Egypt. J. Appl. Agric. Res. (NRC), Vol. 1, No. 2, pp. 97 - 108 (2008)

Response of Cowpea to Foliar Micro-Nutrients Spray and Mulching

M. E. M. Ahmed[*], N. Abd El-Kader[**] and A. Derbala[***]
[*]Horticulture Dept., [**] Soil and Water Dept., and [***] Agric. Eng. Dept., Faculty of Agriculture, Tanta University, Tanta, Egypt.

THE STUDY was carried out at the Experimental Farm of the Faculty of Agriculture, Tanta University, during the summer seasons of 2006 and 2007. The objectiveof thestudy was to evaluate the effect of mulching and foliar micro-nutrient sprays on growth and yield of cowpea plants. Results showed that spraying cowpea with high concentration of Fe, Zn and Mn (600 ppm.) improved yield and its components. Mulching with colorless and blue polyethylene sheets and rice straw gave the highest plant growth parameters and seed yield, compared with the bare soil. In general, foliar spray with a mixture of some micro-nutrients (Fe, Zn and Mn) and mulching with colorless polyethylene, blue polyethylene and rice straw can be recommended for improving growth and increasing production of cowpea under El-Garbia Governorate conditions. Rice straw mulching will contribute to solving the problem of pollution resulting from burning.

Keywords: Mulching, Micro-Nutrients, Cowpea (*Vigna unguiculata*)

Cowpea (*Vigna unguiculata* (L) walp) is one of the most important vegetable crops grown in Egypt. It is considered as an inexpensive source of protein. It is mainly used for human consumption and livestock feed as well as soil cover as green manure (Abd El-Mageed *et al.*, 2001).

Micro-nutrients like Fe, Zn and Mn are known as essential minor-elements. They are playing an important functional role in the physiological process. Their deficiency is considered to be the main factors for limiting yield in many areas. Iron is essential for chlorophyll molecule formation but not a constituent of it (Holmes and Brown, 1957). The main role of Zn in plant metabolism is to activate a series of enzymes. Zn deficiency is thought to restrict RNA synthesis which in turn inhibits protein synthesis causing poor content of protein (Katyal and Randhawas, 1983). Also, Zn is essential for the synthesis of tryptophan and

Correspondence author : E-mail : Dr.memahmed1@yahoo.com

IAA. Mn is closely correlated with chlorophyll formation, since it stimulates its formation (Shanmugaveiu, 1989).

Spraying legume plants with micro-nutrients (Fe, Zn and Mn)was found in plant growth parameters such as plant height and number of branches / plant pod weight, number of seed / pod and seed yield of legumes (El-Shobaky & Abd El-Mageed, 1996, 2001; & Mohamed & Helal, 1999); El-Mansi *et al* 1994; and Fawzi *et al*., 1993). The contents of N, P and K in legume plants are increased with spraying plants with Fe, Zn and Mn (El-Fiki, 1994; El-Shobaky & Abd El-Mageed, 1996 & 2001 and Mohamed & Helal, 1999).

Mulching is considered as a tool to improve plant growth and crop production through its effect on improving root growth characteristics, increasing soil temperature, improving soil moisture, increasing soil CO_2, promoting overall growth and development, that contribute to total yield increase (Wien & Minotti 1987, 1988a , 1988b, Grubinger *et al.*, 1993; Wien *et al.*, 1993, Farias-Lorios *et al.*, 1994a , b; Polthanee, 2000; Chhangani, 2001; Sarno *et al.*, 2004 and Veenstra *et al.*, 2006).

The main objective of the present study was to investigate the effect of mulching and foliar micro-nutrients spraying on growth and yield of cowpea.

Material and Methods

The study was carried on clay soil of the Experimental Farm of the Faculty of Agriculture, Tanta University during the summer seasons of 2006 and 2007 (Table 1).

Seeds of cowpea cv. "Kaha 1" were sown on 2nd and 3rd of May in 2006 and 2007 cropping season, respectively. The experimental design was a complete randomized block with three replications. Each experimental plot was 12 m^2, including 3 rows, each of 5 m length and 80 cm width and one plant per hill with 25 cm apart were planted. The cultural practices were done according to the general program of cowpea cultivation in the region .

Cowpea plants were sprayed with a mixture of Fe, Zn and Mn (300 and 600ppm), two times at 30 and 45 days after sowing. Control plants were sprayed with tap water.

Mulching treatments were colorless polyethylene (100 µm), blue polyethylene (100 µm), rise straw and un-mulched control. Mulching was full wide beds and half wide beds (80 cm and 40 cm wide, respectively). Treatments

were hand-laid on moist beds. Mulching was beginning after one week of planting to the end of the growing season.

During the study period, the following data were recorded:

1. Vegetative traits: For studying vegetative traits, five plants were uprooted from each plot at the full blooming stage (Morsy, 1986 and Metwally *et al.*, 1998) and data on plant height; number of leaves/plant; number of branches/plant; leaf area/plant were recorded. Leaf area was determined using the fresh weight method. The leaves were cleaned from dust and then weighted. Certain known disks were taken from the leaves with a cork puncher and weighted. The leaf area was calculated according to following formula:

$$\text{Leaf area in cm}^2 = \frac{\text{Fresh wt. of leaves}}{\text{Fresh wt. of disks}} \times \text{leaf area of disks in cm}^2$$

2. Yield and quality of seeds: the number of pods/plant, number of seeds/pod and seed yield (ton/fedan.) were recorded. In addition, nitrogen, phosphorus and potassium content of seeds were determined following to A.O.A.C (1995).

All data were subjected to analysis of variance using MSTATC program.

TABLE 1. Chemical analysis of soil before sowing according toRyan *et al.* (1996).

		2006 season	2007season
Soluble cations in saturation extract 1:5 (meq /L)			
Ca^{++}		6.66	6.00
Mg^{++}		4.90	5.2
Na^{+}		12.6	11.9
K^{+}		0.30	0.40
Soluble anions in saturation extract 1:5 (meq /L)			
CO_3^{--}		0.0	0.0
HCO_3^{-}		5.39	4.81
Cl^{-}		8.64	7.52
SO_4^{--}		10.43	9.51
pH		7.81	7.95
EC /25^0 C (m mohos / cm)		2.26	2.01
Organic matter %		0.72	0.92
Nitrogen :	Total (mg / 100g soil)	220.1	235.6
	Available (mg / 100g soil)	35.0	37.9
Phosphorus :	Total (mg / 100g soil)	29.9	35.4
	Available (mg / 100g soil)	5.2	7.5
Potassium :	Total (mg / 100g soil)	825.0	780.0
	Available (mg / 100g soil)	194.2	172.0

Results and Discussion

Vegetative growth

Results indicated that plant height, number of leaves per plant, number of branches per plant and leaf area per plant were significantly affected by spraying micro-nutrients in both seasons (Table 2). The highest values of all characters were obtained from the spraying cowpea plants with 600 ppm. The positive response to micro-nutrients foliar spray was reported by Mohamed and Helal (1999) on broad bean and El-Shobaky and Abd El-Mageed (2001) on pea plants.

With regard to mulching treatments, significant increase in plant height, number of leaves per plant, number of branches per plant and leaf area per plant when compared to the bare soil treatments were observed (Table 2). Cowpea plants grown on rice straw (80 cm) gave the tallest and highest number of branches, highest number of leaves and high leaf area in both seasons. Similar responses were reported by Polthanee, 2000 on cowpea; Chhangani, 2001, on lettuce plants.

The interactions between micro-nutrient sprays and mulching significantly affected plant height, number of leaves per plant, number of branches per plant and leaf area per plant in both seasons. Cowpea plants grown on rice straw (full wide beds) and sprayed with a mixture of micro-nutrients at 600 ppm were very tall and had the highest number of branches, leaves and leaf area in both seasons. Generally, all treatments values were higher than the control.

Yield and quality of seeds

Yield components like number of seeds per pods, number of pods per plant and seeds yield were significantly affected by spraying micro-nutrients at both concentrations in both seasons (Table 3). The highest values of all characters were obtained from the spraying at 600 ppm (seeds yield was 1.209 and 1.198 ton per fed. in the first and second seasons, respectively). Similar positive responses of legumes plants were reported by Fawzy *et al.* (1993), Mohamed & Helal (1999) and El-Shobaky & Abd El-Mageed (2001) on pea plants.

The mulching treatments had increased number of seeds per pods, number of pods per plant and seeds yield when compared to the bare soil treatments. Cowpea plants grown on rice straw (80 cm) gave the highest number of seeds, highest number of pods and highest values of seeds yield in both seasons (seeds yield was 1.242 and 1.198 ton per fed. in the first and second seasons, respectively). Generally, all treatments values were higher than the control. Similar results were reported by Polthanee, 2000 and Chhangani, 2001.

TABLE 2. Response of cowpea plants to foliar micro-nutrients and mulching on vegetative growth during 2006 and 2007 seasons.

Treatments	First season 2006				Second season 2007			
	plant height (cm)	No. of leaves/ plant	No. of branches/ plant	leaf area/ plant (cm^2)	plant height (cm)	No. of leaves/ plant	No. of branches/ plant	leaf area/ plant (cm^2)
Micro-nutrients								
0 ppm	43.5	17.57	4.57	128	46.3	18.77	4.70	149
300 ppm	49.4	17.87	4.78	135	51.9	19.53	4.94	150
600 ppm	55.1	18.09	5.03	144	57.9	19.89	5.18	156
L.S.D. at 5%	1.42	0.059	0.055	1.86	0.95	0.52	0.071	3.3
Mulching treat								
Colorless (40 cm)	49.6	17.88	4.80	137	51.9	19.34	4.85	148
Colorless (80 cm)	52.6	17.96	4.97	138	53.9	19.62	5.04	150
Blue (40cm)	47.3	17.77	4.68	135	49.8	19.16	4.85	146
Blue (80 cm)	49.3	17.84	4.88	137	52.1	19.36	5.01	152
Rice straw (40 cm)	51.2	18.00	4.96	137	54.3	19.92	5.14	150
Rice straw (80 cm)	54.2	18.10	5.23	138	57.8	19.67	5.33	153
Bare soil	41.1	17.34	4.04	128	44.2	18.70	4.36	143
L.S.D. at 5%	2.17	0.090	0.085	2.84	1.46	0.80	0.108	5.0
Interactions								
Colorless 40 * 0	43.6	17.66	4.56	131	46.6	18.27	4.50	138
Colorless 40 * 300	51.4	17.90	4.80	137	52.7	19.63	4.90	148
Colorless 40 * 600	53.8	18.10	5.03	145	56.3	20.13	5.16	158
Colorless 80 * 0	44.3	17.73	4.73	131	46.2	19.17	4.76	141
Colorless 80 * 300	53.0	17.93	4.90	137	53.9	19.73	5.03	150
Colorless 80 * 600	60.5	18.23	5.30	147	61.8	19.97	5.33	160
Blue 40 * 0	42.4	17.50	4.46	128	44.7	18.63	4.63	140
Blue 40 * 300	48.1	17.80	4.73	135	50.4	19.07	4.90	146
Blue 40 * 600	51.3	18.03	4.86	143	54.2	19.77	5.03	152
Blue 80 * 0	44.6	17.60	4.73	129	46.8	18.70	4.86	149
Blue 80 * 300	46.4	17.90	4.86	137	49.7	19.43	5.00	153
Blue 80 * 600	57.0	18.03	5.06	145	59.9	19.93	5.16	154
Rice straw 40 * 0	44.4	17.70	4.80	128	47.6	19.43	5.00	144
Rice straw 40 * 300	52.8	18.03	4.96	136	55.3	20.40	5.13	151
Rice straw 40 * 600	56.4	18.26	5.13	148	60.1	19.93	5.30	155
Rice straw 80 * 0	47.0	17.76	4.93	128	51.0	19.00	5.03	144
Rice straw 80 * 300	53.3	18.13	5.16	138	57.3	20.00	5.30	154
Rice straw 80 * 600	62.3	18.40	5.60	148	65.0	20.00	5.66	160
Bare soil * 0	37.9	17.06	3.80	122	41.1	18.20	4.13	136
Bare soil *300	40.9	17.40	4.06	127	43.6	18.43	4.36	146
Bare soil * 600	44.5	17.56	4.26	135	47.9	19.47	4.60	149
L.S.D. at 5%	3.76	0.156	0.147	4.92	2.53	1.39	0.187	8.7

TABLE 3. Response of cowpea plants to foliar spray with a mixture of micro-nutrients and mulching on yield and quality of seeds during 2006 and 2007 seasons.

Treatments	First season 2006			Second season 2007		
	No. of seeds / pods	No. of pods / plant	Seeds yield (ton / fed.)	No. of seeds / pods	No. of pods / plant	Seeds yield (ton / fed.)
Micro- nutrients						
0 ppm	10.5	28.4	1.142	11.4	29.7	1.160
300 ppm	10.8	30.3	1.162	11.8	31.5	1.182
600 ppm	11.1	31.8	1.209	12.2	33.0	1.198
L.S.D. at 5%	0.10	0.54	0.048	0.20	0.52	0.006
Mulching treat						
Colorless (40 cm)	10.9	30.3	1.164	11.8	31.7	1.176
Colorless (80 cm)	10.9	30.8	1.168	11.9	32.1	1.182
Blue (40cm)	10.8	30.1	1.162	11.6	31.3	1.177
Blue (80 cm)	10.9	30.5	1.165	11.9	31.5	1.183
Rice straw (40 cm)	10.9	30.8	1.170	12.0	31.9	1.187
Rice straw (80 cm)	11.0	31.0	1.242	12.2	32.3	1.198
Bare soil	10.4	27.6	1.127	11.3	29.2	1.156
L.S.D. at 5%	0.15	0.82	0.736	0.31	0.79	0.009
Interactions						
Colorless 40 * 0	10.6	28.6	1.145	11.3	30.3	1.157
Colorless 40 * 300	10.8	30.6	1.166	11.9	31.8	1.180
Colorless 40 * 600	11.2	31.8	1.181	12..3	33.0	1.192
Colorless 80 * 0	10.6	28.7	1.149	11.5	29.9	1.164
Colorless 80 * 300	10.9	31.2	1.169	11.9	32.5	1.182
Colorless 80 * 600	11.2	32.6	1.187	12.3	33.8	1.200
Blue 40 * 0	10.5	28.6	1.142	11.4	29.9	1.155
Blue 40 * 300	10.9	30.3	1.164	11.5	31.3	1.177
Blue 40 * 600	11.1	31.5	1.179	12.0	32.6	1.199
Blue 80 * 0	10.5	28.5	1.148	11.5	29.5	1.161
Blue 80 * 300	10.9	30.6	1.166	11.9	31.8	1.185
Blue 80 * 600	11.2	32.5	1.182	12.2	33.3	1.204
Rise straw 40 * 0	10.6	29.2	1.147	11.6	30.2	1.165
Rice straw 40 * 300	11.0	30.8	1.175	12.1	32.0	1.190
Rice straw 40 * 600	11.2	32.2	1.187	12.3	33.6	1.207
Rice straw 80 * 0	10.7	29.4	1.149	11.7	31.0	1.175
Rice straw 80 * 300	10.9	30.9	1.173	12.2	31.9	1.208
Rice straw 80 * 600	11.3	32.8	1.403	12.5	34.1	1.212
Bare soil * 0	9.9	25.6	1.116	10.7	27.1	1.143
Bare soil *300	10.5	28.2	1.122	11.5	29.4	1.155
Bare soil * 600	10.8	29.1	1.142	11.8	30.9	1.169
L.S.D. at 5%	0.26	1.42	0.127	0.54	1.37	0.016

The interactions between spraying and mulching significantly affected number of seeds per pods, number of pods per plant and seeds yield in both seasons. Rice straw (80 cm) with spraying at 600 ppm treatment gave the highest number of seeds, highest number of pods and highest values of seeds yield in both seasons (seeds yield was 1.403 and 1.212 ton per fed. in the first and second seasons, respectively). Generally, all treatments values were higher than the control.

Seed chemical composition

The effect of all spraying treatments on N% in cowpea plants was insignificant in the first season, but was significant in the second. P and K content of seeds were significantly affected by spraying cowpea plants with some micro-nutrients (Fe, Zn and Mn) at 300 or 600 ppm in both seasons. The highest values of all characters were obtained from the spraying cowpea plants at 600 ppm (Table 4).

With regard to mulching treatments, data presented showed generally that the mulch treatments had increased N, P and K content of seeds when compared to the bare soil treatments. Cowpea plants grown on rice straw (80 cm) were highest values in both seasons. Results of p and K content were significantly in both seasons, but result of N content was significantly in second season.

The interactions between spraying and mulching treatments significantly affected P and K content of seeds in both seasons, but result of N content was significantly in second season. Rice straw (80 cm) with spraying some micro-nutrients (Fe, Zn and Mn) at 600 ppm was the highest values of N, P and K content of seeds. Generally, all treatments values were higher than the control.

Conclusions

Micro-nutrient has been already recognized as essential factors for plant growth, high yield and better quality. Foliar application with micro-nutrients (Fe, Zn and Mn) is not only an additional channel of nutrition, but also considered as a mean to regulate root uptake. Furthermore, foliar application, increase the absorption rate of other nutrients which reflexes on growth and productivity of the vegetable (Wilkins, 1984).

Soil covered with plastic or organic mulches have been used in agriculture to modify environmental conditions. Beds are covered with mulches providing cultural benefits such as weed and disease control. In addition, the mulch materials improve growth and yield of crops (Van Derwerken & Wilcox-Lee, 1988 and Changani, 2001).

TABLE 4. Response of cowpea plants to foliar spray with a mixture of micro-nutrients (Fe, Zn and Mn) and mulching treatments on seed chemical composition during 2006 and 2007 seasons.

Treatments	First season 2006			Second season 2007		
	N (%)	P (mg / 100g)	K (mg / 100g)	N (%)	P (mg / 100g)	K(mg/ 100g)
Micro nutrients (Fe, Zn and Mn)						
0 ppm	3.18	423	1019	3.15	421	1018
300 ppm	3.18	433	1030	3.17	435	1036
600 ppm	3.18	438	1038	3.19	442	1041
L.S.D. at 5%	NS	2.01	1.9	0.01	2.33	1.90
Mulching treat						
Colorless (40 cm)	3.18	428	1031	3.17	427	1026
Colorless (80 cm)	3.18	429	1029	3.17	430	1030
Blue (40cm)	3.18	432	1027	3.17	429	1031
Blue (80 cm)	3.18	431	1029	3.17	433	1032
Rice straw (40 cm)	3.18	434	1030	3.18	439	1037
Rice straw (80 cm)	3.18	437	1032	3.18	441	1042
Bare soil	3.18	428	1026	3.15	426	1023
L.S.D. at 5%	NS	3.07	2.9	0.01	3.57	2.90
Interactions						
Colorless 40 * 0	3.18	421	1019	3.15	415	1013
Colorless 40 * 300	3.18	430	1034	3.17	430	1028
Colorless 40 * 600	3.18	432	1042	3.18	437	1036
Colorless 80 * 0	3.18	422	1018	3.15	419	1018
Colorless 80 * 300	3.18	432	1030	3.17	431	1034
Colorless 80 * 600	3.18	435	1039	3.19	440	1038
Blue 40 * 0	3.18	423	1017	3.15	420	1016
Blue 40 * 300	3.18	436	1029	3.18	431	1036
Blue 40 * 600	3.18	438	1036	3.19	438	1042
Blue 80 * 0	3.18	422	1019	3.14	420	1019
Blue 80 * 300	3.18	433	1030	3.17	436	1037
Blue 80 * 600	3.18	440	1039	3.19	444	1041
Rice straw 40 * 0	3.18	426	1022	3.15	427	1023
Rice straw 40 * 300	3.18	435	1031	3.18	441	1041
Rice straw 40 * 600	3.18	442	1039	3.20	450	1048
Rice straw 80 * 0	3.18	428	1023	3.15	428	1023
Rice straw 80 * 300	3.18	438	1032	3.17	445	1050
Rice straw 80 * 600	3.18	444	1041	3.20	449	1053
Bare soil * 0	3.18	420	1017	3.14	416	1014
Bare soil *300	3.17	430	1027	3.16	429	1025
Bare soil * 600	3.18	436	1033	3.17	434	1028
L.S.D. at 5%	NS	5.32	5.0	0.07	6.18	5.03

In general, previous results stated that mulching treatments increased growth and productivity of tomato (Almasoum, 1991, enhanced due to suitable changes in the wave length composition of light reflected from various colors of polyethylene surface. Rice straw role in improving productivity could be through improving soil properties and nutrients in the root-zone.

In general, foliar spray with a mixture of some micro-nutrients and mulching with polyethylene sheets and rice straw can be recommended for improving and increasing production of cowpea under clay soil, as indicated in this work. Fortunately, the rice straw is available and very cheap in Egypt. Also, the use of rice straw as a mulching leads to contribute to solving the problem of pollution resulting from burning rice straw.

References

Abd El-Mageed, Y.T., El-Shobaky, S.A. and Dakhly, O.F. (2001) Effect of inoculation with Rhizobium mutants and foliar spray with Ortho-phosphoric acid on growth and yield of cowpea. *5th Arab. Hort. Conference, Ismailia,* Egypt.75-85.

Almasoum, A.A. (1991) Plastic mulch colors effects on yield of "Meady" tomatoes. *Minufiya J. Agric. Res.* **16** (2), 1667-1675.

A.O.A.C. (1995) *"Official Method of Analysis".* 16th ed., Association of Official Analytical Chemists International, Arlington Virginia, USA.

Chhangani, S. (2001) Effect of mulches (synthetic and non synthetic) on water conservation, and marketable yield of irrigated lettuce (*Lactuca sativa* L.). In the Sudan Savannah of Nigeria. *Journal-of-Eco-Physiology.* **4** (1/2), 19-25.

El-Fiki, S.F. (1994) Effect of some macro and micro-nutrients on yield and its bio-chemical components of soybean. *M.Sc. Thesis,* Menofiya Univ., Egypt.

El-Mansi, A.A., El-Gamriny, F.A., Arisha, H.M. and Kamel, A.E. (1994) Influence of spraying cowpea plants with Mn and /or Mo on growth, seed yield and seed quality. *Zagazig J.Agric. Res.* **21** (3B), 907-914.

El-Shobaky, S.A. and Abd El-Mageed, Y.T. (1996) Response of two pea cultivars to GA_3 and Zinc sulphate as foliar spray. *Egypt. J. Appl. Sci.,* **11** (1), 87-103.

El-Shobaky, S.A. and Abd El-Mageed, Y.T. (2001) Response of pea plants to foliar spray with some micro-nutrients (Fe, Zn or Mn) in the new reclaimed sandy soil. *Proceeding of 5th Arab. Hort. Conference, Ismailia,* Egypt.47-56.

Farias-Larios, J., Orozco, M. Guzman, S. and Aguilar, S. (1994a) Soil temperature and moisture under different plastic mulches and their relation to growth and cucumber yield in a tropical region. *Gartenbauwissenschaft* **59** (6), 249-252. (C.F. Hort. Abst. **65**:415).

Farias-Larios, J., Guzman, S. and Michel, A.C. (1994b) Effect of plastic mulches on the growth and yield of cucumber in a tropical region. *Biological Agr. Hort.* **10** (4), 303-306. (C.F. Hort. Abst. **64**, 8690).

Fawzi, A.F.A., El-Fouly, M.M. and Moubark, Z.M. (1993) The need of grain legumes for iron, manganese and Zinc fertilization under Egyptian soil condition: Effect and uptake of metalosates. *J. Plant Nutr.* **16** (5), 813-823.

Grubinger, V., Minotti, P.L. Wien, H.C. and Turner, A.D. (1993) tomato response to starter fertilizer, polyethylene mulch and level of soil phosphorus. *J. Am. Soc. Hort. Sci.* **118** (2), 212-216.

Holmes, R.C. and Brown, J.C. (1957) *"Iron and Soil Fertility".* Year book of Agric. US. Sep. Agric., 111-113.

Katyal, J.C. and Randhawas, N.S. (1983) Micronutrients. FAO fertilizer and plant *Nutrition Bull.*, No.7.

Metwally, E.I., Zhewedy, A.M., Hafez, M. and Morsy, M.A. (1998) Kafr El-Sheikh-1 and Kaha-1 new cultivars of cowpea. *Mansoura J. Agric. Sci.* **23** (8), 3887-3897.

Mohamed, F.I. and Helal, F.A. (1999) Effect of planting methods and foliar spray with Manganese, Zinc, Boron and Iron on growth, green yield and its components and chemical content of Broad bean plants. *Minufiya J. Agric. Res.* **24** (3), 1033-1045.

Morsy, M.A. (1986) Effect of plant density and N-fertilizer on seed yield of cowpea. *M. Sc. Thesis,* Zagazig Uni. (Benha Branch) Fac. Agric. Moshtohor.

Ryan, J., Garabet, S. Harmsen, K. and Rashid, A. (1996) A soil and plant analysis manual. Adapted for the West Asia and North Africa Region. International Center for Agricultural Research in the Dry Areas ICARDA, Aleppo, Syria 140 p.

Polthanee, A. (2000) Soil mulching effects on growth and yield of cowpea following rice in the post-monsoon season of Northeastern Thailand. *Thai Journal of Agricultural Science.* **33** (3/4), 167-178.

Sarno, M. Iijima, Lumbanraja, J. Sunyoto, Yuliadi, E. Izumi, Y. and Watanabe, A. (2004) Soil chemical properties of an Indonesian red acid soil as affected by land use and crop management. *Soil-and-Tillage-Research.* **76** (2), 115-124.

Shanmugavelu, K.G. (1989) "Production Technology of Vegetable Crops". Published by Mohan prinlani for exford & J.B.H. Publishing Co. PVC. L.td., New Delhi.

VanDerwerken, J. E. and Wilcox-Lee, D. (1988) Influence of plastic mulch and type and frequency of irrigation on growth and yield of bell pepper. *J. Amer. Soc. For Horticultural Science,* **23** (6), 985-988.

Veenstra, J. J., Horwath, W. R. Mitchell, J. P. and Munk, D. S. (2006) Conservation tillage and cover cropping influence soil properties in San Joaquin Valley cotton-tomato crop. *California Agriculture,* **60** (3), 146-153.

Wien, H.C. and Minotti, P.L. (1987) Growth, yield, and nutrient uptake of transplanted fresh-market tomatoes as affected by plastic mulch and initial nitrogen rate. *J. Amer. Soc. Hort. Sci.* **112** (5), 759-763.

Wien, H.C. and Minotti, P.L. (1988a) Response of fresh-market tomatoes to nitrogen fertilizer and plastic mulch in short growing season. *J. Amer. Soc. Hort. Sci.* **113** (1). 61-65.

Wien, H.C. and Minotti, P.L. (1988b) Increasing yield of tomatoes with plastic mulch and apex removal. *J. Amer. Soc. Hort. Sci.* **113** (3): 342-347.

Wien, H.C., Minotti, P.L. and Grubinger, V.P. (1993) Polyethylene mulch stimulates early roots growth and nutrient uptake of transplanted tomatoes. *J. Amer. Soc. Hort. Sci.* **118** (2), 207-211.

Wilkins, M.B. (1984) *"Adva Need Plant Physiology"*. 1st ed in Greet Britain, Pitman Publishing Limited. 128 long Acre, London.

(*Received* 5/5/2008;
accepted 17/8/2008)

استجابة نباتات اللوبيا للرش ببعض العناصر الصغرى وتغطية التربة

محمد السيد محمد احمد*، ناصر عبد القادر، و اسعد دربالة*****
*قسم البساتين ، **قسم الاراضى والمياه و ***قسم الهندسة الزراعية – كلية الزراعة – جامعة طنطا – مصر.

أجريت دراسة حقلية خلال موسمين زراعيين متتالين (2006 و 2007) بالمزرعة البحثية بكلية الزراعة – جامعة طنطا واستخدم فيها صنف اللوبيا قها 1 لدراسة تأثير الرش بخليط من بعض العناصر الصغرى (حديد، زنك، منجنيز) وذلك بتركيز 0 و 300 و 600 جزء فى المليون (تم الرش مرتين بعد 30 و 45 يوم من الزراعة) وكذلك دراسة تأثير تغطية التربة (كنترول بدون غطاء، غطاء باستخدام قش الارز، غطاء بولى ايثيلين ابيض، غطاء بولى ايثيلين ازرق مع تغطية كاملة و تغطية نصف عرض الخطوط).

وقد اوضحت النتائج ان رش نباتات اللوبيا ببعض العناصر الغذائية مثل الحديد والزنك والمنجنيز بتركيز 600 جزء فى المليون قد حسنت من صفات النمو مثل ارتفاع النبات، عدد الافرع، عدد الاوراق و المساحة الورقية وكذلك اعطت اعلى قيمة لمحصول البذور، عدد البذور فى القرن و عدد القرون على النبات.

وكذلك تغطية التربة (كل المعاملات) اعطت اعلى قيمة لصفات النمو ومحصول البذور ومحتوى النتروجين والفوسفور والبوتاسيوم بالمقارنة بعدم تغطية التربة.

عموما ، يمكن التوصية بالرش بمخلوط من العناصر الصغرى (الحديد والزنك والمنجنيز) بتركيز 600 جزء / مليون وكذلك تغطية التربة باستخدام قش الارز أو بولى ايثيلين ابيض ، أو بولى ايثيلين ازرق لتحسين نمو وزيادة انتاج اللوبيا تحت ظروفالاراضى الطينية بمحافظة الغربية مع العلم بأن قش الارز متوافر ورخيص فى مصر. كما أن استخدام قش الارز فى تغطية التربة يؤدى الى المساهمة فى حل مشكلة التلوث الناتجة من حرق قش الارز.