Response of peanut crop to irrigation intervals and spraying with micronutrients and ascorbic acid in sandy soils

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Abstract: Two field experiments were conducted at the Experimental Farm, Faculty of Agriculture, Suez Canal University at Ismailia during 2009 and 2010 seasons to study the effect of four irrigation intervals (every 6, 8, 10 and 12 days) and four foliar spraying treatments namely micronutrients mixture, 8 and 4 ppm ascorbic acid as well as water (control) on yield, its attributes and quality of peanut Giza 6 variety in sandy soils. Decreasing irrigation intervals from 12 to 6 days significantly increased plant height, number and weight of pods and seeds / plant, 100-seed weight, seed oil percentage as well as straw, pod, seed and oil yields / fad. While number of branches / plant and number of seeds/pod were not affected. Foliar application of micronutrients mixture significantly surpassed the other spraying treatments in number of seeds / plant, dry weight of pods and seeds / plant, 100-seed weight, seed oil percentage as well as pod, seed and oil yields / fad, while the highest straw yield / fad was achieved by spraying 8 ppm ascorbic acid.In the combined data, there was significant interaction between irrigation intervals and spraying with micronutrients mixture and ascorbic acid on100-seed weight as well as straw, pod and seed yields 7 fad. The highest pod yield / fad was produced by irrigation every 6 days and spraying with micronutrients mixture. Meanwhile, irrigation every 6 days with the maximum level of ascorbic acid gave higher straw yield/fad.

Keywords: peanut crop- micronutrients- ascorbic acid- irrigation intervals

INTRODUCTION

Peanut *(Arachis hypogaea* L.*)* is considered to be one of the most important edible oil crops in Egypt, also most of seed production used for industrial purposes, exporting and for fresh human consumption due to high nutritive value of seeds.

The most suitable areas for growing peanut are located in sandy soils where it grows successfully in these soils. Many problems face the production of peanut in sandy soils such as fast loss of water irrigation as well as low fertility especially micronutrients content and high loss of nutrients by leaching.

Limited availability of water is a serious constraint to agricultural production of major crops (Shao *et al.*, 2009) because water is vital factor in plant development. Reduced supply of water is known to hamper important physiological and biochemical mechanisms leading to reduction in plant growth. Substantial yield losses have been observed in different crops due to reduced supply of water even for a short period of time (Pinheiro *et al.*, 2005).

The highest pod yield (3.29 t/ha) was produced by irrigating peanut plants every 5 days compared to 2.26 t/ha from plants irrigated every 10 days (Reddy *et al.*, 1982). Janamatti *et al.* (1986) observed that water stress decreased pod and seed weight of peanut. Thanzuala and Dahiphale(1988) revealed that increasing irrigation interval decreased yield and its components of peanut. Stirling *et al.* (1989) mentioned that drought reduces pod yield of peanut. Also, drought stress decreased all yield components of peanut (Conkerton *et al.*, 1989 and Mahakulkar *et al.*, 1990). Prabawo *et al.* (1990) stated that irrigation at 35 and 70 mm of pan evaporation applied during the pre and/or post early pod filling stages increased pod yield of peanut three fold compared to a dry land crop. Also, Sharma and Sivakumar (1991) emphasized that drought decreased number of pods / plant. Suther and Patel (1992) confirmed that pod yield/ha was higher with 80% available soil water than with 20%. Moreover, decreasing irrigation intervals from 15 to 10 and 5 days significantly increased plant height, number of branches and pods / plant, 100 seed weight as well as pod and oil yields / fad (Sakr *et al.*, 1996 and Farooq *et al.*, 2009).

In Egypt, the amount and availability of micronutrients in the sandy soils are very low, therefore productivity of peanut crop grown at these soils is eliminating by its sufficiently. Application of micronutrients as foliar spraying is readily absorbed by the leaves and not lost through fixation, decomposition or leaching. reported that spraying peanut plants with librel BMX (mixture of Fe, Mn, Cu, B, Zn and Mo) significantly increased plant height, number and weight of branches, pods and seeds / plant, seed oil content as well as seed and oil yields / fad (Abd El-Aziz and Fathi, 1990; Shams El-Din and Ali, 1996; Madny, 1998; Ali and Hassan, 2001 and Hafiz, 2007). Moreover, Marious *et al* (2011) found that foliar application of Zn as Zn-EDTA with concentration 1g/liter on peanut plants caused a significant increment on plant height, 100 seed weight, seed yield and pod yield.

Ascorbic acid is an important antioxidant in plant cells and plays essential role in several physiological processes in plant growth, differentiation, plant cell division and metabolism (Foyer, 1993). Also, it plays important role in cell protection against oxidative stress (Luwe *et al.*, 1993) and photoprotection (Rautenkranz *et al.*, 1994). Some investigators found a positive effect of spraying ascorbic acid on different crops; Abdel–Halim (1995) on tomato plants, Shehata *et al.* (2002) on pepper plants, Helal *et al.* (2005) on pea plants, El-Banna *et al.* (2006) on potato plants. Under conditions of water stress, Dolatabadian *et al.* (2010) recorded that spraying corn plants with ascorbic acid increased stem and leaf dry weight, grain weight and grain fertility. El-Hariri *et*

al. (2010) concluded that spraying flax plants cultivated under salinity stress with ascorbic acid increased plant growth and yield components.

The objective of the present study was to investigate the effect of foliar application of micronutrients mixture and AsA on improving the yield and its quality of peanut under drought stress condition.

MATERIALS AND METHODS

Experimental site and conditions:

Two field experiments were conducted at the Experimental Farm, Faculty of Agriculture, Suez Canal University at Ismailia during 2009 and 2010 seasons to study the effect of four irrigation intervals (every 6, 8, 10 and 12 days) and four foliar spraying treatments namely micronutrients mixture, 8 and 4 ppm ascorbic acid as well as water (control) on yield, its attributes and quality of peanut Giza 6 variety. The soil of the experiments was sandy, where, physical and chemical properties of the experimental soils are presented in Table (1).

Experimental layout, treatments and agronomic practices:

The experimental design was split plots with four replications where irrigation intervals were arranged randomly in the main plots, while spraying treatments were allocated randomly in the sub plots. Each experimental sub plot consisted of 6 ridges 4 meters in length and 50 cm in width (plot area = 12 m^2). Each experiment included 16 treatments which were the combinations of four irrigation intervals (6, 8, 10 and 12 days) and four foliar spraying treatments namely micronutrients mixture, 8 and 4 ppm ascorbic acid as well as water (control). Micronutrients mixture consists of 1.5 g/l of Fe –chelated (12% Fe-EDTA), 1.5 g/l of Mn –chelated (12%Mn-EDTA) , 1 g/l of Zn –chelated (12% Zn –EDTA), 0.5 g/l of copper sulphate (23% $CuSO_4$.$7H_2O$) and 0.5 g/l sodium borate (23% $Na_2BO_3.11H_2O$). Foliar spraying with micronutrients mixture or ascorbic acid was done at three equal doses, after 60, 75 and 90 days from sowing with volume spray of 200 liter / fad.

All seeds of peanut Giza 6 variety were coated by Arab gum and inoculated with specific Rhizobium strain immediately before sowing. Seeds were sown on one side of the ridge in hills 10 cm apart on 30 and 28 April in 2009 and 2010 seasons, respectively. After 20 days from sowing, peanut plants were thinned to one plant per hill. The recommended cultural practices for growing peanut crop at Ismailia Governorate were followed.

Measurements:

At harvest, after 120 days from sowing, samples of 10 guarded plants were randomly taken from the inner ridges in each sub plot to determine plant height (cm), number of branches, pods and seeds/plant, dry weight of pods and seeds/plant (g), number of seeds/pod and 100-seed weight (g). While pod yield (ardab /fad), seed yield (kg /fad) and straw yield (ton/fad) were estimated from plants of the two middle ridges (the 3rd and 4th ridges) in each sub plot and yields per fad were calculated. Seed oil content (%) was determined by using the Soxhelt continuous extraction apparatus with petroleum ether as an organic solvent according to A.O.A.C. (1975) and oil yield (kg/fad) was calculated by multiply seed oil content (%) and seed yield (kg/fad).

Statistical analysis

The analysis of variance of split plots design was used according to Snedecor and Cochran (1982). The combined analysis of variance was performed for the data of the two seasons after test the homogeneity of error by Bartellet test (Stell *et al.*, 1997). Means followed by the same alphabetical letters are not statistically different according to Duncan's Multiple Range Test at the 5% level of significance (Duncan, 1955). Last significant differences (LSD at 5% level) were used for comparison between averages of interactions (Stell *et al.*, 1997).

Table (1): Some physical and chemical properties of the experimental soils (upper 60 cm soil depth).

Seasons	Physical properties					
	Sand	Silt	Clay	Texture class	pH	E C (ds m^{-1})
2009	91.30	3.30	5.40	Sand	7.6	0.19
2010	90.50	3.40	6.10	Sand	7.8	0.21

Seasons	Chemical properties (Available nutrients ppm)								
	B	Mo	Mn	Cu	Fe	Zn	N	P	K
2009	1.14	0.11	1.10	0.25	1.66	0.45	30	2.73	28
2010	1.20	0.13	1.18	0.27	1.72	0.49	35	2.98	33

RESULTS AND DISCUSSION

Effect of irrigation intervals:

Data in Figure (1) showed the effect of irrigation intervals on plant height as well as number of branches, pods and seeds /plant of peanut.

Decreasing irrigation interval from 12 to 6 days increased significantly plant height in the two seasons and the combined average. Irrigation peanut plants every 8 or 10 days produced taller plants compared with 12 days in 2009 season and the combined data where the differences between them were significant (Figure 1).

Number of branches /plant was increment by decreasing irrigation interval up to 6 days but the differences were not great enough to reach the 5% level of significance (Figure 1).

The highest number of pods /plant was produced by irrigating peanut every 6 days followed by 8 days without significant differences between them. while there was a significant difference between them in comparison with 12 days treatment and that held true in the two seasons and over them (Figure 1).

As shown from the same Figure, significant increases were detected in number of seeds /plant in both seasons and over them when irrigation interval was decreased up to 6 days.

These results were expected since water stress inhibits cell enlargement more than cell division. It reduces plant growth by affecting various physiological and biochemical processes such as photosynthesis, respiration, translocation, ion uptake, carbohydrates metabolism and growth promoters (Farooq *et al.*, 2009) which produced shortest peanut plants, less number of pods and seeds/plant. Confirming results were detected by Thanzuala and Dahiphale(1988), Conkerton *et al.* (1989) and Mahakulkar *et al.* (1990).

The results recorded in Figure (3) revealed that there were consistent and remarkable increases in pods and seeds dry weight / plant as well as 100 seed weight as irrigation interval was decreased up to 6 days and that held true in 2009 and 2010 seasons as well as over them.

These results might be attributed to positive role of sufficient water on enhancing plant growth and photosynthesis rate which increase the amount of metabolites synthesized in leaves and partitioned to fruiting organs such as pods and seeds. These results are in harmony with those recorded by Thanzuala and Dahiphale(1988), Conkerton *et al.* (1989), Sakr *et al.* (1996) and Farooq *et al.* (2009).

Number of seeds /pod was increased by decreasing irrigation interval up to 6 days, but the differences among the four irrigation treatments were not significant (Figure 3).

As shown from the data presented in Table (3), significant increases were detected in seed oil percentage as irrigation interval was raised up to 12 days and that was true in 2009 and 2010 seasons as well as the combined data. These results were expected since the largest irrigation interval (12 days) resulted smaller seeds size (100-seed weight) and this might be on the expense of carbohydrate storage rather than oil which reflected in increasing percentage of oil.

It is obvious from Tables (2 and 3) that decreasing irrigation interval up to 6 days induced more significant increments in straw, pod, seed and oil yields/fad than other irrigation treatments in the two growing seasons and over them. The shortest irrigation interval (6 days) was more out yielded than other irrigation intervals in the four aforementioned characters. These results were expected since regular and sufficient irrigation encourages photosynthesis rate and metabolic processes which reflected on enhancing growth of plant, consequently increase the amount of dry matter in leaves as well as translocation of its metabolites to pods and seeds finally increase straw, pod and seed yields/fad. On the other hand, this increasing in oil yield/fad could be mainly due to the increase in seed yield /fad regardless the negative effect of that on seed oil percentage. These results are in a good line with those detected by Thanzuala and Dahiphale (1988), Conkerton *et al.* (1989), Mahakulkar *et al.* (1990) and Sakr *et al.* (1996).

Effect of foliar spraying with micronutrients and ascorbic acid

The results of Figure (2) showed that the tallest plants and highest number of pods / plant were significantly obtained from the treatment of micronutrients mixture or 8ppmAsA without significant differences between them in the both seasons and their combined data, except the number of pods / plant, which, was not significantly ameliorated by spraying treatments in the first season.

Number of branches /plant did not significantly affect by spraying with micronutrients mixture and ascorbic acid in the two seasons and over them (Figure 2).

Foliar application of micronutrients mixture was significantly out numbered two concentrations of ascorbic acid and unsprayed plants (control) in number of seeds / plant in the two growing seasons and the combined data (Figure 2).

The positive effect of micronutrients mixture on peanut plants height as well as number of pods and seeds /plant were in conformity with those recorded by Rezk *et al.* (1991), Zaki *et al.* (1993), Ali and Hassan (2001), Ali and Mowafy (2003) and Hafiz (2007).

Increasing ascorbic acid concentration as foliar spraying from 4 to 8 ppm increased number of seeds/plant with significant differences between them in 2009 and 2010 seasons and over them, on the other hand, the two ascorbic acid concentrations were significantly overcome unsprayed plants (control) in the second season and the combined data (Figure 2). Similar results were emphasized by Abdel–Halim (1995), Shehata *et al.* (2002), Helal *et al.* (2005), El-Banna *et al.* (2006) and Dolatabadian *et al.* (2010).

It is obvious from Figure (4) that the highest dry weight of pods and seeds per plant as well as 100-seed weight were achieved by spraying peanut plants with micronutrients mixture followed by 8 and 4 ppm ascorbic acid as well as unsprayed plants (control) with

significant differences among the four spraying treatments and that was true in 2009 and 2010 seasons as well as the combined data. Confirming results were detected by Rezk *et al.* (1991), Zaki *et al.* (1993), Madny (1998), Anton *et al.* (2001), Ali and Mowafy (2003), Hafiz (2007), Abd El-Monem *et al.* (2009) and Khalifa *et al.* (2011).

It was clearly evident from Figure (4) that number of seeds/pod was increased by foliar nutrition either with micronutrients mixture or ascorbic acid compared to unsprayed plants (control), but the differences among spraying treatments were not high enough to reach the 5% level of significance in the two growing seasons and over them. Hafiz (2007) came to similar results.

Supplementary foliar application peanut plants with 8ppm ascorbic acid produced the heaviest straw yield /fad followed by micronutrients mixture, 4ppm ascorbic acid and unsprayed plants (control) with significant differences among the four spraying treatments and that held true in 2009 and 2010 seasons as well as over them (Table 2). From the combined data, spraying peanut plants with 8 ppm ascorbic acid increased straw yield /fad by 42.75% compared to unsprayed plants (Table 2).

The beneficial effect of ascorbic acid on growth and yield of peanut plants might be due to that ascorbic acid plays essential role in several physiological processes in plant growth, differentiation, plant cell division and metabolism (Foyer, 1993). Also, it plays an important role in cell protection against oxidative stress (Luwe *et al.*, 1993) and photoprotection (Rautenkranz *et al.*, 1994). These results are in harmony with those reported by Abdel–Halim (1995), Shehata *et al.* (2002), Helal *et al.* (2005), El-Banna *et al.* (2006) and Dolatabadian *et al.* (2010).

The data presented in Table(2) for peanut plants which sprayed with micronutrients mixture overcome those received 8 and 4 ppm ascorbic acid as well as unsprayed plants (control), respectively, in pod and seed yields/fad with significant differences among them in the two growing seasons and over them.

The positive effect of micronutrients mixture on pod and seed yields/fad of peanut might be due to their favorable effects on growth and dry matter accumulation in peanut plants as a result of raising root nodules efficiency in nitrogen fixation as well as increasing the uptake of nitrogen by plant roots (Hallsworth *et al.*, 1964 and Leigh, 1971). Also, micronutrients increase photosynthetic pigments content (Abd El-Monem *et al.*, 2009) and enzymes activity in turn enhancing plant metabolism (Peyve, 1969 and Boardman, 1975) which reflected favorably on yield attributes such as number and weight of pods and seeds / plant as well as 100- seed weight and finally increase pod and seed yields/fad of peanut. Confirming results were detected by Abd El-Aziz and Fathi (1990), Shams El-Din and Ali (1996), Anton *et al.* (2001), Ali and Mowafy (2003), Attia (2004), Nour El-Din (2006), Hafiz (2007) and Khalifa *et al.* (2011).

Data in Table (3) revealed that the highest values of seed oil percentage and oil yield/fad of peanut were produced by plants received micronutrients mixture via foliage. Spraying micronutrients mixture surpassed those sprayed 8 and 4 ppm ascorbic acid as well as unsprayed plants (control), respectively. These differences among the four spraying treatments were significant in 2009 and 2010 seasons as well as over them.

The favorable effect of micronutrients mixture on seed oil percentage might be due to the important role of micronutrients in enhancing enzymes activity and metabolism of lipids (Anderson and Pyliotis, 1996).

The increasing in oil yield/fad could be due to the increase in seed yield/fad as well as seed oil percentage. These results are in a good line with those detected by Abd El-Aziz and Fathi (1990), Madny (1998), Anton *et al.* (2001), Ali and Mowafy (2003), Hafiz (2007) and Khalifa *et al.* (2011).

Interaction effect:

The combined analysis of variance for the data of the two seasons revealed that there were significant interaction effects between irrigation intervals and foliar spraying with micronutrients mixture and ascorbic acid on 100- seed weight, straw, pod and seed yields/fad.

The results in combined data of Table (4) on 100-seed weight revealed that using either micronutrients mixture or high concentration of ascorbic acid with normal irrigation gave significantly higher 100-seed weight (80.52 and 80.43g, respectively) without significant difference between them. Meanwhile, untreated plant under normal irrigation gave 70.54g for 100-seed weight. In addition, the lowest 100-seed weight (50.02g) was obtained from the interaction between water and severe water stress (Irrigation every 12 days).

Under water stress conditions (Irrigation every 8 and 10 days), it could be concluded that both of foliar spray by 8ppm AsA and micronutrients mixture had the same effects on 100-seed weight. Also, under same conditions, these treatments significantly ameliorated 100-seed weight compared to untreated plants (spray with water). These results are in a good connection with those obtained by Anton et al (2001) and Elnaz and Bybordi (2011).

Under normal irrigation, the high concentration of AsA gave significantly higher straw yield (5.27 ton/fad) compared to (3.91 ton/fad) which was obtained from untreated plants. Also, under severe water stress (irrigation every 12 days); the highest concentration of AsA produced about 2.05 ton straw/fad compared to 0.90 ton/fad which was obtained from untreated plants with combined data (Table 4). The high concentration of AsA significantly ameliorated straw yields compared to micronutrients under normal irrigation as well as water stress conditions (Table 4). These results are in a good connection with those obtained by Dolatabadian *et al.* (2010).

In the other hand, under normal irrigation, opposite results were obtained from pod and seed yields, The combined data indicate that the highest values (36.79 ardab pod/fad and 2079.45 kg seed/fad) were significantly recorded under the exogenous application of micronutrients mixtures and followed by (33.14 ardab pod/fad and 1863.47 kg seed/fad) which were obtained from the high concentration of AsA with

significant differences between them, respectively (Table 4). Meanwhile, the minimum values of pod yield ardab/fad (16.89 and 18.24) and seed yield kg/fad (895.59 and 968.82) were obtained from the treatment of spraying water (control) and 4ppmAsA under severe water stress, respectively. Generally, under water stress conditions (irrigation every 10 days), both of foliar spray by 8ppm AsA and micronutrients mixture had the same effect on pod and seed yields. The results indicate that pod and seed yields responded significantly to foliar application by micronutrients mixtures as well as high concentration of AsA under water stress conditions (Table 4). These results are in a good line with those detected by Sajedi (2010) and Babaeian *et al.* (2011).

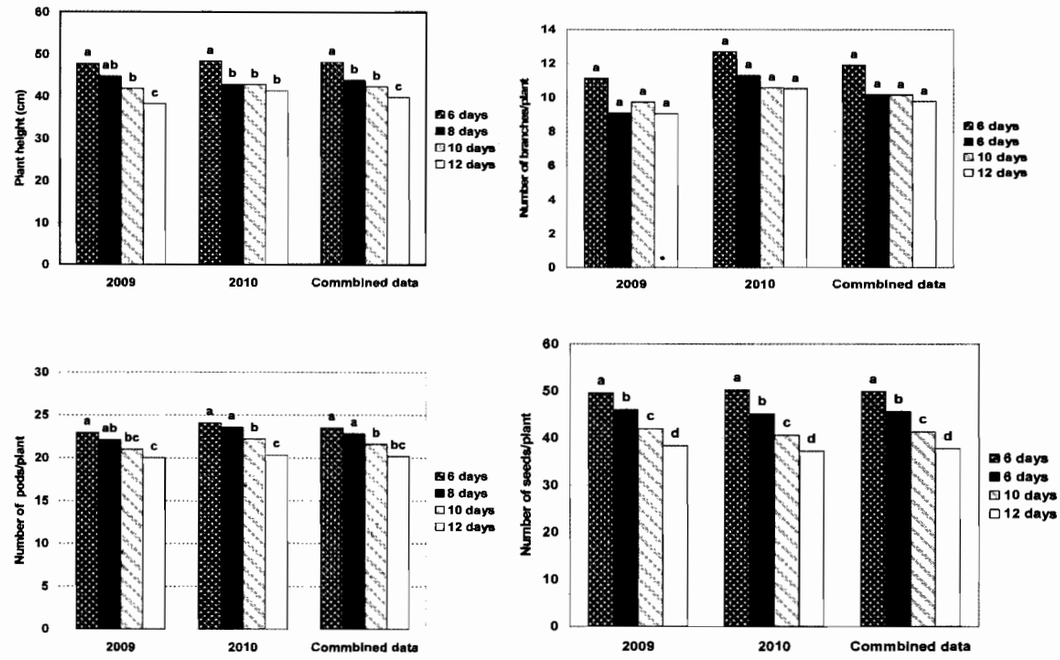

Figure 1: Effect of irrigation intervals on plant height and yield components of peanut at harvest.

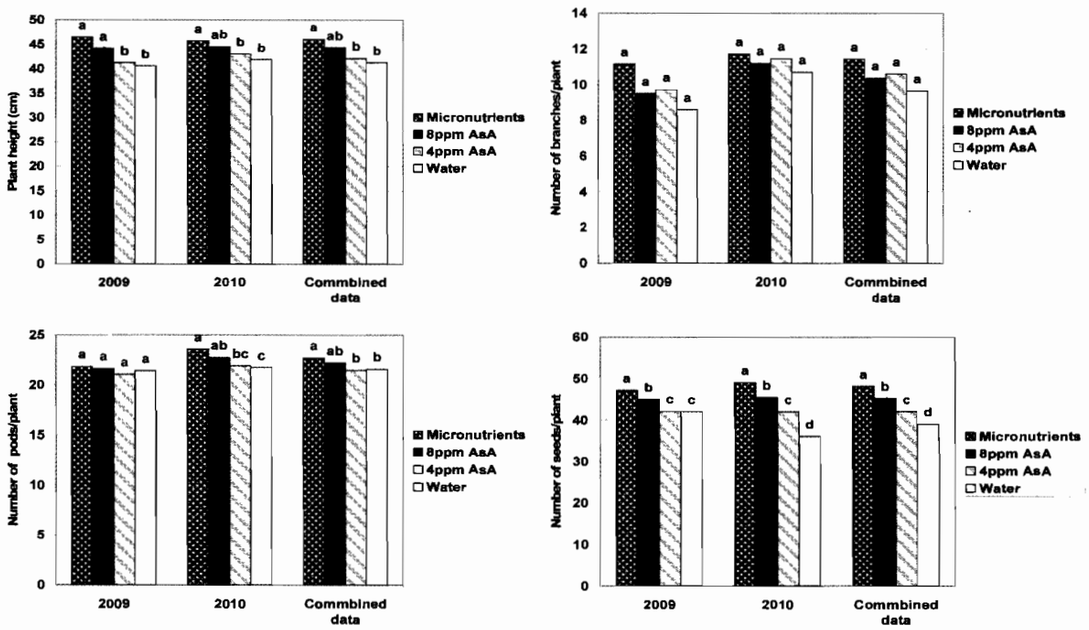

Figure 2: Effect of spraying treatments on plant height and yield components of peanut at harvest. (ASA= Ascorbic acid)

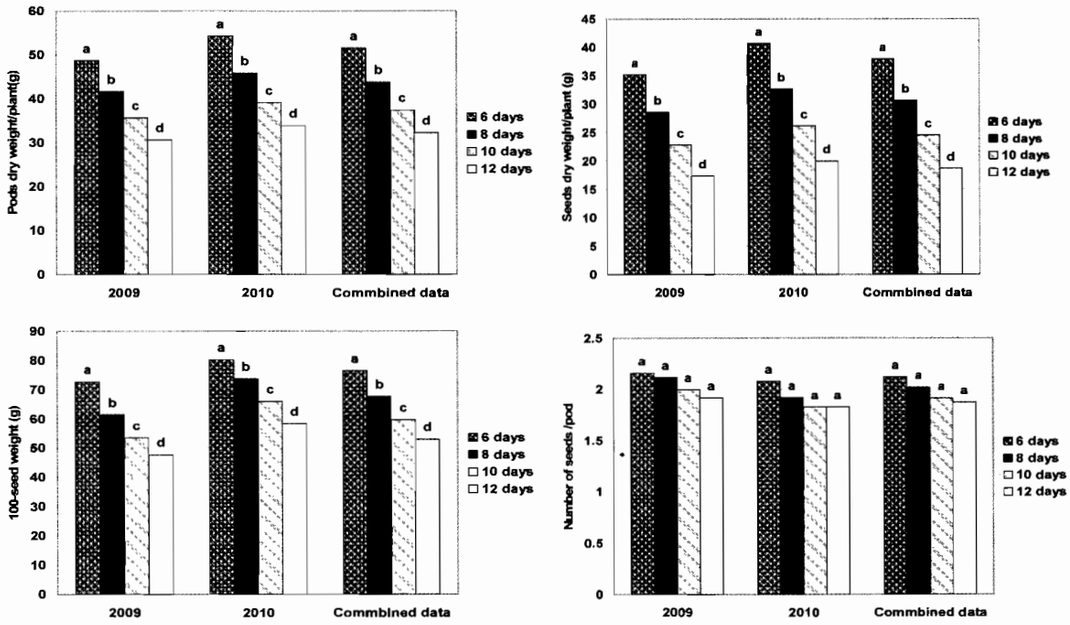

Figure 3: Effect of irrigation intervals on yield components of peanut at harvest.

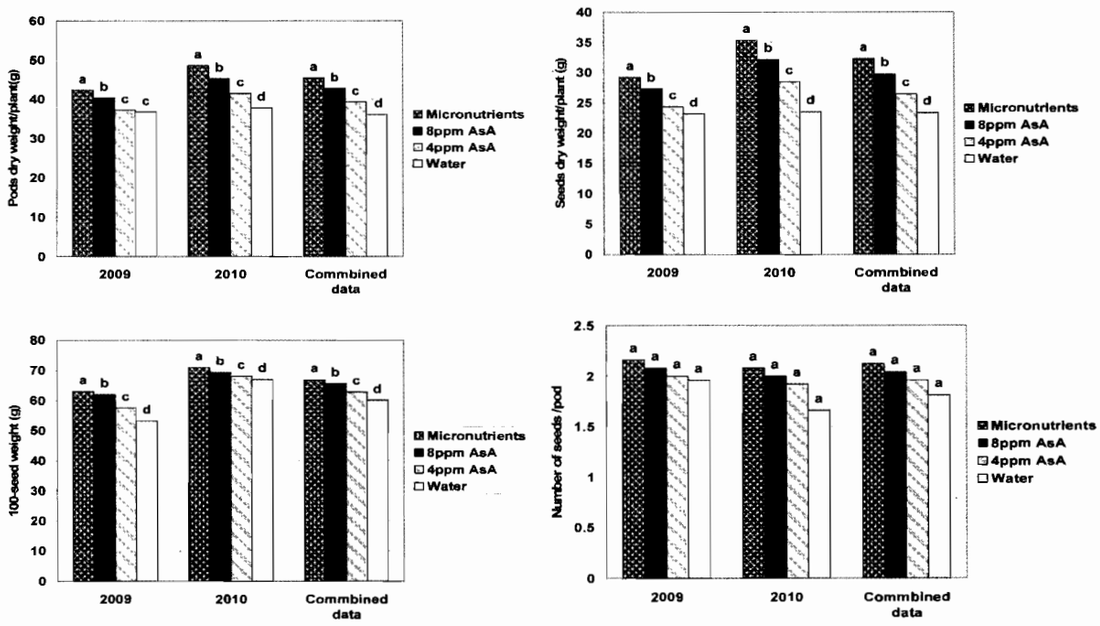

Figure 4: Effect of spraying treatments on yield components of peanut at harvest. (ASA= Ascorbic acid)

CONCLUSIONS

In the present work we demonstrated that foliar application of micronutrients mixture and AsA have immense economic important since an adequate supply of micronutrients and AsA can help peanut plants to tolerant water deficiency. Therefore, we recommend the combination of spraying Giza 6 peanut variety with micronutrients mixture and ascorbic acid 8 ppm at 6 days irrigation interval in semi arid condition. It's essential to check available micronutrients status in the soil exposed to stress to prevent deficiency of productivity and quality. Also, we are going to examine higher levels of AsA than 8 ppm to arrive an adequate application on peanut plants under water stress conditions.

Table (2): Effect of irrigation intervals and spraying treatments on straw, pod and seed yields of peanut at harvest.

Factors	Straw yield(ton /fad)			Pod yield (ardab /fad)			Seed yield (kg/fad)		
	2009	2010	Comb	2009	2010	Comb.	2009	2010	Comb.
Irrigation intervals (A)									
6 days	4.35 a	4.84 a	4.60 a	29.92a	31.97a	30.95a	1701.49a	1793.09a	1747.29a
8 days	3.78 b	4.19 b	3.99 b	26.13b	28.10b	27.11b	1443.69b	1534.08b	1488.89b
10 days	2.27 c	2.52 c	2.40 c	22.74c	24.98c	23.86c	1235.00c	1339.13c	1287.07c
12 days	1.45 d	1.62 d	1.54 d	17.88d	20.12d	19.00d	957.48d	1057.57d	1007.53d
F. test	**	**	**	**	*	**	**	**	**
Spraying treatments (B)									
Micronutrients	3.19 b	3.55 b	3.37 b	27.39a	29.49a	28.44a	1514.55a	1607.17a	1560.86a
8ppm AsA	3.43 a	3.85 a	3.64 a	25.05b	27.19b	26.12b	1378.24b	1481.94b	1430.09b
4ppm AsA	2.81 c	3.11 c	2.96 c	22.71c	24.82c	23.77c	1256.84c	1351.09c	1303.97c
Water	2.43 d	2.67 d	2.55 d	21.52d	23.67d	22.60d	1188.03d	1283.67d	1235.85d
F. test	**	**	**	**	**	**	**	**	**
Interaction (A* B)	**	*	**	**	**	**	*	**	**

AsA= Ascorbic acid

Table (3): Effect of irrigation intervals and spraying treatments on seed oil percentage and oil yield of peanut at harvest.

Factors	Seed oil percentage (%)			Oil yield (kg/fad)		
	2009	2010	Comb.	2009	2010	Comb.
Irrigation intervals (A)						
6 days	40.28d	41.45d	40.87d	686.76a	745.43a	716.10a
8 days	42.35c	44.13c	43.24c	611.95b	677.56b	644.75b
10 days	44.87b	46.93b	45.90b	554.70c	629.06c	591.88c
12 days	48.83a	51.18a	50.01a	469.08d	542.54d	505.81d
F. test	**	**	**	**	*	**
Spraying treatments (B)						
Micronutrients	45.44a	47.45a	46.44a	675.13a	748.72a	711.92a
8 ppm AsA	44.50b	46.32b	45.41b	603.31b	675.64b	639.47b
4 ppm AsA	43.42c	45.21c	44.32c	539.52c	603.65c	571.58c
Water	42.99d	44.70d	43.85d	504.54d	566.58d	535.56d
F. test	*	*	*	*	*	*
Interaction (A* B)	N.S	N.S	N.S	N.S	N.S	N.S

AsA= Ascorbic acid

Table (4): Effect of the interaction between irrigation intervals and spraying treatments on 100- seed weight, straw, pod and seed yields of peanut at harvest (Combined data).

Irrigation intervals	Spraying treatments	100- seed weight (g)	Straw yield (ton /fad)	Pod yield (ardab /fad)	Seed yield (Kg /fad)
6 days	**Micronutrients**	80.52	4.58	36.79	2079.45
	8ppm AsA	80.43	5.27	33.14	1863.47
	4ppm AsA	74.52	4.35	27.55	1563.64
	Water	70.54	3.91	26.30	1482.59
8 days	**Micronutrients**	70.53	4.25	30.04	1653.33
	8ppm AsA	69.23	4.58	27.51	1509.74
	4ppm AsA	66.29	3.77	26.31	1444.75
	Water	64.48	3.37	24.58	1347.72
10 days	**Micronutrients**	62.02	2.57	25.46	1374.81
	8ppm AsA	62.10	2.67	24.42	1317.30
	4ppm AsA	58.12	2.31	22.96	1238.65
	Water	56.81	2.03	22.61	1217.51
12 days	**Micronutrients**	56.14	1.81	21.47	1135.85
	8ppm AsA	52.22	2.05	19.41	1029.85
	4ppm AsA	53.83	1.41	18.24	968.82
	Water	50.02	0.90	16.89	895.59
LSD 5%		1.73	0.09	1.25	119.88

AsA= Ascorbic acid

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استجابة محصول الفول السودانى لفترات الري والرش الورقى بالعناصر الصغرى وحمض الاسكوربيك فى الاراضى الرملية

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أجريت تجربتان حقليتان بمزرعة كلية الزراعة – جامعة قناة السويس – بالاسماعيلية خلال موسمى ٢٠٠٩ و٢٠١٠ وذلك لدراسة تأثير أربع فترات ري (كل ٦ و ٨ و١٠ و١٢ يوم) وأربع معاملات للرش الورقى هى مخلوط العناصر الصغرى و ٨ و٤ جزء فى المليون من حمض الاسكوربيك والرش بالماء (كنترول) على المحصول ومكوناته وجودته فى الفول السودانى صنف جيزة ٦ فى الاراضى الرملية ويمكن تلخيص النتائج كما يلى :

أدى تقليل فترات الرى من ١٢ الى ٦ ايام الى زيادة معنوية فى ارتفاع النبات وعدد القرون والبذور| نبات والوزن الجاف للقرون والبذور|نبات ووزن ١٠٠ بذرة والنسبة المئوية للزيت بالبذور وايضا محصول العرش والقرون والبذور ومحصول الزيت|فدان. بينما لم يتأثر كل من عدد الافرع|نبات وعدد بذور القرن.

أدى الرش الورقى بمخلوط العناصر الصغرى الى تحقيق أعلى القيم وتفوق معنويا على جميع معاملات الرش الاخرى وذلك بالنسبة للصفات الاتية :- عددالبذور|نبات – الوزن الجاف للقرون والبذور|نبات ووزن ١٠٠ بذرة ومحصول القرون والبذوروالزيت |فدان – النسبة المئوية للزيت بالبذور. بينما ادى الرش بحمض الاسكوربيك بتركيز ٨ جزء فى المليون الى زيادة معنوية ومتفوقا على جميع معاملات الرش الاخرى فى محصول العرش |فدان .

وجد تأثير معنوى للتفاعل بين فترات الرى x الرش الورقى على الصفات الاتية :- وزن ١٠٠ بذرة ومحصول القرون |فدان – محصول البذور| الفدان ومحصول العرش|فدان. وقد تحقق اعلى محصول قرون |فدان بالري كل ٦ أيام و الرش بمخلوط العناصر الصغرى. بينما التفاعل بين الري كل ٦ أيام واعلى تركيز من حمض الاسكوربيك قد حقق اعلى محصول عرش|فدان.