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EFFECT OF MICRONUTRIENTSS AND WEED CONTROL TREATMENTS ON PEANUT YIELD AND ASSOCIATED WEEDS UNDER SANDY SOIL CONDITIONS.

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Abstract: Two field trials were carried out during 2005 and 2006 successive summer seasons at Ismailia Agricultural Research Station, to study the effect of micronutrients and weed control treatments on the dry weights of annual weeds (g/m^2), peanut yield, yield components, macronutrient uptake, protein and oil percentage of peanut grown under sandy soil condition.

The results showed that foliar application of micronutrients signify-cantly reduced the dry weights of all weed species. Applying foliar appli-cation of micronutrients at the rate of 3.0 g/L reduced significantly the dry weights of total annual weeds at 75 and 105 (DAS) by 33.8 and 10.8%, respectively, as compared to control treatment (without addition of foliar application) in the first and second seasons. In general, foliar application of micronutrients increased signify-cantly seed, straw and biological yield of peanut as well as N, P and K uptake and protein percentage as compared with control treatment in both seasons.

All herbicidal treatments gave significant effect on reducing the dry weights of all weed species at 75 and 105 (DAS) in 2005 and 2006 seasons. Applying butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing reduced the dry weights of total annual weeds by (90.5 & 92.5%) and (94.2 & 89.9%) at 75 and 105 (DAS), respectively, as compared to weedy check in 2005 and 2006 seasons. Applying oxyfluorfen at the rate of 240 g (a.i)/ fed followed by one hand-hoeing increased significantly seed yield of peanut by 190.5 and 172.7%, respectively, and oxyfluorfen at the same rate applied alone significantly increased straw yield of peanut by 78.4 and 67.1%, respectively, as compared with weedy check in 2005 and 2006 seasons. Concerning to N,P and K uptake by peanut, data revealed that oxyfluorfen at the rate of 240 g (a.i)/ fed alone or followed by one hand-hoeing gave the highest values as compared with other treatments in both seasons. Protein percentage of peanut was affected significantly by clethodim at the rate of 125 g (a.i)/fed and butralin at the rate of 1200 g (a.i)/ fed followed by one hand-hoeing in 2005 and 2006 seasons, respectively.

Foliar application of micronut-rients at the rate of 3.0 g/L with oxyfluorfen at the rate of 240 g (a.i)/fed or butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing reduced significantly the dry weights of total annual weeds by 98.8 and 98.3%, respectively, as compared to control treatment plus weedy check

at 75 (DAS) in 2005 and 2006 seasons. Foliar application of micronutrients with butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing and oxyfluorfen at the rate of 240 g (a.i)/fed significantly increased N, P and K uptake of peanut seeds, straw and biological yield as compared to control treatment plus weedy check in 2005 season. Foliar application of micronutrients at the rate of 3.0 g/L plus oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing increased significantly N, P and K uptake of seeds, straw and biological yield as compared to control treatment plus weedy check in 2006 season.

Economic evaluation of the results indicated that using foliar application of micronutrients at rate 4.5 g/L and weed treatment by oxyfluorfen at the rate of 240 g (a.i)/ fed followed by one hand-hoeing gave the highest economic values in the average of two seasons for all economic evaluation. Applying foliar application of micronutrients at the rate of 4.5 or/ and 3.0 g/L with oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing increased gross income, net income and profitability, respectively.

Key words: Peanut, micronutrients, weed control.

Introduction

Peanut (*Arachis hypogaea* L.) is an important summer oil seed crop and food grain legume. It contains about 50% oil, 25-30% protein, 20% carbohydrate and 5% fiber and ash which make it a substantial contribution to human nutrition (Fageria, *et al* 1997). In Egypt, peanut has been considered as one of the most profitable crops grown in the new reclaimed sandy soil which commonly suffers from deficiency or unavailability of most the micronutrients. The beneficial effect of micronutrients comes from its role in improvement of photosynthesis and peanut yield and quality as well as nutrient uptake. Repvathy *et al.* (1996), Dahdoh and Mousa (2000), El-Masry (2001) and Nassar *et al*. (2002) attributed the promoting impacts of micronutrients to their capability to enable the plants to grow well and improve transferring the photosynthetic substances from leaves to grains during the synthesis process due to their effects on enzymatic group and consequently, reflected positively on the weight of grains. Weeds in peanut crop can be control by using cultural, mechanical, physical and chemical means. Weed management is critical to peanut production from both yield and quality perspectives. Weeds reduce grower profits in several ways. Weed/crop competition for sunlight, water and nutrients can significantly lower peanut yields. Research indicates that if peanuts are kept weed-free for 4 to 6 weeks, the yield reduction will be minimized. Therefore, it is most important to use a pre-plant incorporated herbicide for full-season weed

management. Fletcher and Kirkwood (1982), mentioned that fluazifop-butyl as post-emergence was more selective for the control of annual and perennial narrow weeds in over sixty different dicotyledonous crops. Also, when groundnut had been treated with fluazifop-butyl at the rate of 2.0 kg/ha 35-40 days after sowing, it killed all weeds. This statement agrees with that found by Grichar and Boswell (1986), Al-Marsafy *et al.* (1992), Abd El-Woahed (1993) and El-Sehly (2005). Khozimy (2006) who indicated that clethodim had superior ability in reduction of dry weights of narrow and total weeds comparing with other treatments at 45 days from sowing and fluazifop-p-butyl gave reasonable effect on dry weights of narrow and total weed. Moshtohry, *et al* (2007) reported that butralin was considered as alternative for oxyfluorfen and pendimethalin against annual weeds which decreased in dry weight by 85-92%. Clethodim or fluazifop butyl were effective against grasses which decreased in dry weight by 84-99%. Many researchers studied the effect of some herbicides on yield and yield components i.e. Panwar *et al.* (1988) and Grichar and Boswell (1989) and found that fluazifop-p-butyl applied 30 days after sowing groundnut increased pod yield by 68% over a weedy check. Abd El-Woahed (1993), reported that significant reduction in pods yield was due to increasing oxyflurofen herbicide rates of 0.50, 0.75 and 1.0 l/fed. Ibrahim (1995) reported that the yield of pods, straw yield, pods/ plant, 100-pods weight (g) of peanut were affected significantly by weed control treatments in both seasons. In the first season weed free and oxyflurofen (180 and 240 g/fed) gave the highest yield of pods. The respective values were 34.34, 32.41 and 30.41, respectively, compared with that of the weedy check being 15.92. For straw yield, in the first season oxyflurofen (240 g/fed) gave the highest significant values of straw yield by 3.20 compared with that of the weedy check. 100-pods weight (g) was affected by fluazifop-butyl weed treatment in the first season only. Oil percentage was not affected by weed control treatments in both seasons. Therefore, this study aimed to investigate the effect of micronutrientss and some weed control treatments on yield and yields components of peanut and associated weeds.

Materials and Methods

Two field experiments were carried out at newly reclaimed sandy soil in Ismailia Agricultural Research Station during 2005 and 2006 summer seasons. Those experiments aimed to study the effect of foliar application of micronutrients and weed control treatments on the

dry weights of annual broad - leaved, narrow and total annual weeds (g/m^2). In addition, it aimed to study the response of yield, its components, N, P and K uptake in seed, straw, biological yield, oil and protein percentage of peanut (*Arachis hypogaea* L.). The experimental design was split-plot in four replications. The foliar application of micronutrients were arranged in the main plots while, weed control treatments were devoted to the sub plots as follows:-

A– Main plots (foliar application of micronutrients**):**

Micronutrients were added as a foliar application solution containing (Fe, Zn and Mn) in a chelated form (EDTA). Foliar application of micronutrients was done twice at vegetative stage (45 and 60 days after sowing) at the rate of 200 L/fed as follows:

1-Zero(without addition of micronutrients) control.

2-.Foliar application of micronutrients at rate of 3.0 g / liter. **(EDTA).**

3-Foliar application of micronutrients at rate 4.5 g / liter.

Table (A): Some physical and chemical analysis of the soil.

Analysis	Season	
	2005	2006
Physical analysis :		
Coarse sand %	83.4	83.8
Fine sand %	7.6	7.4
Silt %	0.8	0.7
Clay %	8.3	8.1
Soil texture	Sandy	Sandy
Chemical analysis :		
PH (1: 2.5 susp.)	7.38	7.51
EC mmhos / cm (1:5 ext.)	0.25	0.33
Available soluble (ppm)		
Available N (ppm)	36.24	42.07
Available P (ppm)	3.16	2.74
Available K (ppm)	143.22	148.63
Available Fe (ppm)	1.26	1.42
Available Zn (ppm)	0.17	0.23
Available Mn (ppm)	1.58	1.37
Available Cu (ppm)	0.82	0.93

*According to the methods described by Ryan (1996).

B– Sub plots: (Weed control treatments):

1. Butralin [N - secondary-butyl - 4-tertiary-butyl-2,6dinitroaniline] known commercially as Amex 48% EC, applied as post sowing at the rate of 1200 g (a.i)/fed.

2.Butralin applied as post sowing at the rate of 1200 g (a.i)/fed + hand-hoeing once at 45 days after sowing (DAS).

3.Oxyfluorfen [2-chloro-1-(3-ethoxy – 4 – nitrophenoxy) – 4 - trifluoro-methyl benozene known commercially as Goal 24% EC, applied as post sowing at the rate of 240 g (a.i)/fed.

4. Oxyfluorfen applied as post sowing at the rate of 240 g (a.i)/fed + hand-hoeing once at 45 days after sowing.

5. Clethodim [3 - chloro - 2 - propenyl) oxy- liminolpropil - 5 - (12 - (ethylio) propyl – 3 - hydroxy – 2 - cyclohexen – 1 - one] known commercially as Select 12.5% EC, applied after 30 days from sowing at the rate of 125 g (a.i)/fed.

6.Fluazifop-butyl[Butyl-2–{4(5–trifluoromethyl–2–pyridyloxy) phenoxy propionate}] known commercially as Fusilade super 12.5% EC, applied after 30 days from sowing at the rate of 187.5 g (a.i)/fed.

7. Hand-hoeing twice (30 and 45) days from sowing.

8. Weedy check (control).

Herbicide treatments were sprayed by the above herbicides using knapsack sprayer at water volume of 200 L/fed.

Sowing took place on 15th and 18th of May in 2005 and 2006 seasons, respectively. Harvest was done on 26th and 30th September in both seasons, respectively. The plot area was 21m^2 (5m. length and 4.2 m. width). Peanut seeds (cv. Giza 5) at the rate (35 kg/fed) were sown in rows (60 cm apart and 10 cm between hills). Peanut seeds were inoculated just before sowing with the specific rhizobium bacteria inoculants. Phosphorus fertilizer, as mono-super phosphate (15.5% P2O5) was added during the seed bed preparation at rate of 150 kg/fed. Potassium sulphate (48% K2O) at the rate of 50 kg/fed was applied at sowing. Nitrogen fertilizer was added at a rate of 30 kg N/fad as ammonium sulfate (20.6 %N) in two equal portions, the first half at sowing and the second after 30 days later. Sprinkler irrigation was applied at 3 days intervals. All other cultural practices were used as recommended for peanut production in the region.

Data recorded:

A. Weeds:

Weeds were removed by hand pulled from one square meter in each plot after 75 and 105 days from sowing and classified into

three groups according to Tackholm (1974) as follows:

1. Annual broad-leaved weeds.
2.Annual narrow-leaved weeds.
3. Total annual weeds

The dry weight of each group was recorded after air drying for three days and oven dried at 70 ºC for 24 hours. The dry weight was recorded to the nearest gram.

B- Yield components:

At harvest time, sample of ten random peanut plants from each plot were chosen to determine the following characters:

1. Dry weight of plant (g).
2. Number of pods per plant.
3. Weight of pods per plant (g).
4. Number of pods per 100 (g).
5. 100 pods weight (g).
6. Number of seeds per plant.
7. Weight of seeds per plant (g).
8. Number of seeds per 100 (g).
9. 100 seeds weight (g).

C- Yield:

Four rows from each experimental plot were harvested to determine the following:

1. Seed yield (kg /fed).
2. Straw yield (ton/fed).
3. Biological yield (ton/fed).
4. Protein percentage.
5. Oil percentage.

D- Chemical analysis:

Nitrogen was determined using modified Kjeldahl method and protein content was calculated by multiplying N% by 6.25. Phosphorous was determined colorimetrically using ammonium molybdate and ammonium metavanadate according to the procedure outlined by Ryan *et al*.,(1996). Potassium was determined using flame Spectrophotometry method, Black(1982). Oil content were determined according to A.O.A.C. (1995).

Economic evaluation:

Economic evaluation of the results was achieved to investigate the variances between the different studied factors to get the highest profitability by using some economic criteria as gross income, net income and profitability. Economic criteria were used according to the method described by Buckett (1981). Economic criteria were estimated from the following formulas:

1- Gross income (GI) = Total revenue from selling production of peanut crop (seeds + straw yield).

2- Net income (NI) = Gross income – Total costs. It was calculated by substracting cost input from total income according to Agricultural Statistics (2004 and 2005).

3-Profitability(P) = (Net income / Total costs) x100

Statistical Analysis.

All data obtained were statistically analyzed according to procedures outlined by Snedecor and Cochran (1982). Means values were compared by using the least significant differences (L.S.D) test at 5%.

Results and Discussion

I-Effect of foliar spraying of micronutrients.

I- A. On weeds:

Weed assessment revealed that dominant weed species in the experimental site were common purslane (*Portulaca oleraceus* L*)*, livid amaranth *(Amaranthus caudatus)*, mexican fireplant *(Euphorbia prunifolia)*, cocklebur (*Xanthinum spinosm)* and black nightshade (*Solanum nigrum*) as annual broad-leaf weeds as well as jungle rice (*Eichonoclloa colonum*), goosegrass (*Eleusine indica*), (vahl) panz (*Dinebra retvoflexa*), large crabgrass (*Digitaria sanguinalis*), field sandbur (*Cenchrus biflorus*) and crow foot grass (*Dacteloctenium agyptium*) as annual narrow-leaved weeds.

Data in Tables (1 and 2) show that foliar application of micronutrients reduced significantly the dry weights of annual broad-leaved, narrow and total annual weeds in 2005 and 2006 seasons.

Foliar application of micronutrients at the rate of 4.5 g/L reduced significantly the dry weights of annual broad - leaved weeds by 31.3 and 42.7% at 75 and 105 days after sowing (DAS) ,respectively, in 2005 season and by 34.6% at 75 (DAS) as compared to control treatment (without the addition of micronutrients) in 2006 season.

Foliar application of micronutrients at the rate of 3.0 g/L reduced significantly the dry weights of annual narrow leaved weeds by 47.2% at 75 (DAS) as compared to control treatment in 2005 season only.

Foliar application of micronutrients at the rate of 3.0 g/L reduced significantly the dry weights of total annual weeds at 75 and 105 (DAS) by 33.8 and 10.8%, respectively, as compared to control treatment (without the addition of foliar application) in the 2005 and 2006 seasons These results might be due to the addition of micronutrients which increased peanut growth and increased the competition of peanut plants against weeds. These results are in agreement with those obtained by Yagadin (1984).

I - B - On yield

I- B 1- On yield and yield components.

Data in Tables (3 and 4) show that foliar application of micronutrients at rate of 4.5 g/L significantly increased the dry weight of peanut plant (g), weight of pods per plant (g) and seed yield (kg/fed) by 14.6, 31.3 and 17.7% ,respectively, in 2005 season. The same treatment increased number of pods per plant and seed yield (kg/fed) by 16.0 and 15.5%, respectively, as compared to the control treatment in 2006 season. Similar results were obtained by Repvathy *et al.* (1996) and Dahdoh and Mousa (2000).

Table(1): Effect of micronutrients and weed control treatments on the dry weight of annual broad - leaved, narrow -leaved and total weeds (g/m^2) at 75 and 105 days after sowing (DAS)* in 2005 season.

Micro-Nutrients	Weed control treatments	Rate g (a.i) /fed	Broad – leaved (g/m^2)		Narrow – leaved (g/m^2)		Total weeds (g/m^2)	
			75 DAS	105 DAS	75 DAS	105 DAS	75 DAS	105 DAS
Zero	1. Butralin	1200	0.7	29.1	437.6	698.4	438.3	727.5
	2. Butralin + *HH	1200	1.3	0.0	106.3	65.4	107.6	65.4
	3. Oxyfluorfen	240	35.7	0.0	409.0	459.6	444.7	459.6
	4. Oxyfluorfen + *HH	240	0.0	0.0	293.2	140.6	293.2	140.6
	5. Clethodim	125	442.6	330.0	7.0	119.4	449.6	449.4
	6. Fluazifop-butyl	187.5	230.9	80.0	482.8	484.9	713.7	564.9
	7. Hand-hoeing twice		124.1	190.9	327.3	509.4	451.4	700.3
	8. Weedy check (control).		753.0	391.8	797.1	855.9	1550.1	1247.7
Mean			198.5	127.7	357.5	416.7	556.1	544.4
3.0 g / liter	1. Butralin	1200	0.0	0.0	424.7	466.7	424.7	466.7
	2. Butralin + *HH	1200	1.6	27.0	61.5	139.4	63.1	166.4
	3. Oxyfluorfen	240	0.0	3.5	117.8	345.4	117.8	348.9
	4. Oxyfluorfen + *HH	240	0.0	0.0	18.2	279.2	18.2	279.2
	5. Clethodim	125	510.9	116.2	3.2	104.1	514.1	220.3
	6. Fluazifop-butyl	187.5	173.2	175.1	304.4	381.3	477.6	556.4
	7. Hand-hoeing twice		149.3	168.5	76.4	411.2	225.7	579.7
	8. Weedy check (control).		600.4	447.0	503.3	1008.5	1103.7	1455.5
Mean			179.4	117.2	188.7	392.0	368.1	509.1
4.5 g / liter	1. Butralin	1200	0.0	0.0	267.8	535.7	267.8	535.7
	2. Butralin + *HH	1200	0.0	0.0	199.3	55.1	199.3	55.1
	3. Oxyfluorfen	240	13.3	0.0	351.1	474.9	364.4	474.9
	4. Oxyfluorfen + *HH	240	0.0	0.0	197.3	416.1	197.3	416.1
	5. Clethodim	125	389.5	81.6	56.9	177.4	446.4	259.0
	6. Fluazifop-butyl	187.5	139.5	77.7	297.4	509.9	436.9	587.6
	7. Hand-hoeing twice		82.0	60.5	108.3	561.2	190.3	621.7
	8. Weedy check (control).		466.4	366.0	776.8	759.0	1243.2	1125.0
Mean			136.3	73.2	281.9	436.2	418.2	509.4
Over all means	1. Butralin	1200	0.2	9.7	376.7	566.9	376.9	576.6
	2. Butralin + *HH	1200	1.0	9.0	122.4	86.6	123.3	95.6
	3. Oxyfluorfen	240	16.3	1.2	292.6	426.6	309.0	427.8
	4. Oxyfluorfen + *HH	240	0.0	0.0	169.6	278.6	169.6	278.6
	5. Clethodim	125	447.7	175.9	22.4	133.6	470.0	309.6
	6. Fluazifop-butyl	187.5	181.2	110.9	361.5	458.7	542.7	569.6
	7. Hand-hoeing twice		118.5	140.0	170.7	493.9	289.1	633.9
	8. Weedy check (control).		606.6	401.6	692.4	874.5	1299.0	1276.1
Mean			171.4	106.0	276.0	414.9	447.5	521.0
LSD at 5% level								
Micronutrients		A	12.4	19.8	53.1	NS	32.3	NS
Weed control treatments		B	27.4	20.6	71.5	34.3	57.1	160.7
Micronutrients x weed control treatments		AB	47.7	35.8	124.5	59.8	64.5	NS

*One hand-hoeing = HH.

Table(2): Effect of micronutrients and weed control treatments on the dry weight of annual broad-leaved, narrow -leaved and total weeds (g/m^2) at 75 and 105 days after sowing (DAS)* in 2006 season.

Micro-Nutrients	Weed control treatments	Rate g (a.i) /fed	Broad – leaved (g/m^2)		Narrow – leaved (g/m^2)		Total weeds (g/m^2)	
			75 DAS	105 DAS	75 DAS	105 DAS	75 DAS	105 DAS
Zero	1. Butralin	1200	54.4	3.1	144.9	340.2	199.3	343.3
	2. Butralin + *HH	1200	40.3	0.0	42.3	95.7	82.6	95.7
	3. Oxyfluorfen	240	0.0	0.0	114.4	171.5	114.4	171.5
	4. Oxyfluorfen + *HH	240	0.0	0.0	33.8	46.7	33.8	46.7
	5. Clethodim	125	239.4	251.0	24.4	8.2	263.8	259.2
	6. Fluazifop-butyl	187.5	256.0	18.7	160.1	357.9	416.1	376.6
	7. Hand-hoeing twice		256.3	45.3	161.2	369.3	417.5	414.6
	8. Weedy check (control).		368.5	268.3	356.4	592.9	724.9	861.2
Mean			151.9	73.3	129.7	247.8	281.6	321.1
3.0 g / liter	1. Butralin	1200	0.0	41.1	159.3	225.0	159.3	266.1
	2. Butralin + *HH	1200	0.0	10.3	12.4	52.0	12.4	62.3
	3. Oxyfluorfen	240	0.0	1.7	129.5	221.3	129.5	223.0
	4. Oxyfluorfen + *HH	240	0.0	0.0	84.4	51.1	84.4	51.1
	5. Clethodim	125	256.5	35.5	0.0	30.7	256.5	66.2
	6. Fluazifop-butyl	187.5	125.4	47.2	235.3	321.3	360.7	368.5
	7. Hand-hoeing twice		220.5	53.3	242.6	325.2	463.1	378.5
	8. Weedy check (control).		330.3	328.4	354.1	548.0	684.4	876.4
Mean			116.6	64.7	152.2	221.8	268.8	286.5
4.5 g / liter	1. Butralin	1200	45.0	0.0	173.0	238.3	218.0	238.3
	2. Butralin + *HH	1200	0.5	0.0	26.6	91.3	27.1	91.3
	3. Oxyfluorfen	240	10.3	45.9	127.0	233.9	137.3	279.8
	4. Oxyfluorfen + *HH	240	1.9	8.0	153.9	227.3	155.8	235.3
	5. Clethodim	125	155.6	10.9	5.5	74.4	161.1	85.3
	6. Fluazifop-butyl	187.5	102.9	87.9	137.8	252.0	240.7	339.9
	7. Hand-hoeing twice		131.5	108.3	164.7	268.0	296.2	376.3
	8. Weedy check (control).		347.0	235.9	367.8	489.0	714.8	724.9
Mean			99.3	62.1	144.5	234.3	243.9	296.4
Over all means	1. Butralin	1200	33.1	14.7	159.1	267.8	192.2	282.6
	2. Butralin + *HH	1200	13.6	3.4	27.1	79.7	40.7	83.1
	3. Oxyfluorfen	240	3.4	15.9	123.6	208.9	127.1	224.8
	4. Oxyfluorfen + *HH	240	0.6	2.7	90.7	108.4	91.3	111.0
	5. Clethodim	125	217.2	99.1	10.0	37.8	227.1	136.9
	6. Fluazifop-butyl	187.5	161.4	51.3	177.7	310.4	339.2	361.7
	7. Hand-hoeing twice		202.8	69.0	189.5	320.8	392.3	389.8
	8. Weedy check (control).		348.6	277.5	359.4	543.3	708.0	820.8
Mean			122.6	66.7	142.1	234.6	264.7	301.3
LSD at 5% level								
Micronutrients		A	19.8	NS	NS	NS	NS	30.3
Weed control treatments		B	27.5	22.3	36.2	51.5	47.4	57.2
Micronutrients x weed control treatments		AB	47.8	38.8	63.0	89.6	82.5	99.6

*One hand-hoeing = HH.

I- B 2- On N, P, and K uptake as well as protein percentage.

Data in Tables (5 and 6) show the effect of micronutrients on N-uptake of seeds, straw and biological yield of peanut plants in both 2005 and 2006 seasons. At the first season, there were no significant differences among three levels of micronutrients on straw and biological yield as well as protein percentage of peanut plant. However, N-uptake of seeds gave the highest value by applying 4.5 g/L of micro-nutrients as a foliar application. No significant differences could be noticed between 3.0 and 4.5 g/L of micronutrients, while control (without addition of micronutrients) gave the lowest N-uptake of seeds. At second season, the rate of 3 g/L gave the highest value of N-uptake for seeds, straw and biological yield as well as protein percentage. Also, no significant difference was found between both rates i.e. 3.0 and 4.5 g/L of micronutrients on N uptake of peanut straw. While, the control treatment showed the lowest N-uptake for seeds, straw and biological yields. On the other hand, the high rate of micronutrients (4.5 g/L) recorded the lowest value of protein (%). Generally, in both seasons, control treatment gave the lowest value of P and K uptake of seeds, straw and biological yield as well as protein percentage. Meanwhile, the rate of 3 g/L gave the highest value of P and K uptake for seeds, straw and biological yield as well as protein (%). While, no significant difference was found between both rates i.e. 3.0 and 4.5 g/L of micronutrients on P uptake of seeds, straw and biological yields as well as K uptake for seeds. On the other hand, no significant effect could be noticed among the three levels of micronutrients on P uptake of seeds and straw yield of peanut plant.

The beneficial effects of the studied micronutrients may be attributed to one or more of the following:

I-These elements have promoted the effects of the growth regulators and enzymes, enzymeatic activities, photosynthetic processes as well as synthesis of protein, carbohydrates and lipids as reported by Ibrahim and Shalaby (1994), Nassar (1997) and Marschner (1998).

II-The addition of the tested micronutrients improve the translocation of photosynthetic substances from leaves to seeds during the synthesis process. Yet, they produce better number of fertile tillers and pegs because of inducing changes in the endogenous hormone ratios and predominance of cytokinins at the time of tillering (Szirtes *et al*. 1986).

II -Effect of weed control treatments.

II - A. On weeds:

Data in Tables (1 and 2) show that all herbicidal treatments gave significant effect on the dry weights of broad - leaved, narrow - leaved and total annual weeds at 75 and 105 (DAS) in 2005 and 2006 seasons.

For the dry weight of annual broad-leaved weed, applying oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing reduced it significantly by (100 & 100%) and (99.8 & 99.0%) ,respectively at 75 and 105 (DAS) as compared to weedy check in 2005 and 2006 seasons.

Applying clethodim at the rate of 125 g (a.i)/fed reduced significantly narrow - leaved weeds by 96.8 and 97.2 % at 75 (DAS) and by 93.0% at 105 (DAS), respectively, as compared to weedy check in 2005 and 2006 seasons. Applying butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing reduced the dry weight of annual narrow-leaved weeds by 90.1% at 105 (DAS) as compared to weedy check in 2005 season

For the dry weight of total annual weeds, applying butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing reduced it by (90.5 & 92.5%) and (94.3 & 89.9%), respectively, at 75 and 105 (DAS) in 2005 and 2006 seasons as compared to weedy check. Similar results were obtained by Khozimy (2006) and Moshtohry *et al* (2007).

II – B - On yield

II – B 1- On yield and yield components.

Data in Tables (3 and 4) show that all herbicide treatments gave significant effect on yield and its components in 2005 and 2006 seasons. For oil percentage data did not give any significant effect in both seasons.

Applying butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing increased significantly the dry weight of peanut plants (89.3%), number of pods per plant (121.1%), weight of 100 pods per g (34.8%), number of seeds per plant (209.2%), weight of seeds per plant (195.1%) and weight of 100/g seeds (53.9%) as compared to weedy check in 2005 season. Applying oxyfluorfen at the rate of 240 g (a.i)/fed increased significantly weight of pods/plant (166.9%) and seed yield (kg/fed) (190.56%) as compared to weedy check in 2005 season. Weedy check treatment increased significantly the number of seeds per 100/g by 20.2% as compared to butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing in 2005 season. Applying oxyfluorfen at the rate of 240 g (a.i)/fed increased significantly

straw yield (ton/fed) and biological yield (ton/fed) by 78.8 and 85.3%, respectively, as compared to weedy check in 2005 season (Table, 3).

Applying butralin at the rate of 1200 g (a.i)/fed increased significantly biological yield (ton/fed) by 76.9% as compared to weedy check in 2006 season. Applying butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing increased significantly dry weight of plant (102.6%), number of pods per plant (104.0%) and weight of seeds per plant (172.2%) as compared to weedy check in 2006 season. Applying oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing increased significantly weight of pods per plant (g) (112.6%), number of pods per 100 g (20.1%), number of seed per plant (189.6%), weight of 100 seeds (32.1%) and seed yield (kg/fed) (172.7%) as compared to weedy check in 2006 season. Applying oxyfluorfen at the rate of 240 g (a.i)/fed increased significantly straw yield (ton/fed) by 112.6 as compared to weedy check in 2006 season. Weedy check treatment increased significantly number of seeds per 100 g by 10.4% as compared to oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand - hoeing in 2006 season (Table, 4). These results clearly indicate the importance of practicing one hand hoeing beside the pre - emergence herbicides to reduce the dry weights of weeds which was reflected on increasing the yield of peanut and its components. Similar results were obtained by Ibrahim (1995), Khozimy (2006) and Moshtohry *et al* (2007).

II - B 2- On N, P and K uptake and protein percentage.

Data in Tables (5 and 6) show that all weed control treatments had a significant effect on N P K uptake, protein (%) of seeds, straw and biological yield of peanut plant in 2005 and 2006 seasons.

Generally, in both seasons, the lowest values of N, P and K uptake of measured yields as well as protein (%) were recorded with control treatment (weedy check). However, in the first season, the highest value of these nutrients for straw and biological yield was recorded when oxyfluorfen was applied at the rate of 240 g (a.i)/fed compared with the other treatments. With respect to seeds, the highest value of N, P and K uptake was found when butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing and or oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing were applied. Meanwhile, the clethodim at the rate of 125 g (a.i)/fed gave the highest value of protein (%) compared to other treatments. In the second season, the highest value of N, P and K

uptake for most cases were recorded when butralin at the rate of 1200 g (a.i)/fed and or oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing were applied compared with other treatments. Also, butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing significantly gave the highest value of protein (%), but the lowest one was recorded when oxyfluorfen at the rate of 240 g (a.i)/fed followed by one hand-hoeing, fluazifop-butyl at the rate of 187.5 g (a.i)/fed and hand hoeing twice were applied. Similar results were obtained by Repvathy *et al.* (1996), Dahdoh and Mousa (2000), El-Masry (2001) and Nassar *et al*. (2002).

III - Effect of the interaction between micronutrients and weed control treatments.

III - A. On weeds:

Data in Tables 1 and 2 show that the interaction between foliar application of micronutrients and weed control treatments had a significant effect on the dry weights of annual broad - leaved, narrow - leaved and total annual weeds at 75 and 105 (DAS) in the 2005 and 2006 seasons.

In general, the interaction between foliar application of micronutrients treatments with butralin alone or followed by one hand-hoeing and oxyfluorfen alone or followed by one hand-hoeing reduced significantly the dry weights of annual broad-leaved weeds at 75 and 105 (DAS) while, the highest value was obtained from zero micronutrients treatment with weedy check in both 2005 and 2006 seasons.

The application of foliar micronutrients at a rate of 3.0 g/L with clethodim reduced significantly the dry weights of annual narrow - leaved weeds by 99.6% as compared to zero micronutrients treatment with weedy check at 75 (DAS) in 2005 season. Foliar addition of micronutrients at a rate of 4.5 g/L with butralin followed by one hand-hoeing reduced significantly the dry weights of annual narrow - leaved weeds by 94.5% as compared to zero micronutrients treatment with weedy check at 105 (DAS) in 2005 season. Foliar addition of micronutrients at a rate of 3.0 g/L with clethodim reduced significantly the dry weights of annual narrow - leaved weeds by 100% as compared to spraying micronutrients at a rate of 4.5 g/L with weedy check at 75 (DAS) in 2006 season. Applying zero micronutrients treatment with clethodim reduced significantly the dry weights of annual narrow - leaved weeds by 98.6% as compared to zero micronutrients treatment with weedy check at 105 (DAS) in 2006 season.

Foliar addition of micronutrients at a rate of 3.0 g/L with

oxyfluorfen followed by one hand-hoeing reduced significantly the dry weights of total annual weeds by 98.8% as compared to zero micronutrients treatment with weedy check at 75 (DAS) in 2005 season only. Foliar addition of micronutrients at the rate of 3.0 g/L with butralin followed by one hand-hoeing reduced significantly the dry weights of total annual weeds by 98.3% as compared to zero micronutrients treatment with weedy check at 75 (DAS) in 2006 season. Zero micronutrients treatment with oxyfluorfen followed by one hand-hoeing reduced significantly the dry weights of total annual weeds by 94.78% as compared to applying foliar addition of micronutrients at the rate of 3.0 g/L with weedy check at 105 (DAS) in 2006 season only Similar results were obtained by Khozimy (2006) and Moshtohry *et al* (2007).

III – B - On yield

III – B 1- On yield and yield components

Data in Tables 3 and 4 show that the interaction between foliar addition of micronutrients and weed control treatments had a significant effect on dry weight of peanut plant (g) and number of pods per 100 (g) in 2005 season only. Applying micronutrients at a rate of 4.5 g/L with butralin followed by one hand-hoeing increased significantly the dry weight of plants (g) by 179.2% as compared to zero micronutrients treatment with weedy check in 2005 season.

The application of zero micronutrients treatment with weedy check increased significantly the number of pods per 100 (g) by 31.4% as compared to spraying micronutrients at a rate of 3.0 g/L with butralin followed by one hand-hoeing or oxyfluorfen followed by one hand-hoeing in 2006 season. These results are in agreement with those obtained by Ibrahim (1995) and Moshtohry *et al* (2007).

III - B 2- On N, P and K uptake and protein percentage.

Data in Tables (5 and 6) show that foliar application of micronutrients at a rate of 4.5 g/L with oxyfluorfen alone gave the highest values in N-uptake of seeds while, the lowest value was obtained from zero micronutrients treatment with weedy check in 2005 season. Applying zero micronutrients treatment with butralin alone gave the highest values in N-uptake of straw and biological yield of peanut plants while, the lowest value was obtained from foliar treatment of micronutrients at a rate of 3.0 g/L with weedy check in 2005 season. Foliar application of micronutrients at a rate of 4.5 g/L with oxyfluorfen followed by one hand-hoeing gave the highest values in N-uptake of seeds while, the lowest value was obtained from zero micro-

nutrients treatment with weedy check in 2006 season. Applying foliar application of micro-nutrients at a rate of 3.0 g/L with oxyfluorfen followed by one hand-hoeing gave the highest values in N-uptake of straw and biological yield of peanut plant while, the lowest value was obtained from foliar addition of micronutrients at a rate of 3.0 g/L with weedy check in 2006 season.

Foliar application of micro-nutrients at the rate of 4.5 g/L with oxyfluorfen alone gave the highest values in P-uptake of seeds while, the lowest value was obtained from foliar addition of micronutrients at a rate of 3.0 g/L with weedy check in 2005 season. Applying foliar addition of micronutrients at a rate of 4.5 g/L with oxyfluorfen alone gave the highest values in P-uptake of straw and biological yield of peanut plant while, the lowest value was obtained from foliar addition of micronutrients at a rate of 3.0 g/L with weedy check in 2005 season. Foliar addition of micronutrients at a rate of 3.0 g/L with oxyfluorfen followed by one hand-hoeing gave the highest values in P-uptake of seeds, straw and biological yield of peanut plant while, the lowest value was obtained from zero micronutrients treatment with weedy check in 2006 season.

Foliar addition of micro-nutrients at a rate of 3.0 g/L with oxyfluorfen followed by one hand-hoeing gave the highest values in K-uptake of seeds while, the lowest value was obtained from foliar addition of micronutrients at a rate of 3.0 g/L with weedy check in 2005 season. Applying foliar addition of micronutrients at a rate of 4.5 g/L with oxyfluorfen alone gave the highest values in K-uptake of straw and biological yield of peanut plant, while, the lowest value was obtained from zero micronutrients treatment with weedy check in 2006 season.

Foliar addition of micro-nutrients at a rate of 3.0 g/L with either clethodim or oxyfluorfen alone gave the highest values in protein (%) while, the lowest value was obtained from zero micro-nutrients treatment with hand hoeing twice and foliar addition of micronutrients at a rate of 4.5 g/L with clethodim in 2005 and 2006 seasons.

Economic evaluation:-

A-Effect of foliar addition of micronutrients.

Foliar application of micronutrients increased all economic criteria in both 2005 and 2006 seasons (Table 7). The average increasing percentage in gross income, net income and profitability in both seasons due to using foliar application of micronutrients at a rate of 4.5 g/L were 16.3, 60.8 and 54.4% ,respectively, as compared with

applying zero micronutrients treatment with weedy check.

B- Effect of weed control treatments:-

Applying oxyfluorfen followed by one hand-hoeing realized the highest average of the two seasons for gross income, net income, and benefit/costs ratio by 3055.0, 1109.2 and 54.4 L.E, respectively.

C- Effect of the interaction between foliar application of micronutrients and weed control treatments.

Applying foliar addition of micronutrients at rate 4.5 g/L with oxyfluorfen followed by one hand-hoeing increased gross income by 3187.9 L.E. Applying foliar addition of micronutrients at rate 3.0 g/L with oxyfluorfen followed by one hand-hoeing increased net income, and profitability by the average of two seasons about 1239.1 and 62.6 L.E. ,respectively. Therefore, these treatments are considered most profitable to be used in this study to control weeds under new reclaimed lands at Ismailia.

CONCLUSION

From this study, the results cleared that foliar application of micronutrients with butralin at the rate of 1200 g (a.i)/fed followed by one hand-hoeing, oxyfluorfen at the rate of 240 g (a.i)/fed alone or followed by one hand-hoeing were more effective in most parameters under study. So, this study recommend the use of foliar application of micro-nutrients plus the previous herbicides.

References

A.O.A.C. 1995. Official Methods of Analysis.16 th Ed. Association of Official Agricultural Chemists. Washington D.C.

AI-Marsafy H.T., Kholosy A.S.O., Attia S.A.M. and Hassanein E.E. 1992. Potential chemical weed control in peanuts. J. Agric. Sci., Mansoura Univ. 17, 2591-2595.

Abd-El-Woahed M.S.A. 1993. Physiological response of groundnut to fertilizer and weed control. Ph. D. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.

Black, C. A. 1982. Methods of soil analysis. Part 2. Chemical and microbiological properties. Second Edition. Amer. Soc. Agron. Madison, Wisconsin, U.S. A.

Buckett, M. 1981. An Introduction to Farm Organization and Management. Pergamon Press Ltd., England, Ed.2.

Dahdoh, M.S.A. and B.I.M. Mousa (2000) Zn- Co and Ee-Ni interaction and their effect on peanut and broad bean plants. Egypt. J. Soil Sci. 40(4) 453-467.

El-Masry, A.A.Y. 2001 Effect of some soil amendments and fertilizer application practices on the yield of some crops under salt affected soils. Ph.D. Thesis, Al-Azhar Univ., Egypt.

El-Sehly S.E. 2005. Weed control in peanut and its effect on exportation characters. Ph.D. Thesis, Fac. of Agric., Al-Azhar Univ.

Fageria, N.K., V.C. Baligar and C. Jones. 1997. Growth and mineral nutrition of field crops. 2nd Ed. Marcel Dekker, Inc, New York pp: 494

Fletcher W. W. and Kirkwood R.C. 1982. Herbicides and plant growth regulators. Granada Publ., London.

Grichar W.J. and Boswell, T.E. 1986. Post emergence grass control in peanut *(Arachis hypogaca).* Weed Sci. 34, 587-590.

Grichar W.J. and Boswell T. E. 1989. Benmuda grass (*Cynoclon dactylon*) control with post emergence herbicides in peanut (*Arachis bypogaea*). Weed Technol. 3, 267-271.

Ibrahim, M.F. 1995 Effect of some herbicides on groundnut in newly reclaimed soil. M.Sc. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.

Ibrahim, M.E. and M.H. Shalaby 1994. Effect of some micronutrients and methods of their application on growth, yield and mineral composition of wheat. Annals Agric. Sci. Moshtohor, 32(3): 1371-1388.

Khozimy,A.M.H.2006. The role of some herbicides for controlling weeds and their side effects on peanut crop. M. Sc. Thesis, Fac. Agric., Suez Canal Univ., Egypt.

Marschner, H. 1998. Mineral Nutrition of Higher Plants. Academic Press Limited, London, Norfolk.

Moshtohry, M.R., A.N.M. ,Nassar, F.M. Ismail, M,F.Ibrahim. 2007. Effect of varieties and weed control treatments on weeds, growth characters, yield and yield components of peanut (*Arachis hypogaea* L.). J. Agric.Sci. Mansoura Univ.32(10):8043-8063.

Nassar, K.E.M. 1997. Some factors affecting the absorption of micronutrients by plant. Ph. D. Thesis, Fac. Agric., Menofiya Univ.

Nassar, K.E.; A.O. Osman; M.H. El-Kholy and Madiha M. Badran. 2002. Effect of seed coating with some micronutrients on Faba bean (*Vicia faba* L.). II-Effect on yield, yield attributes and mineral composition. Egypt. J. Soil Sci. 42(3), 363-381.

Panwar R.S., Malik R.K. and Bhan Y.M. 1988. Chemical weed control in groundnut. Indian J. Agron. 33, 458-459.

Repvathy, M.; R. Krishasamy and T. Chitdeshwari. 1996. Physiological aspects of iron deficiency in groundnut (*Arachis hypogaea* L) and (*Vigana Mungol*), Madras Agric. J.77 (3-4), 151-157.

Ryan, J., S. Garabet, K. Harmsen, and A. Rashid. 1996. A Soil and Plant Analysis Manual Adapted for the West Asia and North Africa Region. ICARDA , Aleppo, Syria. 140pp.

Snedecor, G.W. and W.G. Cochran 1982. Statistical Methods. 7th Ed., Iowa State Univ., Press, Ames, Iowa, U.S.A

Szirtes, V. ; J. Szirtes; S. Varga; J. Balassa; I. Mate and J. Balnfal 1986. Hormone centered theory and practice of the application of foliar fertilizers in winter wheat and other cereals. "Foliar fertilization" Alexander (ed.) Martinus Nijhoff Publishers: 346-377.

Tackholm V. 1974. Student's Flora of Egypt. 2nd Ed. Cairo Univ., Egypt. Graphical Service, Beirut, Lebanon.

Yagadin. 1984. Micronutrients Fertilizers. In Agricultural Chemistry. Mir Publishers, Oscow p 7-37.

تأثير العناصر الصغرى ومعاملات مكافحة الحشائش على محصول الفول السودانى والحشائش المصاحبة تحت ظروف التربة الرملية.

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أجريت تجربتان حقليتان خلال الموسمين الصيفيين 2005 و 2006 بمحطة البحوث الزراعيه بالإسماعيلية لدراسة تأثير العناصر الصغرى ومعاملات مكافحة الحشائش على الوزن الجاف للحشائش الحوليه العريضة والنجيلية والكلية (جم/ م2) والمحصول ومكوناته والعناصر الكبرى الممتصة والنسبة المئوية للبرونين لمحصول الفول السودانى تحت ظروف الأراضى الرملية.

أوضحت النتائج أن رش النباتات بالعناصر الصغرى كان لها تأثيرا معنويا على إنقاص الوزن الجاف للحشائش الحوليه للأجناس المختلفة (جم/ م2). وأن رش النباتات بالعناصر الصغرى بمعدل 3 جم/لتر بعد 75 يوم من الزراعة خفض الحشائش الحولية الكلية بنسبة 33.8 و 10.8 % بالمقارنة بمعاملة الكنترول فى الموسمين الأول والثانى. وعموما أدى رش العناصر الصغرى لزيادة معنوية فى وزن البذور والقش والمحصول البيولوجى ونسبة النتروجين والفوسفور والبوناسيوم الممتص والنسبة المئوية للبروتين مقارنة بمعاملة عدم رش العناصر الصغرى فى كلا الموسميين.

أثرت معاملات مكافحة الحشائش معنويا على الوزن الجاف (جم/ م2) للحشائش الحولية العريضة و النجيلية والكلية فى الموسمين عند 75 و 105 يوم من الزراعة. وأدى إضافة معاملة بيوترالين بمعدل 1200جم/ف متبوعا بعزقة واحدة إلى خفض الوزن الجاف للحشائش الحولية الكلية بنسبة (90.5 و 92.5%) و (94.2 و 89.9%) على الترتيب عند 75 و 105 يوم من الزراعة مقارنة بمعاملة الكنترول فى كلا الموسمين. كما أدى إضافة معاملة اوكسي فلورفين 240 جم/ف متبوعا بعزقة واحدة إلى زيادة معنوية فى محصول البذور (كجم/ف) بنسبة 190.5 و 172.7% على الترتيب وأعطت نفس المعاملة بدون عزيق زيادة معنوية فى محصول القش بنسبة 78.4 و 67.1% على الترتيب مقارنة بمعاملة الكنترول فى كلا الموسمين. وبالنسبة للنتروجين والفوسفور والبوتاسيوم الممتص أوضحت النتائج أن معاملة اوكسي فلورفين 240 جم/ف منفردا أو متبوعا بعزقة واحدة أعطت أعلى القيم مقارنة بباقى المعاملات فى كلا الموسميين. وتأثرت النسبة المئوية للبروتين بإضافة معاملة كليثوديم 1200 جم/ف و بيوترالين بمعدل 1200جم/ف متبوعا بعزقة واحدة فى موسمى 2005 و 2006 على التوالى.

أدى رش العناصر الصغرى بمعدل 3 جم /لتر مع معاملة اوكسي فلورفين 240 جم/ف متبوعا بعزقة واحدة ومعاملة بيوترالين بمعدل 1200جم/ف متبوعا بعزقة واحدة إلى إنخفاض معنوى فى الوزن الجاف للحشائش الحولية الكلية بنسبة 98.8 و 93.3% على الترتيب مقارنة بمعاملة الكنترول (بدون رش عناصر) مع معاملة الكنترول (بدون رش حشائش) عند 75 و 105 يوم من الزراعة فى كلا الموسميين. كما أدى رش العناصر الصغرى مع معاملة بيوترالين بمعدل 1200جم/ف متبوعا بعزقة واحدة و معاملة اوكسي فلورفين 240 جم/ف إلى زيادة معنوية فى النتروجين والفوسفور والبوتاسيوم الممتص فى البذور والقش والمحصول البيولوجى مقارنة بمعاملة الكنترول (بدون رش عناصر) مع معاملة الكنترول (بدون رش حشائش) فى موسم 2005. كما ادى رش العناصر الضغرى بمعدل 3 جم/لتر مع معاملة اوكسي فلورفين 240 جم/ف متبوعا بعزقة واحدة إلى زيادة معنوية فى النتروجين والفوسفور والبوتاسيوم فى البذور والقش والمحصول البيولوجى مقارنة بمعاملة الكنترول (بدون رش عناصر) مع معاملة الكنترول(بدون رش حشائش) فى موسم 2006.

أشار التقييم ألإقتصادى الى أن رش العناصر الصغرى بمعدل 4.5 جم/لتر أعطى أعلى زيادة فى القيم الإقتصادية فى الموسمين. وأعطت معاملة اوكسي فلورفين 240 جم/ف متبوعا بعزقة واحدة إلى زيادة معنوية فى كل القيم الإقتصادية فى الموسمين. وأدى رش العناصر الصغرى بمعدل 4.5 أو 3.0 جم/لتر على الترتيب مع المعاملة بمبيد اوكسي فلورفين 240 جم/ف متبوعا بعزقة واحدة إلى زيادة معنوية فى الدخل الإجمالى والعائد الصافى وهامش الربح والفائدة/معدل التكلفة والأربحية الإقتصادية فى متوسط الموسمين.