. The values were 0.84 cm/hr, 22.74 % and 0.87 cm/hr, 26.11 % for the first and second seasons.

Table (2): Effect of different treatments on soil physical properties in the first season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Bulk density, Db, gm/cm^3	Total porosity (E, %)	Hydraulic conductivity (Kh, cm/hr)	Moisture content (Θw, %) Just before harvesting	Water consumption (CU, cm)	Water use efficiency (WUE, Kg fed-1cm-1)	Grain yield, Kg/fed
without	1 week	0	1.17	55.85	0.79	21.00	92.08	24.46	2252.20
		50	1.12	57.74	0.80	21.86	92.56	24.51	2268.90
		75	1.11	58.11	0.81	22.51	92.83	24.53	2277.50
		100	1.07	59.62	0.82	22.56	92.92	24.59	2284.60
	2 weeks	0	1.19	55.00	0.70	19.26	89.74	25.42	2281.30
		50	1.18	55.51	0.71	19.44	90.05	26.11	2351.10
		75	1.17	55.91	0.72	19.70	90.44	26.88	2431.10
		100	1.16	56.15	0.75	19.90	91.21	27.49	2507.60
	3 weeks	0	1.25	52.83	0.58	17.46	77.76	28.55	2220.00
		50	1.24	53.21	0.60	17.55	77.84	28.67	2231.60
		75	1.22	53.96	0.61	17.68	78.07	28.73	2242.80
		100	1.21	54.34	0.63	17.84	78.21	28.84	2255.40
with	1 week	0	1.15	56.60	0.79	21.83	92.28	28.33	2614.20
		50	1.12	57.74	0.80	22.01	92.63	28.75	2662.70
		75	1.11	58.11	0.81	22.61	92.95	29.31	2724.80
		100	1.09	58.87	0.84	22.74	93.44	30.48	2848.40
	2 weeks	0	1.20	54.72	0.71	18.66	89.79	33.25	2985.40
		50	1.20	54.72	0.73	19.12	90.10	34.50	3108.40
		75	1.18	55.47	0.74	19.25	90.65	34.95	3167.80
		100	1.17	55.85	0.74	19.49	91.41	35.09	3207.70
	3 weeks	0	1.25	52.83	0.60	17.48	77.82	32.38	2519.70
		50	1.24	53.21	0.62	17.80	77.88	32.40	2523.50
		75	1.22	53.96	0.63	17.93	78.72	32.50	2558.60
		100	1.22	53.96	0.64	18.10	79.15	32.77	2593.90
Control			1.19	55.05	0.70	19.26	89.74	25.42	2281.30
(A) Spraying ascobin		Without	1.17	55.69	0.71	19.73	86.97	26.57	2300.34
		with	1.18	55.50	0.72	19.75	87.23	32.06	2792.93
		F	NS	NS	NS	NS	590.85*	586.29*	585.88*
		LSD_{05}					0.05	0.84	87.57
(B) Irrigation intervals		1 week	1.12	57.83	0.81	22.14	92.71	26.87	2491.66
		2weeks	1.18	55.42	0.72	19.35	90.42	30.46	2755.05
		3weeks	1.23	53.54	0.61	17.73	78.18	30.61	2393.19
		F	9.09*	7.45*	69.93*	49.55*	1166.81*	919.37*	893.90*
		LSD_{05}	0.06	2.57	0.04	1.03	0.75	0.30	20.41
(C) Supper Phosphate		0	1.20	54.64	0.70	19.28	86.58	28.73	2478.80
		50	1.18	55.35	0.71	19.63	86.84	29.16	2524.37
		75	1.17	55.92	0.72	19.95	87.28	29.48	2567.10
		100	1.15	56.46	0.74	20.11	87.72	29.88	2616.27
		F	NS	NS	NS	NS	4.29*	36.43*	72.04*
		LSD_{05}					0.70	0.25	19.90

* % of recommended dose

Concerning increasing superphosphate application, the results revealed that the values of (Kh) and (Θw) were insignificant. The values were differed between 0.70 and 0.74, 0.72 and 0.77 cm/hr and between 19.28 and 20.11, 22.19 and 23.14 % in the first and second seasons, respectively.

Water consumption (CU) and water use efficiency (WUE).

The results in Tables (2 and 3) show that the lowest values of (CU) were obtained by irrigation intervals every three weeks in the first season and five weeks in the second one without both spraying ascobin or phosphorus addition, where the values decreased by 13.36 and 11.42 % in the first and second seasons, respectively as compared with control. While, the highest values of (CU) were recorded with irrigation intervals every one week in the first season and three weeks in the second one with spraying ascobin and added 100 % of recommended dose of phosphorus, where the values increased by 4.12 and 16.33 % in the first and second seasons, respectively.

Concerning the irrigation intervals, the results clear that (CU) for maize and wheat plants were significantly decreased by increasing irrigation intervals from one to three weeks and three to five weeks in the first and second seasons, where the values of (CU) decreased from 92.71 to 78.18 and 87.97 to 67.95 cm, respectively. Similar results were obtained by El-Tawil (2003), Ziadah *et al.,* (2000) and Mohamed *et al.,* (1995), they reported that the consumptive use of water increased as the available soil moisture increased, whereas water use efficiency increased under dry soil condition compare with wet condition.

Moreover, data of tables (2 and 3) reveal that (CU) values for maize and wheat plants were significantly increased by increasing phosphorus application in the first and second seasons, the increases differed from 86.58 to 87.72 and 77.26 to 78.29 cm, respectively. Similar results were obtained by Hanna *et al.,* (1996), who found that the consumptive use of water and water use efficiency in broad bean increased due to phosphorus application to soil.

With regard to ascobin foliar, the results in Tables (2 and 3) indicate that (CU) values for maize and wheat plants were significantly increased with ascobin foliar in the first and second seasons, where the values of (CU) were increased from 86.97 to 87.23, 77.52 to 77.96 cm for maize and wheat plants, respectively.

On the other hand, data in Tables (2 and 3) show that (WUE) values for maize and wheat plants take the opposite trend of (CU), where the (WUE) values were significantly changes with all different treatments. The highest (WUE) value was recorded by irrigation intervals every two or four weeks in the first and second seasons with 100 % of phosphorus application levels and spraying ascobin, the increases were 38.05 and 36.78 % in the first and second seasons, respectively as compared with control.

Table (3): Effect of different treatments on soil physical properties in the second season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Bulk density, Db, gm/cm^3	Total porosity (E, %)	Hydraulic conductivity (Kh, cm/hr)	Moisture content (Θw, %) Just before harvesting	Water consumption (CU, cm)	Water use efficiency (WUE, Kg fed-1cm-1)	Grain yield, Kg/fed
without	3 week	0	1.12	57.74	0.82	24.42	87.52	28.20	2468.13
		50	1.11	57.97	0.84	24.93	87.65	28.21	2472.80
		75	1.07	59.62	0.86	25.70	87.85	28.22	2479.33
		100	1.05	60.38	0.86	25.73	88.01	28.23	2484.40
	4 weeks	0	1.18	55.53	0.73	22.15	76.22	32.03	2441.52
		50	1.17	55.85	0.74	22.39	76.67	32.69	2505.97
		75	1.16	56.23	0.75	22.65	77.54	33.15	2570.67
		100	1.15	56.60	0.76	22.82	78.09	33.29	2599.82
	5 weeks	0	1.24	53.21	0.58	19.73	67.51	36.05	2433.99
		50	1.23	53.58	0.63	20.06	67.61	36.08	2439.11
		75	1.22	53.96	0.65	20.75	67.74	36.15	2448.56
		100	1.21	54.34	0.67	20.94	67.86	36.24	2459.14
with	3 week	0	1.13	57.18	0.83	25.18	87.74	33.57	2944.87
		50	1.11	58.29	0.83	25.20	88.00	34.11	3001.34
		75	1.09	58.77	0.86	25.99	88.32	34.84	3076.60
		100	1.06	60.03	0.87	26.11	88.66	35.85	3178.31
	4 weeks	0	1.19	55.09	0.72	21.89	76.94	42.16	3244.03
		50	1.19	55.09	0.75	22.38	76.89	43.01	3306.48
		75	1.18	55.47	0.76	22.48	77.80	43.25	3364.90
		100	1.17	55.85	0.77	22.75	78.30	43.82	3430.67
	5 weeks	0	1.25	52.83	0.63	19.78	67.64	40.06	2709.49
		50	1.24	53.21	0.64	19.99	67.90	41.07	2788.92
		75	1.22	53.96	0.66	20.14	68.53	41.56	2848.54
		100	1.21	54.34	0.67	20.48	68.84	42.14	2901.25
Control			1.18	55.53	0.73	22.15	76.22	32.03	2441.52
(A) Spraying ascobin		Without	1.16	56.25	0.74	22.69	77.52	32.38	2483.62
		with	1.17	55.84	0.75	22.70	77.96	39.62	3066.28
		F	NS	NS	NS	NS	612.31*	3423.31*	587.07*
		LSD_{05}					0.08	0.53	103.48
(B) Irrigation intervals		3weeks	1.09	58.75	0.85	25.41	87.97	31.40	2763.22
		4 eeks	1.17	55.71	0.75	22.44	77.30	37.93	2933.01
		5weeks	1.23	53.68	0.64	20.23	67.95	38.67	2628.62
		F	12.77*	10.16*	68.75*	52.35*	1167.38*	6115.97*	767.23*
		LSD_{05}	0.06	2.61	0.04	1.17	0.96	0.17	17.96
(C) Supper Phosphate		0	1.19	55.26	0.72	22.19	77.26	35.35	2707.00
		50	1.17	55.67	0.74	22.49	77.45	35.86	2752.44
		75	1.16	56.34	0.76	22.95	77.96	36.20	2798.10
		100	1.14	56.92	0.77	23.14	78.29	36.59	2842.26
		F	NS	NS	NS	NS	4.74*	60.13*	59.51*
		LSD_{05}					0.62	0.20	21.70

*** % of recommended dose**

Regarding irrigation intervals, the results reveal that the (WUE) values were significantly increase with increasing irrigation intervals from one to three weeks for maize plant and three to five weeks for wheat, the increases were from 26.87 to 30.61 and 31.40 to 38.67 kg $fed^{-1}cm^{-1}$ in the first and second seasons, respectively. Meanwhile, increasing phosphorus fertilizers to the recommended dose gave the highest values of (WUE), which were 29.88 and 36.59 kg $fed^{-1}cm^{-1}$ for maize and wheat plants, respectively. Thus, it is obvious that water use efficiency tended to decrease in water retained in the root zone. Similar conclusion was obtained by Hanna *et al.,* (1996).

Concerning spraying ascobin, it can be noticed that (WUE) values were significantly increased with spraying ascobin, where the of (WUE) increased from 26.57 to 32.06, 32.38 to 39.62 kg $fed^{-1}cm^{-1}$ in the first and second seasons, respectively.

Effect of different treatments on some soil chemical properties.

Soil pH.

Data in Tables (4 and 5) show that all different treatments led to insignificant variation between soil pH values. The maximum value of soil pH was 7.60, 7.55 in the first and second seasons, which decreased by 1.81, 1.82 %, respectively, compared with control. This value was obtained by irrigation intervals every one or three weeks in the first and second seasons with100 % of phosphorus application level for each season and spraying ascobin. On the contrary, the highest pH values were 7.83, 7.80, which increased by 1.16, 1.43 % of the two seasons, respectively, which obtained by irrigation intervals every three or five weeks in the first and second seasons without superphosphate addition and or spraying ascobin.

Concerning irrigation intervals, data reveal that soil pH values were significantly increased with increasing irrigation intervals. The increases of soil pH values were ranged from 7.63 to 7.81 by increasing irrigation intervals from one to three weeks in the first season, while in the second season were ranged from 7.57 to 7.78 by increasing irrigation intervals from three to five weeks. Similar results were obtained by Soomro *et al.,* (2001), who found a little increase in soil pH values by irrigation intervals on seed cotton yield at 14 days compared to 7 and 21 day intervals.

Data in Tables (4 and 5) indicate that increasing level of phosphorus application to the recommended dose for maize and wheat plants, caused a decrease in soil pH value reached to 7.70 and 7.66 in the first and second seasons, respectively. Similar results were obtained by El-Sodany and El-Maddah (2009), they reported that soil (pH) slightly decrease by using inorganic phosphorus.

It can be noticed from these tables that soil pH values were insignificantly affected by ascobin foliar for the two seasons, where its no wide variation with or without spraying ascobin.

Soil salinity

Data in Tables (4 and 5) show the values of electrical conductivity of soil paste extract (EC, dSm^{-1}), soluble cations and anions (meq/l), total soluble salts (TSS, %) and sodium adsorption ratio (SAR) of the soil as affected by different treatments.

4

5

The results declear that all different treatments led to changes in these characters, where the minimum values of (EC), (Ca^{+2}, Mg^{+2}, Na^{+}, K^{+}, Cl^{-} and SO_4^{-2}), (TSS) and (SAR) were recorded by decreasing both irrigation intervals and phosphorus addition rates, as well as spraying ascobin. While the maximum values of these characters were recorded by increasing both irrigation intervals to be three and five weeks in the first and second seasons, respectively with increasing phosphorus levels to 100% of the recommended dose and without spraying ascobin.

Regarding the irrigation intervals, the results show that the values of (EC), (Ca^{+2}, Mg^{+2}, Na^{+}, K^{+}, Cl^{-} and SO_4^{-2}), (TSS) and (SAR) were increased by increasing irrigation intervals from one to three weeks in the first season and from three to five weeks in the second one, this may be due to the lowest of irrigation intervals led to an increase in the leaching of soluble salts and decrease them at the two seasons. The values decreased to (2.54 and 2.42 dSm^{-1}), (8.81 and 8.23, 6.98 and 7.10, 9.22 and 8.69, 0.35 and 0.27, 11.53 and 11.48, 9.01 and 7.93 meq/l), (0.10 and 0.10 %) and (3.28 and 3.14) with irrigation intervals every one or three weeks in the first and second seasons, respectively, and its reached to (2.85 and 2.76 dSm^{-1}), (8.99 and 8.66, 7.32 and 7.74, 11.64 and 10.87, 0.39 and 0.31, 13.51 and 13.42, 10.79 and 9.78 meq/l), (0.13 and 0.12 %) and (4.08 and 3.80) for the same characters with increasing irrigation intervals to be every three or five weeks in the first and second seasons, respectively. Similar conclusion was obtained by Soomro *et al.,* (2001).

Also, it can be noticed from these tables that the values of (EC), (TSS) and (SAR) were significantly increased with increasing phosphorus levels from zero to 100 % of the recommended dose, the increases differed from 2.63 to 2.75 and 2.53 to 2.65 dSm^{-1} for (EC), 0.10 to 0.13 and 0.09 to 0.13 % for (TSS) and 3.61 to 3.76 and 3.38 to 3.58 for (SAR) in the first and second seasons, respectively. Similar results were obtained by El-Sodany and El-Maddah (2009), they reported that soil salinity (EC), soluble ions, total soluble salts (TSS) and sodium adsorption ratio (SAR) were progressive increases by using inorganic phosphorus.

Concerning spraying ascobin, the results reveal that there is no significant variation of EC, TSS and SAR as a result of ascobin foliar application.

Effect of different treatments on macro and micronutrients of the soil.

Soil macronutrients.

Data in Tables (6 and 7) indicate that the available N,P and K of the soil were changed with all different treatments at the end of the two growing seasons compared with control. The highest values of available N, P and K were obtained by irrigation intervals every one week in the first season and three weeks in the second one with 100 % recommended dose of phosphorus and spraying ascobin, where they increased by 20.97 and 21.20 %, 20.98 and 22.40 % and 23.73 and 26.76 % for available N, P and K in the first and second seasons, respectively compared with control. While, the lowest values were detected with increasing irrigation intervals to become every three or five weeks in the first and second seasons respectively without addition of both phosphorus and spraying ascobin.

Table (6):Effect of different treatments on soil macro and micronutrients in the first season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Available macronutrients (ppm)			DTPA- extractable micronutrients (ppm)			
			N	P	K	Fe	Mn	Zn	Cu
without	1 week	0	39.92	13.23	452.36	5.50	5.40	5.34	2.08
		50	40.50	13.43	459.63	5.62	5.48	5.38	2.11
		75	41.08	13.62	467.45	5.66	5.59	5.44	2.14
		100	41.65	13.82	474.59	5.79	5.64	5.51	2.15
	2 weeks	0	35.15	11.44	382.45	4.77	4.10	4.86	1.83
		50	35.60	11.64	390.54	4.92	4.29	4.93	1.88
		75	36.06	11.82	397.00	5.04	4.48	5.04	1.93
		100	36.75	12.03	404.12	5.15	4.64	5.13	1.96
	3 weeks	0	31.01	9.66	313.90	3.21	3.07	4.21	1.56
		50	31.24	9.86	322.00	3.54	3.14	4.34	1.64
		75	31.71	10.09	329.65	3.73	3.39	4.43	1.68
		100	32.17	10.28	337.84	3.92	3.59	4.50	1.70
with	1 week	0	40.35	13.25	450.70	5.30	5.46	5.29	2.06
		50	40.82	13.46	457.05	5.41	5.54	5.33	2.09
		75	41.62	13.68	465.16	5.52	5.58	5.38	2.10
		100	42.52	13.84	473.21	5.96	5.65	5.64	2.27
	2 weeks	0	35.36	11.45	380.21	4.69	4.16	4.93	1.88
		50	35.81	11.64	390.72	4.85	4.34	4.95	1.90
		75	36.24	11.83	398.41	4.87	4.51	4.98	1.93
		100	36.97	12.11	406.09	4.90	4.69	5.04	1.95
	3 weeks	0	31.83	9.71	314.59	3.66	3.08	4.34	1.61
		50	32.06	9.88	320.25	3.86	3.23	4.38	1.63
		75	32.29	10.06	325.56	3.99	3.35	4.46	1.68
		100	32.75	10.27	337.21	4.09	3.45	4.53	1.69
Control			35.15	11.44	382.45	4.77	4.10	4.86	1.83
(A) Spraying ascobin		Without	36.07	11.74	394.29	4.74	4.40	4.93	1.89
		with	36.55	11.76	393.26	4.76	4.42	4.94	1.90
		F	NS	NS	NS	NS	NS	NS	NS
		LSD_{05}							
(B) Irrigation intervals		1 week	41.06	13.54	462.52	5.60	5.54	5.41	2.12
		2 weeks	35.99	11.74	393.69	4.90	4.40	4.98	1.91
		3 weeks	31.88	9.98	325.12	3.75	3.29	4.40	1.65
		F	2513.73*	2512.22*	2517.82*	2091.26*	2452.71*	2234.26*	2438.35*
		LSD_{05}	0.30	0.12	4.46	0.07	0.07	0.04	0.02
(C) Supper Phosphate		0	35.60	11.46	382.36	4.52	4.21	4.83	1.84
		50	36.01	11.65	390.03	4.70	4.34	4.88	1.87
		75	36.50	11.85	397.20	4.80	4.48	4.96	1.91
		100	37.13	12.06	405.51	4.97	4.61	5.06	1.95
		F	19.00*	27.67*	36.12*	89.03*	88.79*	23.16*	41.06*
		LSD_{05}	0.43	0.14	4.73	0.06	0.05	0.06	0.02

*** % of recommended dose**

Regarding the irrigation intervals, the results in Tables (6 and 7) reveal a significantly decreases in soil available N, P and K with increasing irrigation intervals from one to three weeks in the first season and from three to five weeks in the second one led to the decrease were 31.88, 9.98 and 325.12

ppm in the first season and 31.03, 10.12 and 304.26 ppm in the second one for N, P and K, respectively.

Table (7):Effect of different treatments on soil macro and micronutrients in the second season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Available macronutrients (ppm)			DTPA- extractable micronutrients (ppm)			
			N	P	K	Fe	Mn	Zn	Cu
without	3 week	0	39.09	13.71	438.09	5.51	5.11	5.17	1.88
		50	39.54	13.93	445.31	5.63	5.19	5.22	1.91
		75	40.11	14.14	452.55	5.79	5.26	5.26	1.95
		100	40.67	14.36	460.16	5.94	5.40	5.34	1.99
	4 weeks	0	34.30	11.74	364.58	4.39	3.50	4.38	1.58
		50	34.76	11.96	372.61	4.48	3.65	4.47	1.63
		75	35.10	12.15	381.85	4.76	4.17	4.66	1.68
		100	35.78	12.38	391.49	4.86	4.26	4.74	1.71
	5 weeks	0	30.21	9.76	291.18	3.27	2.56	3.85	1.25
		50	30.47	9.98	299.53	3.58	2.62	3.93	1.30
		75	30.81	10.23	309.59	3.69	2.71	4.00	1.33
		100	31.27	10.45	317.28	3.87	2.82	4.06	1.35
with	3 week	0	39.20	13.71	438.66	5.58	5.15	5.16	1.92
		50	39.65	13.95	446.50	5.73	5.19	5.23	1.96
		75	40.77	14.18	453.33	5.78	5.27	5.28	1.98
		100	41.57	14.37	462.15	5.95	5.43	5.38	2.01
	4 weeks	0	34.32	11.73	366.62	4.40	3.58	4.51	1.60
		50	34.99	11.93	374.65	4.55	3.77	4.57	1.64
		75	35.68	12.15	383.08	4.70	4.15	4.70	1.70
		100	36.02	12.46	389.95	5.00	4.36	4.83	1.72
	5 weeks	0	30.88	9.83	292.61	3.41	2.57	3.86	1.26
		50	31.22	10.02	300.75	3.49	2.62	3.91	1.32
		75	31.45	10.21	307.98	3.55	2.72	3.99	1.34
		100	31.91	10.45	315.20	3.68	2.83	4.03	1.36
Control			34.30	11.74	364.58	4.39	3.50	4.38	1.58
(A) Spraying ascobin		Without	35.17	12.07	377.02	4.65	3.94	4.59	1.63
		with	35.64	12.08	377.62	4.65	3.97	4.62	1.65
		F	NS	NS	NS	NS	NS	NS	NS
		LSD_{05}							
(B) Irrigation intervals		3 weeks	40.07	14.04	449.59	5.74	5.25	5.26	1.95
		4 weeks	35.12	12.06	378.10	4.64	3.93	4.61	1.66
		5 weeks	31.03	10.12	304.26	3.57	2.68	3.95	1.31
		F	2518.97*	2542.76*	2538.98*	2636.81*	2506.95*	2568.11*	2967.34*
		LSD_{05}	0.29	0.13	4.70	0.07	0.08	0.04	0.02
(C) Supper Phosphate		0	34.66	11.75	365.29	4.43	3.74	4.49	1.58
		50	35.10	11.96	373.23	4.58	3.84	4.55	1.63
		75	35.65	12.18	381.40	4.71	4.05	4.65	1.66
		100	36.20	12.41	389.37	4.88	4.18	4.73	1.69
		F	20.48*	31.84*	43.52*	103.76*	141.71*	30.34*	46.57*
		LSD_{05}	0.42	0.15	4.52	0.05	0.05	0.06	0.02

*** % of recommended dose**

Regarding superphosphate addition, the results show that increasing phosphorus levels from zero to 100 % of the recommended dose caused an increases in available N, P and K of the soil, the increases were 37.13, 12.06 and 405.51 ppm in the first season, and 36.20, 12.41 and 389.37 ppm in the second one, respectively.

Concerning spraying ascobin, data reveal that there is no wide variation between different treatments on available N, P and K of the soil.

Soil micronutrients.

Data in Tables (6 and 7) show that all different treatments led to change in the soil micronutrients concentration (Fe, Mn, Zn and Cu) at the end of the two seasons compared with the control. The maximum values of Fe, Mn, Zn and Cu concentrations were recorded by irrigation intervals every one week in the first season and three weeks in the second one with 100 % of recommended dose of phosphorus levels addition and spraying ascobin, where they increased by 24.95, 37.80, 16.05 and 24.04 % in the first season and 35.54, 55.14, 22.83 and 27.22 % in the second one, respectively. While, the minimum values of the concentration of soil micronutrients were obtained by irrigation intervals every three weeks in the first season and five weeks in the second one without phosphorus addition and spraying ascobin.

On the other hand, increasing irrigation intervals from one to three weeks in the first season and from three to five weeks in the second one led to significantly decreases in the concentration of Fe, Mn, Zn and Cu of the soil, the values were decreased from 5.60, 5.54, 5.41 and 212 ppm in the first season and 5.74, 5.25, 5.26 and 1.95 ppm in the second one, respectively, to be 3.75, 3.29, 4.40 and 1.65 ppm and 3.57, 2.68, 3.95 and 1.31 ppm in the first and second seasons, respectively. Also, increasing superphosphate addition from zero to 100 % of the recommended dose caused significantly increase in the concentrations of Fe, Mn, Zn and Cu of the soil. The increases were ranged from 4.52 to 4.97, 4.21 to 4.61, 4.83 to 5.06 and 1.84 to 1.95 ppm in the first season and from 4.43 to 4.88, 3.74 to 4.18, 4.49 to 4.73 and 1.58 to 1.69 ppm in the second one, respectively. Similar results were obtained by Fouda *et al.,* (2005), who reported that the concentration of heavy metals in the soil increased with application of phosphatic fertilizers. Non significant variation were detected with ascobin foliar application in the first and second seasons on soil micronutrients.

Effect of different treatments on chemical composition of plants.

Macronutrients concentrations and its uptake.

The results in Tables (8 and 9) indicate that all different treatments caused changes in the concentrations and uptake of macronutrients (N, P and K) in maize and wheat grains in the first and second seasons. The highest values of N, P and K concentrations and uptake were obtained by irrigation intervals every two or four weeks in the first and second seasons with 100 % of recommended dose of phosphorus addition and spraying ascobin, where the values increased by 5.38, 11.76, 9.71 % and 16.35, 23.70, 21.13 % of maize grains in the first season and 7.52, 14.00, 11.92 % and 21.04, 26.23, 24.06 % of wheat grains in the second one for the concentrations and uptake of N, P and K, respectively as compared with control. While, the lowest values were resulted by irrigation intervals every

three or five weeks in the first and second seasons with the same addition of phosphorus and ascobin.

Regarding to irrigation intervals, results reveal that the concentrations and uptake of N, P and K by maize and wheat grains were significantly decreased by increasing irrigation intervals to three or five weeks in the first and second seasons. The maximum values of N, P and K concentrations and uptake by maize and wheat plants were recorded by irrigation intervals every two or four weeks, the increases were 1.737, 0.522, 0.550 % and 50.52, 15.43, 16.36 Kg fed^{-1} for maize grains in the first season and 1.622, 0.474, 0.524 % and 39.05, 12.38, 13.68 Kg fed^{-1} for wheat grains in the second one, respectively. The minimum values of N, P and K concentrations and uptake were obtained by irrigation intervals every three or five weeks, which were 1.533, 0.406, 0.446 % and 41.25, 10.55, 11.48 Kg fed^{-1} for maize grains and 1.440, 0.352, 0.403 % and 30.52, 8.30, 9.35 Kg fed^{-1} for wheat grains. These results reveal that irrigation intervals every two or four weeks were more effective upon increase the concentrations and uptake of N, P and K, which take the following order : 2 weeks > 1 week > 3 weeks in the first season and 4 weeks > 3 weeks > 5 weeks in the second one. These results agree with Khamis (1987), who reported that increasing soil moisture content caused a highly significant increase in concentrations and uptake of N, P and K by broad bean seeds and shoots.

Regarding to superphosphate addition, the results declear that the concentrations and uptake of N, P and K by maize and wheat grains were increased by increasing phosphorus levels from zero to 100 % of recommended dose, where the highest values increased to 1.652, 0.472, 0.506 % and 47.02, 13.46, 14.39 Kg fed^{-1} and 1.546, 0.422, 0.472 % and 35.96, 10.47, 11.66 Kg fed^{-1} for maize and wheat grains, respectively. Similar conclusions were obtained by Hanna *et al.,* (1996) and Barsoom (1998), who found that NPK concentration and uptake in broad bean seeds and straw were increased due to phosphorus application to soil.

Concerning ascobin foliar application, the results in Tables (8 and 9) show that the concentrations and uptake of N, P and K of maize and wheat grains in the first and second seasons were significantly affected by spraying ascobin, where spraying ascobin increased the concentrations and uptake of N, P and K, which reached to 1.656, 0.477, 0.509 % and 47.57, 13.68, 14.60 Kg fed^{-1} of maize grains and reached to 1.551, 0.425, 0.475 % and 36.31, 10.62, 11.80 Kg fed^{-1} of wheat grains as compared with the treatments without spraying ascobin (untreated ones). These results may be due to ascobin foliar enhancing the accumulation of nontoxic metabolites (sugars, amino acids, proline and protein) and improving levels of N, P and K (Sheteawi, 2007). Similar results were obtained by Abd El-Aziz *et al.,* (2006), who reported that the percentage and uptake of N, P and K tended to increase by increasing the concentration of ascorbic acid up to 400 ppm as compared to the untreated ones.

Table (8): Effect of different treatments on macronutrients concentration (%) and uptake (Kg fed-1) of maize grains in the first season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	Concentration, %			Uptake, Kg fed-1		
			N	P	K	N	P	K
without	1 week	0	1.608	0.446	0.479	42.17	11.69	12.55
		50	1.618	0.453	0.486	43.84	12.22	13.11
		75	1.633	0.461	0.493	44.65	12.59	13.47
		100	1.638	0.463	0.498	45.41	12.95	13.91
	2 weeks	0	1.693	0.493	0.525	46.86	13.84	14.81
		50	1.709	0.502	0.533	48.03	14.31	15.24
		75	1.724	0.510	0.539	49.40	14.85	15.78
		100	1.727	0.517	0.545	49.54	15.07	15.96
	3 weeks	0	1.501	0.382	0.428	38.27	9.41	10.40
		50	1.506	0.387	0.433	38.64	9.58	10.58
		75	1.518	0.396	0.439	39.28	9.88	10.82
		100	1.523	0.397	0.440	40.07	10.14	11.11
with	1 week	0	1.644	0.467	0.500	45.82	13.10	14.04
		50	1.645	0.468	0.500	46.13	13.12	14.06
		75	1.654	0.473	0.506	47.27	13.52	14.45
		100	1.660	0.474	0.510	47.54	13.65	14.69
	2 weeks	0	1.739	0.527	0.553	50.83	15.63	16.46
		50	1.757	0.536	0.560	51.94	16.08	17.27
		75	1.767	0.543	0.569	53.04	16.56	17.39
		100	1.784	0.551	0.576	54.52	17.12	17.94
	3 weeks	0	1.532	0.411	0.449	41.70	10.76	11.67
		50	1.544	0.419	0.456	42.62	11.13	12.02
		75	1.560	0.424	0.461	44.35	11.61	12.52
		100	1.581	0.431	0.466	45.05	11.84	12.72
Control			1.693	0.493	0.525	46.86	13.84	14.81
(A) Spraying ascobin		Without	1.616	0.451	0.486	43.85	12.21	13.14
		with	1.656	0.477	0.509	47.57	13.68	14.60
		F	580.22*	574.73*	585.68*	581.66*	602.15*	551.10*
		LSD_{05}	0.007	0.005	0.004	0.66	0.26	0.27
(B) Irrigation intervals		1 week	1.638	0.463	0.496	45.35	12.85	13.78
		2 weeks	1.737	0.522	0.550	50.52	15.43	16.36
		3 weeks	1.533	0.406	0.446	41.25	10.55	11.48
		F	1176.34*	1157.89*	1153.98*	1163.49*	1156.87*	1173.25*
		LSD_{05}	0.010	0.006	0.005	0.44	0.23	0.23
(C) Supper Phosphate		0	1.620	0.454	0.489	44.27	12.40	13.32
		50	1.630	0.461	0.495	45.20	12.74	13.71
		75	1.643	0.468	0.501	46.33	13.17	14.07
		100	1.652	0.472	0.506	47.02	13.46	14.39
		F	9.87*	39.05*	28.46*	97.80*	177.39*	150.45*
		LSD_{05}	0.013	0.004	0.004	0.35	0.10	0.11

*** % of recommended dose**

Table (9): Effect of different treatments on macronutrients concentration (%) and uptake (Kg fed-1) of wheat grains in the second season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	Concentration, %			Uptake, Kg fed-1		
			N	P	K	N	P	K
without	3 week	0	1.496	0.391	0.441	33.07	8.69	9.79
		50	1.505	0.398	0.448	33.49	9.05	9.97
		75	1.517	0.407	0.456	34.04	9.12	10.23
		100	1.528	0.412	0.463	34.91	9.46	10.58
	4 weeks	0	1.569	0.443	0.495	35.51	10.98	12.26
		50	1.581	0.452	0.503	36.46	11.38	12.66
		75	1.592	0.461	0.511	37.27	11.75	13.04
		100	1.608	0.468	0.518	38.44	12.15	13.41
	5 weeks	0	1.410	0.328	0.381	28.51	7.48	8.52
		50	1.417	0.335	0.388	29.03	7.72	8.75
		75	1.427	0.342	0.394	29.62	7.94	8.97
		100	1.430	0.344	0.396	29.90	8.04	9.08
with	3 week	0	1.531	0.415	0.465	35.63	9.69	10.86
		50	1.534	0.415	0.465	35.67	9.75	10.89
		75	1.539	0.421	0.470	35.89	9.82	10.97
		100	1.550	0.427	0.477	36.73	10.14	11.36
	4 weeks	0	1.623	0.478	0.528	39.39	12.57	13.89
		50	1.645	0.488	0.536	40.67	13.04	14.33
		75	1.671	0.495	0.545	41.68	13.34	14.68
		100	1.687	0.505	0.554	42.98	13.86	15.21
	5 weeks	0	1.443	0.355	0.406	30.81	8.42	9.46
		50	1.454	0.362	0.412	31.44	8.67	9.71
		75	1.464	0.370	0.420	32.04	8.92	9.98
		100	1.474	0.376	0.427	32.79	9.19	10.29
Control			1.569	0.443	0.495	35.51	10.98	12.26
(A) Spraying ascobin		Without	1.507	0.398	0.449	33.36	9.48	10.61
		with	1.551	0.425	0.475	36.31	10.62	11.80
		F	558.76*	496.01*	545.80*	587.20*	600.20*	576.84*
		LSD_{05}	0.008	0.005	0.005	0.52	0.20	0.21
(B) Irrigation intervals		3 weeks	1.525	0.411	0.461	34.93	9.47	10.58
		4 weeks	1.622	0.474	0.524	39.05	12.38	13.68
		5 weeks	1.440	0.352	0.403	30.52	8.30	9.35
		F	1146.79*	1137.60*	1138.13*	1157.19*	1159.28*	1152.09*
		LSD_{05}	0.009	0.006	0.006	0.41	0.20	0.21
(C) Supper Phosphate		0	1.512	0.402	0.453	33.82	9.64	10.80
		50	1.523	0.409	0.459	34.46	9.94	11.05
		75	1.535	0.416	0.466	35.09	10.15	11.31
		100	1.546	0.422	0.472	35.96	10.47	11.66
		F	12.14*	58.56*	47.81*	93.77*	167.11*	146.17*
		LSD_{05}	0.012	0.003	0.003	0.27	0.08	0.09

*** % of recommended dose**

Micronutrient concentrations and its uptake.

Results in Tables (10 and 11) indicate that all different treatments led to changes in the concentrations and uptake of micronutrients (Fe, Mn, Zn and Cu) of maize and wheat grains. The highest values of Fe, Mn, Zn and Cu concentration and uptake were recorded by irrigation intervals every two or four weeks in the first and second seasons with spraying ascobin and without

phosphorus addition, the values were increased by 6.53, 5.75, 3.90, 4.25 mg Kg^{-1} and 12.45, 11.70, 9.71, 11.54 g fed^{-1} for maize grains compared with control. The concentration and uptake of wheat grains increased by 6.04, 5.28, 5.19, 3.77 mg Kg^{-1} and 14.16, 13.38, 13.27, 11.85 g fed^{-1}, respectively compared with control.

Regarding the irrigation intervals, the results reveal that the concentration and uptake of micronutrients (Fe, Mn, Zn and Cu) were significantly decreased with increasing irrigation intervals, where the maximum values were recorded by irrigation intervals every two and four weeks in the first and second seasons, where the values were increased to 127.17, 49.99, 76.22, 11.63 mg Kg^{-1} and 40.01, 15.73, 23.97, 5.04 g fed^{-1} for maize grains and 152.74, 37.36, 71.70, 10.68 mg Kg^{-1} and 39.58, 9.68, 18.58, 2.77 g fed^{-1} for wheat grains. The minimum values were recorded every three and five weeks in the 1^{st} and 2^{nd} season. These results means that the irrigation intervals every two weeks in the first season and four weeks in the second one were more effective than one or three weeks in the first season and three or five weeks in the second one upon increasing the concentration and uptake of micronutrients (Fe, Mn, Zn and Cu), which take the order: 2 weeks > 1 week > 3 weeks in the first season and 4 weeks > 3 weeks > 5 weeks in the second one. Similar conclusion was obtained by El-Naggar *et al.,* (1991), who found that the concentration and uptake of micro elements in grain and straw of wheat increased as soil moisture stress decreased.

Concerning superphosphate addition, the results show that the values of Fe, Mn, Zn and Cu concentrations and uptake by maize and wheat plants were significantly decreased by increasing phosphorus levels from zero to 100 % of the recommended dose. The highest values are 116.28, 46.28, 72.28, 11.05 mg Kg^{-1} and 32.55, 12.93, 20.12, 4.12 g fed^{-1} for maize grains and 139.65, 34.85, 66.76, 10.14 mg Kg^{-1} and 33.70, 8.14, 15.60, 2.36 g fed^{-1} for wheat grains, which obtained without superphosphate addition. The lowest values are 112.67, 45.08, 70.94, 10.79 mg Kg^{-1} and 30.20, 12.05, 18.89, 3.80 g fed^{-1} for maize grains and 135.14, 34.02, 65.13, 9.96 mg Kg^{-1} and 31.69, 7.70, 14.75, 2.25 g fed^{-1} for wheat grains, which obtained by added 100 % of phosphorus levels in the first and second seasons. These results agree with Barsoom (1998) and Fouda *et al.,* (2005) which detected a significant reduction decrease of Cu, Zn and Mn uptake by increasing phosphorus fertilizers.

Table (10): Effect of different treatments on DTPA- extractable metals (mg Kg-1) and uptake (g fed-1) of maize grains in the first season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	DTPA- extractable micronutrients (mg Kg-1)				Uptake micronutrients, g fed-1			
			Fe	Mn	Zn	Cu	Fe	Mn	Zn	Cu
without	1 week	0	113.42	45.23	71.23	10.87	30.59	12.20	19.21	3.89
		50	112.16	44.71	70.70	10.78	29.41	11.72	18.54	3.77
		75	111.19	44.60	70.43	10.71	29.13	11.66	18.35	3.79
		100	110.64	44.27	70.09	10.65	27.99	11.23	17.76	3.54
	2 weeks	0	125.39	49.41	75.66	11.54	39.27	15.47	23.69	4.94
		50	123.68	48.86	75.07	11.41	37.97	15.00	23.05	4.83
		75	122.32	48.27	74.45	11.32	37.07	14.63	22.56	4.76
		100	121.07	47.74	73.89	11.25	35.88	14.15	21.90	4.46
	3 weeks	0	100.72	41.11	66.73	10.24	22.04	9.00	14.60	2.87
		50	99.25	40.73	66.18	9.83	21.54	8.84	14.36	2.85
		75	97.56	40.24	65.56	9.78	21.01	8.66	14.12	2.82
		100	96.64	39.98	65.31	9.74	20.59	8.52	13.92	2.69
with	1 week	0	118.11	46.74	72.82	11.09	33.75	13.36	20.81	4.26
		50	116.70	46.36	72.37	11.03	32.75	13.00	20.28	4.18
		75	116.63	46.33	72.33	11.03	32.64	12.96	20.15	4.21
		100	116.44	46.24	72.25	11.00	32.50	12.88	20.13	4.06
	2 weeks	0	133.58	52.25	78.61	12.03	44.16	17.28	25.99	5.51
		50	132.01	51.69	77.85	11.93	42.94	16.81	25.32	5.41
		75	130.45	51.12	77.43	11.81	41.85	16.40	24.84	5.33
		100	128.87	50.56	76.84	11.73	40.95	16.07	24.42	5.07
	3 weeks	0	106.43	42.90	68.63	10.53	25.46	10.26	16.42	3.27
		50	105.03	42.46	68.16	10.48	24.69	9.98	16.02	3.21
		75	103.42	42.06	67.69	10.41	23.29	9.48	15.29	3.08
		100	102.35	41.69	67.29	10.37	23.28	9.47	15.25	2.99
Control			125.39	49.41	75.66	11.54	39.27	15.47	23.69	4.94
(A) Spraying ascobin		Without	111.17	44.60	70.44	10.68	29.37	11.76	18.50	3.77
		with	117.50	46.70	72.69	11.12	33.19	13.16	20.41	4.22
		F	584.37*	582.05*	576.40*	590.15*	581.14*	567.73*	578.06*	600.98*
		LSD_{05}	1.13	0.38	0.40	0.08	0.68	0.25	0.34	0.08
(B) Irrigation intervals		1 week	114.41	45.56	71.53	10.90	31.09	12.38	19.40	3.96
		2 weeks	127.17	49.99	76.22	11.63	40.01	15.73	23.97	5.04
		3 weeks	101.43	41.40	66.94	10.17	22.74	9.28	15.00	2.97
		F	1160.42*	1160.49*	1159.83*	143.37	1159.88*	1173.62*	1165.60*	1130.12*
		LSD_{05}	1.23	0.41	0.44	0.07	0.83	0.31	0.43	0.10
(C) Supper Phosphate		0	116.28	46.28	72.28	11.05	32.55	12.93	20.12	4.12
		50	114.81	45.80	71.72	10.91	31.55	12.56	19.60	4.04
		75	113.59	45.44	71.32	10.84	30.83	12.30	19.22	4.00
		100	112.67	45.08	70.94	10.79	30.20	12.05	18.89	3.80
		F	24.67*	16.52*	8.38*	14.03*	137.29*	120.02*	97.06*	154.99*
		LSD_{05}	0.90	0.36	0.57	0.09	0.25	0.10	0.15	0.03

* % of recommended dose

Table (11): Effect of different treatments on DTPA- extractable metals (mg Kg-1) and uptake (g fed-1) of wheat grains in the second season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	DTPA- extractable micronutrients (mg Kg-1)				Uptake micronutrients, g fed-1			
			Fe	Mn	Zn	Cu	Fe	Mn	Zn	Cu
without	3 week	0	136.64	34.16	65.53	10.01	30.40	7.60	14.58	2.23
		50	134.48	33.82	64.87	9.94	29.72	7.48	14.32	2.20
		75	133.44	33.69	64.47	9.89	29.64	7.45	14.30	2.19
		100	132.90	33.47	64.12	9.87	28.88	7.27	13.94	2.14
	4 weeks	0	150.90	36.96	70.92	10.60	38.48	9.42	18.08	2.70
		50	149.07	36.59	70.25	10.53	37.51	9.21	17.68	2.65
		75	147.37	36.20	69.54	10.43	36.48	8.96	17.21	2.58
		100	145.55	35.84	68.85	10.37	35.16	8.69	16.67	2.51
	5 weeks	0	120.63	31.38	59.85	9.37	26.81	6.18	11.80	1.85
		50	118.81	31.09	59.10	9.30	26.13	6.04	11.49	1.81
		75	117.08	30.77	58.59	9.24	25.63	5.94	11.30	1.78
		100	115.43	30.52	58.04	9.19	25.13	5.84	11.11	1.76
with	3 week	0	141.99	35.16	67.37	10.23	32.88	8.18	15.68	2.37
		50	140.35	34.89	66.95	10.16	32.88	8.14	15.60	2.37
		75	140.20	34.88	66.86	10.15	32.58	8.11	15.55	2.36
		100	139.83	34.83	66.83	10.15	32.55	8.08	15.52	2.36
	4 weeks	0	160.02	38.91	74.60	11.00	43.93	10.68	20.48	3.02
		50	158.21	38.53	73.88	10.92	42.62	10.38	19.90	2.94
		75	156.40	38.13	73.15	10.84	41.82	10.20	19.56	2.90
		100	154.37	37.73	72.36	10.76	40.63	9.93	19.04	2.83
	5 weeks	0	127.74	32.53	62.28	9.65	29.69	6.79	12.99	2.01
		50	125.98	32.23	61.67	9.56	28.96	6.63	12.69	1.97
		75	123.93	31.92	61.06	9.50	28.23	6.49	12.41	1.93
		100	122.74	31.72	60.57	9.45	27.78	6.39	12.20	1.90
Control			150.90	36.96	70.92	10.60	38.48	9.42	18.08	2.70
(A) Spraying ascobin		Without	133.53	33.71	64.51	9.90	30.83	7.51	14.37	2.20
		with	140.98	35.12	67.30	10.20	34.55	8.33	15.97	2.41
		F	584.11*	562.04*	580.82*	545.26*	584.79*	563.30*	579.36*	575.81*
		LSD_{05}	1.33	0.26	0.50	0.06	0.66	0.15	0.29	0.04
(B) Irrigation intervals		3 weeks	137.48	34.36	65.88	10.05	31.19	7.79	14.94	2.28
		4 weeks	152.74	37.36	71.70	10.68	39.58	9.68	18.58	2.77
		5 weeks	121.54	31.52	60.15	9.41	27.30	6.29	12.00	1.88
		F	1164.83*	1163.70*	1165.73*	1139.14*	1158.93*	1161.13*	1156.01*	1259.14*
		LSD_{05}	1.49	0.28	0.55	0.06	0.60	0.16	0.32	0.04
(C) Supper Phosphate		0	139.65	34.85	66.76	10.14	33.70	8.14	15.60	2.36
		50	137.82	34.52	66.12	10.07	32.97	7.98	15.28	2.32
		75	136.40	34.27	65.61	10.01	32.40	7.86	15.06	2.29
		100	135.14	34.02	65.13	9.96	31.69	7.70	14.75	2.25
		F	26.43*	14.10*	14.83*	7.60*	91.70*	73.62*	75.97*	56.92*
		LSD_{05}	1.08	0.27	0.52	0.08	0.26	0.06	0.12	0.02

*** % of recommended dose**

Concerning ascobin foliar of maize and wheat plants, the results indicate that the concentration and uptake by maize and wheat grains of Fe, Mn, Zn and Cu were significantly increased with twice spraying ascobin by

the rate of 2 g/1.5 L. water for maize and wheat plants as compared with the treatments without spraying ascobin (untreated plants). The values of Fe, Mn, Zn and Cu concentration and uptake increased to 117.50, 46.70, 72.69, 11.12 mg Kg^{-1} and 33.19, 13.16, 20.41, 4.22 g fed^{-1} for maize grains and 140.98, 35.12, 67.30, 10.20 mg Kg^{-1} and 34.55, 8.33, 15.97, 2.41 g fed^{-1} for wheat grains, respectively, for the above mentioned micronutrients.

Effect of different treatments on growth characters, yield and yield components.

Most of the recorded growth characters of maize and wheat plants were significantly affected by irrigation intervals, phosphorus and ascobin foliar application. Results in Tables (12 and 13) show that the increase in maize grains yield reached to 40.61 %, while the increases in wheat grains and straw yield reached to 40.51 and 20.84 % compared with control.

Results of Tables (12 and 13) revealed that irrigation every two weeks with 100 % addition of the recommended dose of phosphorus and foliar ascobin application gave the highest values of maize grain yield which reached to 3.2077 ton/fed. in the first season. While, wheat grain and straw yield were 3.4307 and 4.4535 ton/fed. in the second season, which obtained by the same treatment except the irrigation intervals was every four weeks. However, the same treatments gave the highest values in plant height, ear length, ear diameter, number of rows per ear, number of kernels per row, 100 seed weight and dry matter of maize in the first season and in plant height, spike length, 1000 seed weight, dry matter and harvest index of wheat in the second season.

Results show that all growth characters, yield and yield components were significantly decreased by increasing irrigation intervals. The highest value of relative increasing grain yield of maize or grain and straw yield of wheat were recorded by irrigation intervals every two and four weeks, which were 20.77 % for maize grains, 20.13 and 10.64 % for wheat grains and straw, respectively. The lowest values of relative increasing grain yield of maize or grain and straw yield of wheat were recorded by irrigation intervals every three or five weeks in the first and second seasons, which were 4.90 % for maize grains, 7.66 and 4.48 % for wheat grains and straw, respectively. The other growth characters, yield and yield components take the same trend, where irrigation intervals every two weeks for maize or four weeks for wheat were more effective than the other irrigation intervals, which take the order: 2 weeks > 1 week > 3 weeks in the first season and 4 weeks > 3 weeks > 5 weeks in the second one. Similar results were obtained by Refaat and Saleh (1997) on sweet basil plant and Kandeel (2001) on *Rosmarinus officinalis L*., they reported that the plant growth was reduced by increasing irrigation intervals.

Table (13): Effect of different treatments on wheat yield and its components in the second season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	Biological yield, ton/fed	Grain yield, ton/fed	Straw yield, ton/fed	Plant height, cm	Spike length, cm	1000 Seed weight, g	Dry matter g/10 plants after 90 days	* R.I.Y., %		Harvest Index,%
										Grain	Straw	
without	3 week	0	6.1409	2.4681	3.6728	95.60	10.73	47.57	19.04	1.09	-0.64	40.19
		50	6.1513	2.4728	3.6785	96.16	10.82	48.77	19.23	1.28	-0.49	40.20
		75	6.1638	2.4793	3.6845	96.81	10.91	49.49	19.32	1.55	-0.33	40.22
		100	6.1739	2.4844	3.6895	97.62	10.94	50.68	19.54	1.76	-0.19	40.24
	4 weeks	0	6.1381	2.4415	3.6965	96.30	10.89	48.90	19.32	0.00	0.00	39.78
		50	6.2576	2.5060	3.7517	97.06	10.97	49.38	19.85	2.64	1.49	40.05
		75	6.4000	2.5707	3.8293	97.51	11.09	50.00	19.92	5.29	3.59	40.17
		100	6.4700	2.5998	3.8701	97.85	11.15	50.16	20.08	6.48	4.70	40.18
	5 weeks	0	6.1134	2.4340	3.6795	93.69	10.71	46.90	18.69	-0.31	-0.46	39.81
		50	6.1249	2.4391	3.6857	95.32	10.80	48.15	18.81	-0.10	-0.29	39.82
		75	6.1429	2.4486	3.6944	97.07	10.86	48.59	19.00	0.29	-0.06	39.86
		100	6.1576	2.4591	3.6984	98.60	10.93	49.11	19.29	0.72	0.05	39.94
with	3 week	0	7.1462	2.9449	4.2014	99.83	11.47	53.60	21.80	20.62	13.66	41.21
		50	7.2411	3.0013	4.2398	100.42	11.54	54.66	21.95	22.93	14.70	41.45
		75	7.3460	3.0766	4.2694	100.76	11.62	55.16	22.19	26.01	15.50	41.88
		100	7.4861	3.1783	4.3078	101.05	11.71	55.40	22.41	30.18	16.54	42.46
	4 weeks	0	7.5772	3.2440	4.3332	101.42	11.79	56.35	22.65	32.87	17.22	42.81
		50	7.6760	3.3065	4.3696	101.87	11.87	57.74	22.81	35.43	18.21	43.08
		75	7.7800	3.3649	4.4151	102.69	11.93	58.52	23.21	37.82	19.44	43.25
		100	7.8842	3.4307	4.4535	103.44	12.01	59.55	23.56	40.51	20.48	43.51
	5 weeks	0	6.6304	2.7095	3.9209	98.17	11.17	50.67	20.44	10.98	6.07	40.86
		50	6.7864	2.7889	3.9974	98.48	11.28	51.38	20.67	14.23	8.14	41.10
		75	6.9380	2.8485	4.0895	98.98	11.34	52.24	21.07	16.67	10.63	41.06
		100	7.0331	2.9012	4.1319	99.13	11.41	52.83	21.32	18.83	11.78	41.25
Control			6.1381	2.4415	3.6965	96.30	10.89	48.90	19.32	0.00	0.00	39.78
(A) Spraying ascobin		Without	6.2029	2.4836	3.7192	96.63	10.90	48.97	19.34	1.72	0.61	40.04
		with	7.2937	3.0663	4.2275	100.52	11.59	54.84	22.01	25.59	14.36	41.99
		F	86.5627	87.1902	86.1462	73.50	84.12	84.65	578.05*	687.06	584.29	588.75*
		LSD_{05}	0.1935	0.1035	0.0901	0.70	0.12	1.04	0.48	4.24	2.45	0.35
(B) Irrigation intervals		3 weeks	6.7312	2.7632	3.9680	98.53	11.22	51.92	20.68	13.18	7.34	40.98
		4 weeks	7.0229	2.9330	4.0899	99.77	11.46	53.82	21.43	20.13	10.64	41.60
		5 weeks	6.4908	2.6286	3.8622	97.43	11.06	49.98	19.91	7.66	4.48	40.46
		F	08.8855	68.4231	37.8452	88.66	44.34	39.85	990.01*	765.45	335.74*	549.41*
		LSD_{05}	0.0307	0.0179	0.0127	0.13	0.02	0.22	0.08	0.74	0.35	0.07
(C) Supper Phosphate		0	6.6244	2.7070	3.9174	97.50	11.13	50.67	20.32	10.87	5.97	40.78
		50	6.7062	2.7524	3.9538	98.22	11.21	51.68	20.55	12.73	6.96	40.95
		75	6.7951	2.7981	3.9970	98.97	11.29	52.33	20.78	14.60	8.13	41.07
		100	6.8675	2.8423	4.0252	99.61	11.36	52.95	21.03	16.41	8.89	41.26
		F	32.8064*	39.5104*	8.9264*	11.36*	10.23*	48.13*	29.34*	550.24*	374.68*	3.20*
		LSD_{05}	0.0531	0.0218	0.0313	0.78	0.09	0.41	0.16	0.17	0.10	0.33

*** % of recommended dose**

With respect to superphosphate addition, the results show that all growth characters, yield and yield components were significantly increased by increasing phosphorus levels from zero to 100 % of recommended dose. The mean values of relative increasing grain yield of maize and grain and straw yield of wheat were differ between 8.66 and 14.68, 10.87 and 16.41, 5.97 and 8.89 %, respectively. The other growth characters, yield and yield components take the same trend. Similar results were obtained by Hussain *et al.,* (2008) and Alias *et al.,* (2003).

With respect to foliar ascobin application, data reveal that all growth characters, yield and yield components were significantly affected by spraying ascobin by two equal doses (2 g/1.5 L water). The mean values of relative increasing grain yield of maize were increased from 0.83 to 22.43 % by spraying ascobin in the first season, while in the second season, the mean values were increased from 1.72 to 25.59 % of wheat grains and from 0.61 to 14.36 % of wheat straw by spraying ascobin. The same trend was found with other characters under study for maize and wheat plants. Similar results were obtained by Abd El-Aziz *et al.,* (2006) and El-Bassiouny *et al.,* (2005), they reported that all growth parameters tended to increase as a result of foliar spray with ascorbic acid.

Estimation of the net treatment costs.

The obtained results in Table (14) indicate that the highest net revenue value (4455.64 LE/fed.) was incorporated with the combination consists of irrigation intervals every two weeks in the first season and every four weeks in the second one at 100 % of the recommended dose of phosphorus in both seasons with foliar application by ascobin, which was the best treatment and should be recommended to obtain high net revenue comparing to the other treatments.

However, it can be noticed from Table (14) that reducing or increasing irrigation intervals than the recommended period led to decreasing the yield of maize and wheat in the first and second seasons, consequently, decreasing the net revenue values. Moreover, the net revenue values were increased by increasing the addition rate of phosphorus fertilizer and by using ascobin as foliar application.

Table (14): The net revenue * (LE/fed.) due to different treatments through the two growing seasons under study.

Spraying ascobin	** Irrigation intervals	*** Super-phosphate	Increasing yield Ton/fed.			Total yield price, LE/fed.			Net revenue LE/fed.
			Maize grain	Wheat grain	Wheat straw	Maize grain	Wheat grain	Wheat straw	
without	1 or 3	0	-0.0291	0.0266	-0.0237	-49.47	61.18	-18.96	-7.25
		50	-0.0124	0.0313	-0.0180	-21.08	71.99	-14.40	36.51
		75	-0.0038	0.0378	-0.0120	-6.46	86.94	-9.60	70.88
		100	0.0033	0.0429	-0.0070	5.61	98.67	-5.60	98.68
	2 or 4	0	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
		50	0.0698	0.0645	0.0552	118.66	148.35	44.16	311.17
		75	0.1498	0.1292	0.1328	254.66	297.16	106.24	658.06
		100	0.2263	0.1583	0.1736	384.71	364.09	138.88	887.68
	3 or 5	0	-0.0613	-0.0075	-0.0170	-104.21	-17.25	-13.60	-135.06
		50	-0.0497	-0.0024	-0.0108	-84.49	-5.52	-8.64	-98.65
		75	-0.0385	0.0071	-0.0021	-65.45	16.33	-1.68	-50.80
		100	-0.0259	0.0176	0.0019	-44.03	40.48	1.52	-2.03
with	1 or 3	0	0.3329	0.5034	0.5049	565.93	1157.82	403.92	2127.67
		50	0.3814	0.5598	0.5433	648.38	1287.54	434.64	2370.56
		75	0.4435	0.6351	0.5729	753.95	1460.73	458.32	2673.00
		100	0.5671	0.7368	0.6113	964.07	1694.64	489.04	3147.75
	2 or 4	0	0.7041	0.8025	0.6367	1196.97	1845.75	509.36	3552.08
		50	0.8271	0.8650	0.6731	1406.07	1989.50	538.48	3934.05
		75	0.8865	0.9234	0.7186	1507.05	2123.82	574.88	4205.75
		100	0.9264	0.9892	0.7570	1574.88	2275.16	605.60	4455.64
	3 or 5	0	0.2384	0.2680	0.2244	405.28	616.40	179.52	1201.20
		50	0.2422	0.3474	0.3009	411.74	799.02	240.72	1451.48
		75	0.2773	0.4070	0.3930	471.41	936.10	314.40	1721.91
		100	0.3126	0.4597	0.4354	531.42	1057.31	348.32	1937.05

*** = (Yield of treatment - control) - the cost of the treatment**

The price of yield and the costs of different treatments were calculated as subsidized price of 2008 and 2009.

**** = one, two and three weeks in the first season and three, four and five weeks for the second one**

***** = % of recommended dose**

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تأثير فترات الري ومستويات من الفوسفور والرش بحمض الاسكوربيك والستريك (اسكوبين) علي محصولي الذرة والقمح وبعض خصائص التربة .

الحسيني إبراهيم المداح ، منصور الدسوقي السوداني و احمد عبد العزيز محمود
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اجريت تجارب حقليه علي ارض طينيه في مزرعه محطه البحوث الزراعيه بالجميزه ، محافظه الغربيه خلال موسمي صيفي 2010 وشتوي 2011/2010 وذلك لدراسه تأثير ثلاث فترات ري مع معدلات من الفوسفور والرش بالاسكوبين (حامض الاسكوربيك والستريك) وذلك علي النمو ومحصولي الذره والقمح وبعض صفات التربه ، بالاضافه الي اجراء الدراسه الاقتصاديه بهدف تحديد افضل معامله لتحقيق اعلي صافي دخل مزرعي.

ويمكن تلخيص النتائج المتحصل عليها كالتالي:-

1- أدت زياده فترات الري الي زياده معنويه في قيم الكثافه الظاهريه وكفاءه استخدام المياه ، بينما قيم المساميه الكليه للتربه والتوصيل الهيدروليكي ومحتوي التربه من الرطوبه قبل الحصاد والاستهلاك المائي اخذت الاتجاه العكسي وذلك خلال موسمي النمو.

2- أدي تقليل فترات الري الي نقص معنوي في قيم رقم الحموضه والتوصيل الكهربي والكاتيونات والانيونات الذائبه ونسبه الاملاح الكليه الذائبه ونسبه الصوديوم المدمص، وزياده معنويه في صلاحيه عناصر التربه (النتروجين والفوسفور والبوتاسيوم والحديد والمنجنيز والزنك والنحاس).

3- أدت زياده معدلات اضافه الفوسفور الي زياده معنويه في كفاءه استخدام المياه والمحصول ومكوناته وكذلك التوصيل الكهربي وصلاحيه العناصر الكبري والصغري في التربه وكذلك تركيزاتها وامتصاصها في الحبوب في كلا الموسمين.

4- أدي اضافه الاسكوبين بالرش الي زياده معنويه في قيم الاستهلاك المائي وكفاءه استخدام المياه، وزياده تركيز وامتصاص العناصر الكبري والصغري (النتروجين والفوسفور والبوتاسيوم والحديد والمنجنيز والزنك والنحاس) في حبوب الذره والقمح وكذلك زياده المحصول ومكوناته. بينما لم يكن للرش بالاسكوبين اي تأثير علي الخواص الطبيعيه او الكيميائية للتربه.

5- أوضحت الدراسه الاقتصاديه ان الري كل اسبوعين في الموسم الاول في حالة محصول الذره وكل اربعه اسابيع في الموسم الثاني في حالة محصول القمح مع 100% من الموصي به للتسميد الفوسفاتي والرش بالاسكوبين في كلا الموسمين هي احسن معامله من الوجهة الاقتصادية.

قام بتحكيم البحث

أ.د / محمد وجدى العجرودى	**كلية الزراعة – جامعة المنصورة**
أ.د / كرم فؤاد موسى	**كلية الزراعة – جامعة الزقازيق**

Table (4):Effect of different treatments on some soil chemical properties in the first season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Soil pH 1:2.5 susp.	EC, dSm^{-1}	Soluble cations, meq/l				Soluble anions, meq/l				TSS,%	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
without	1 week	0	7.65	2.49	8.70	6.77	9.02	0.33	0.00	5.29	10.63	8.90	0.09	3.24
		50	7.64	2.53	8.75	6.97	9.13	0.34	0.00	4.82	11.25	9.11	0.09	3.26
		75	7.63	2.56	8.83	7.04	9.30	0.35	0.00	4.47	11.75	9.30	0.11	3.30
		100	7.62	2.61	8.93	7.09	9.64	0.36	0.00	4.23	12.25	9.52	0.12	3.41
	2 weeks	0	7.74	2.65	8.80	7.07	10.17	0.35	0.00	4.94	12.50	8.95	0.10	3.61
		50	7.73	2.67	8.90	7.12	10.32	0.36	0.00	4.59	12.88	9.23	0.11	3.65
		75	7.72	2.70	9.00	7.17	10.51	0.36	0.00	4.12	13.25	9.67	0.12	3.70
		100	7.71	2.73	9.05	7.27	10.63	0.37	0.00	3.65	13.63	10.04	0.12	3.72
	3 weeks	0	7.83	2.79	8.85	7.17	11.38	0.37	0.00	4.47	13.14	10.16	0.11	4.02
		50	7.82	2.83	8.95	7.22	11.64	0.38	0.00	4.23	13.38	10.58	0.12	4.10
		75	7.81	2.87	9.00	7.37	11.81	0.39	0.00	4.00	13.88	10.69	0.13	4.13
		100	7.80	2.92	9.15	7.47	12.11	0.41	0.00	3.65	14.04	11.44	0.14	4.20
with	1 week	0	7.64	2.47	8.70	6.75	8.95	0.33	0.00	5.35	10.59	8.79	0.08	3.22
		50	7.63	2.51	8.75	7.00	9.02	0.35	0.00	5.15	11.25	8.71	0.09	3.21
		75	7.61	2.55	8.85	7.05	9.27	0.36	0.00	4.76	12.00	8.76	0.11	3.29
		100	7.60	2.58	8.95	7.15	9.42	0.36	0.00	4.41	12.50	8.98	0.12	3.32
	2 weeks	0	7.73	2.63	8.80	7.05	10.21	0.36	0.00	4.76	12.50	9.16	0.09	3.63
		50	7.72	2.66	8.88	7.08	10.40	0.37	0.00	4.41	12.75	9.55	0.10	3.68
		75	7.71	2.69	8.99	7.12	10.54	0.38	0.00	4.17	13.13	9.72	0.11	3.71
		100	7.70	2.72	9.05	7.20	10.70	0.38	0.00	3.82	13.50	10.01	0.13	3.75
	3 weeks	0	7.82	2.77	8.85	7.15	11.20	0.38	0.00	4.29	12.88	10.41	0.11	3.96
		50	7.81	2.81	8.93	7.33	11.37	0.39	0.00	4.06	13.25	10.71	0.12	3.99
		75	7.80	2.86	9.05	7.40	11.62	0.40	0.00	3.94	13.63	10.91	0.13	4.05
		100	7.79	2.91	9.15	7.45	11.97	0.41	0.00	3.70	13.88	11.40	0.14	4.16
Control			7.74	2.65	8.80	7.07	10.17	0.35	0.00	4.94	12.50	8.95	0.10	3.61
(A) Spraying ascobin		Without	7.72	2.70	8.91	7.14	10.47	0.36	0.00	4.37	12.71	9.80	0.11	3.69
		with	7.71	2.68	8.91	7.14	10.39	0.37	0.00	4.40	12.65	9.76	0.11	3.66
		F	NS	NS									NS	NS
		LSD_{05}												
(B) Irrigation intervals		1 week	7.63	2.54	8.81	6.98	9.22	0.35	0.00	4.81	11.53	9.01	0.10	3.28
		2 weeks	7.72	2.68	8.93	7.13	10.43	0.37	0.00	4.31	13.02	9.54	0.11	3.68
		3 weeks	7.81	2.85	8.99	7.32	11.64	0.39	0.00	4.04	13.51	10.79	0.13	4.08
		F	1843.15*	1840.94*									90.76*	2576.81*
		LSD_{05}	0.01	0.01									0.00	0.03
(C) Supper Phosphate		0	7.73	2.63	8.78	6.99	10.15	0.36	0.00	4.85	12.04	9.40	0.10	3.61
		50	7.72	2.67	8.86	7.12	10.31	0.36	0.00	4.54	12.46	9.65	0.11	3.65
		75	7.71	2.71	8.95	7.19	10.51	0.37	0.00	4.24	12.94	9.84	0.12	3.70
		100	7.70	2.75	9.05	7.27	10.75	0.38	0.00	3.91	13.30	10.23	0.13	3.76
		F	NS	19.01*									361.86*	17.03*
		LSD_{05}		0.03									0.002	0.04

*** % of recommended dose**

Table (5): Effect of different treatments on some soil chemical properties in the second season

Spraying ascobin	Irrigation intervals	* Super-phosphate	Soil pH 1:2.5 susp.	EC, dSm^{-1}	Soluble cations, meq/l				Soluble anions, meq/l				TSS, %	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
without	3 week	0	7.59	2.38	8.14	7.09	8.40	0.25	0.00	5.17	10.78	7.92	0.08	3.04
		50	7.58	2.41	8.19	7.14	8.59	0.26	0.00	4.94	11.15	8.09	0.09	3.10
		75	7.57	2.45	8.29	7.19	8.85	0.27	0.00	4.82	11.65	8.12	0.10	3.18
		100	7.56	2.49	8.44	7.19	9.10	0.28	0.00	4.59	12.15	8.26	0.12	3.25
	4 weeks	0	7.69	2.53	8.14	7.24	9.76	0.27	0.00	4.94	12.40	8.07	0.09	3.52
		50	7.67	2.57	8.19	7.34	10.00	0.28	0.00	4.82	12.78	8.21	0.10	3.59
		75	7.67	2.61	8.27	7.41	10.23	0.29	0.00	4.59	13.15	8.45	0.11	3.65
		100	7.66	2.65	8.37	7.46	10.48	0.29	0.00	4.35	13.53	8.72	0.12	3.72
	5 weeks	0	7.80	2.70	8.59	7.61	10.49	0.30	0.00	4.70	13.04	9.25	0.11	3.69
		50	7.79	2.74	8.69	7.71	10.67	0.30	0.00	4.47	13.28	9.63	0.12	3.73
		75	7.78	2.78	8.74	7.81	10.92	0.31	0.00	4.39	13.78	9.62	0.13	3.80
		100	7.76	2.84	8.84	7.91	11.31	0.33	0.00	4.08	14.03	10.28	0.14	3.91
with	3 week	0	7.58	2.37	8.05	7.03	8.29	0.25	0.00	5.17	10.66	7.78	0.08	3.02
		50	7.58	2.40	8.13	7.05	8.57	0.27	0.00	4.94	11.15	7.93	0.09	3.11
		75	7.56	2.43	8.25	7.07	8.74	0.28	0.00	4.82	11.90	7.62	0.10	3.16
		100	7.55	2.47	8.35	7.10	8.98	0.29	0.00	4.59	12.40	7.73	0.12	3.23
	4 weeks	0	7.68	2.52	8.55	7.15	9.24	0.29	0.00	4.94	12.40	7.89	0.09	3.30
		50	7.68	2.55	8.60	7.20	9.43	0.29	0.00	4.70	12.65	8.17	0.10	3.36
		75	7.67	2.59	8.70	7.25	9.58	0.30	0.00	4.47	13.03	8.33	0.11	3.39
		100	7.65	2.62	8.80	7.30	9.74	0.31	0.00	4.35	13.40	8.39	0.12	3.43
	5 weeks	0	7.79	2.69	8.45	7.65	10.54	0.31	0.00	4.59	12.78	9.58	0.11	3.71
		50	7.78	2.72	8.55	7.70	10.76	0.31	0.00	4.47	13.15	9.70	0.11	3.77
		75	7.77	2.76	8.65	7.75	11.01	0.32	0.00	4.35	13.53	9.85	0.12	3.84
		100	7.75	2.82	8.80	7.80	11.27	0.33	0.00	4.12	13.78	10.31	0.14	3.91
Control			7.69	2.53	8.14	7.24	9.76	0.27	0.00	4.94	12.40	8.07	0.09	3.52
(A) Spraying ascobin		Without	7.68	2.60	8.41	7.42	9.90	0.29	0.00	4.65	12.64	8.72	0.11	3.52
		with	7.67	2.58	8.49	7.34	9.68	0.30	0.00	4.63	12.57	8.61	0.11	3.44
		F	NS	NS									NS	NS
		LSD_{05}												
(B) Irrigation intervals		3 weeks	7.57	2.42	8.23	7.10	8.69	0.27	0.00	4.88	11.48	7.93	0.10	3.14
		4 weeks	7.67	2.58	8.45	7.29	9.81	0.29	0.00	4.64	12.92	8.28	0.11	3.50
		5 weeks	7.78	2.76	8.66	7.74	10.87	0.31	0.00	4.40	13.42	9.78	0.12	3.80
		F	2132.05*	2239.23*									736.75*	2458.70*
		LSD_{05}	0.01	0.01									0.00	0.02
(C) Supper Phosphate		0	7.69	2.53	8.32	7.29	9.45	0.28	0.00	4.92	12.01	8.42	0.09	3.38
		50	7.68	2.56	8.39	7.36	9.67	0.29	0.00	4.72	12.36	8.62	0.10	3.44
		75	7.67	2.60	8.48	7.41	9.89	0.29	0.00	4.57	12.84	8.67	0.11	3.50
		100	7.66	2.65	8.60	7.46	10.15	0.30	0.00	4.35	13.21	8.95	0.13	3.58
		F	NS	21.75*									233.97*	34.27*
		LSD_{05}		0.03									0.00	0.04

*** % of recommended dose**

Table (12): Effect of different treatments on maize yield and its components in the first season.

Spraying ascobin	Irrigation intervals	* Super-phosphate	Plant height, cm	Ear length, cm	Ear diameter, cm	No. of rows per ear	No. of kernels per row	100 seed weight, g	Grain yield, ton/fed	R.I.G.Y., %	Dry matter, g/plant after 80 days
without	1 week	0	272.38	21.27	15.64	15.27	45.31	32.90	2.2522	-1.28	207.61
		50	274.29	21.45	15.84	15.41	46.15	33.19	2.2689	-0.54	210.43
		75	277.44	21.72	16.02	15.78	47.07	33.52	2.2775	-0.17	213.83
		100	279.02	21.92	16.14	16.08	48.35	33.86	2.2846	0.14	218.98
	2 weeks	0	276.27	21.49	15.73	15.36	46.16	33.37	2.2813	0.00	213.79
		50	279.24	21.69	15.75	15.47	46.75	34.05	2.3511	3.06	222.66
		75	281.36	21.79	15.80	15.66	47.29	34.41	2.4311	6.57	228.74
		100	283.78	21.93	15.92	15.71	47.80	34.72	2.5076	9.92	231.21
	3 weeks	0	269.09	20.75	15.28	14.97	44.02	32.68	2.2200	-2.69	198.54
		50	272.06	21.11	15.48	15.11	44.52	32.89	2.2316	-2.18	205.39
		75	276.32	21.29	15.78	15.53	44.66	33.18	2.2428	-1.69	213.08
		100	279.70	21.89	16.08	15.97	46.18	33.53	2.2554	-1.14	227.13
with	1 week	0	292.30	22.78	16.33	16.43	49.79	36.20	2.6142	14.59	256.43
		50	294.60	22.91	16.34	16.65	50.11	36.36	2.6627	16.72	259.85
		75	297.00	23.19	16.55	16.78	51.33	36.62	2.7248	19.44	264.70
		100	298.92	23.24	16.60	16.85	51.75	36.91	2.8484	24.86	268.87
	2 weeks	0	300.58	23.41	16.71	16.98	52.07	37.26	2.9854	30.86	273.58
		50	305.41	23.57	16.78	17.08	52.65	37.71	3.1084	36.26	285.41
		75	306.07	23.98	16.80	17.35	53.07	38.05	3.1678	38.86	292.29
		100	310.51	24.60	17.08	17.74	53.71	38.76	3.2077	40.61	299.25
	3 weeks	0	284.73	22.07	15.94	15.77	48.10	35.26	2.5197	10.45	233.96
		50	286.14	22.27	16.02	15.98	48.69	35.47	2.5235	10.62	241.76
		75	287.37	22.48	16.03	16.01	49.27	35.81	2.5586	12.16	244.30
		100	289.96	22.68	16.28	16.32	49.52	35.95	2.5939	13.70	249.35
Control			276.27	21.49	15.73	15.36	46.16	33.37	2.2813	0.00	213.79
(A) Spraying ascobin		Without	276.75	21.53	15.79	15.53	46.19	33.53	2.3003	0.83	215.95
		with	296.13	23.10	16.46	16.66	50.84	36.70	2.7929	22.43	264.15
		F	581.40*	576.95*	616.62*	574.83*	576.89*	580.58*	585.5952*	586.77*	583.12*
		LSD_{05}	3.46	0.28	0.12	0.20	0.83	0.57	0.0876	3.84	8.59
(B) Irrigation intervals		1 week	285.74	22.31	16.18	16.16	48.73	34.95	2.4917	9.22	237.59
		2 weeks	292.90	22.81	16.32	16.42	49.94	36.04	2.7551	20.77	255.87
		3 weeks	280.67	21.82	15.86	15.71	46.87	34.35	2.3932	4.90	226.69
		F	928.88*	892.88*	750.64*	726.23*	1037.19*	1061.97*	894.2667*	893.91*	904.40*
		LSD_{05}	0.66	0.05	0.03	0.04	0.16	0.09	0.0205	0.89	1.60
(C) Supper Phosphate		0	282.56	21.96	15.94	15.80	47.58	34.61	2.4788	8.66	230.65
		50	285.29	22.17	16.04	15.95	48.15	34.95	2.5244	10.65	237.58
		75	287.59	22.41	16.16	16.19	48.78	35.27	2.5671	12.53	242.82
		100	290.32	22.71	16.35	16.45	49.55	35.62	2.6163	14.68	249.13
		F	17.65*	28.11*	15.96*	41.47*	41.23*	20.23*	72.0415*	1731.24*	147.97*
		LSD_{05}	2.26	0.17	0.13	0.13	0.38	0.28	0.0198	0.18	1.85

*** % of recommended dose**