Effect of Nodulation and N-Fertilization on Acari and Insects in Cowpea Fields

Abou-Tayesh, M.A.M; [1] Abir S. AL-Nasser;[2] H.M.EL-Nenaey[1] and S.A.Allam[1]
[1]Plant Protection Institute, Agricultural Research Center Egypt .
[2] Department of Biology, Faculty of Applied Sciences. Umm AL- Qura Univ., Makkah, KSA.

Received on:20/3/2014 *Accepted: 13/4/2014*

ABSTRACT

The current study was conducted at Sahka Agriculture. Research. Station, KafrEl-Sheikh, Egypt. Cowpea plants (*Vigna unquiculata*, L., Walp.) variety Doki 331, were inoculated with microsymbiont *Bradyrhizobium sp.* along with urea fertilizer at levels of 40 and 80 kg N/Fed. Applied in two equal doses at 30 and 45 days after sowing. The investigation lasted for three months in two summer planttions 2010 and 2011. To survey the presence mites, insect pests, beneficial and visitor insects at four fertilization levels: Nodulation + 50% N -fertilization, Nodulation + 100% N-fertilization, Non -Nodulation + 50% N -fertilization and non-nodulation + 100% N-fertilization. Results indicated presence of 4 species of mites belonging to 4 families orders in all nodulation and N- fertilization treatments during both seasons. While insect pests had 10 species belonging to 9 families in all nodulation and N-fertilization. Except that with Non-nodulation and N-fertilization in season 2010. Where it had 9 species belonging to 8 families and 5 orders during season 2010. Also, 8 species of beneficial insects belonging to 6 families and 5 orders in nodulation + 50% N- fertilization and Non –nodulation + 100% N-fertilization. But in Nodulation+ 100% N- fertilization was found 9 species belonging to 7 families and 6 orders. While, in non-nodulation + 50% N-fertilization there were 5 species belonging to 5 families orders during season 2010. Finally, 4 species of visitors insects belonging to 4 families and orders in all Nodulation and N-fertilization during season 2011. Results indicated the population density of the mite, insect pests, beneficial and visitor insects increased with nodulation and N-fertilization, recording the highest figure at 80 kg N/fed. *Tetranychus urticae* (koch), *Aphis craccivora* (koch), *Paederus alfierii* (Koch) *and Apis mellifera (L.)* were the dominant species in cowpea nodulation & N- fertilization and represented by 84.42, 77.08, 87.26, 82.76%, 34.43, 30.85, 39.04, 38.37%, 45.28, 33.91, 46.15, 40.00% and 47.06, 51.02, 66.66, 46.66% of Acari, pests, beneficial and visitor insects in the first season, respectively. It could be stated that each dominant and subdominant species which differently affected population diversity. Diversity index values of Acari species were 0.2484, 0.3302, 0.2198, 0.2730 and 0.3682, 1.3311, 0.3319, 0.4260. While, pests were 0.6905, 0.7617, 0.6579, 0.6586 and 0.7986, 0.8656, 0.7966, 0.8226. also, beneficial insects were 0.7248, 0.8137, 0.6155, 0.7472 and 0.9277, 0.9356, 0.9216. Finally, visitor insects were 0.4219, 0.4318, 0.3765, 0.3873 and 0.5839, 0.5866, 0.5908, 0.5965 for nodulation + 50% N- fertilization, nodulation + 100% N- fertilization, non- nodulation + 50% N- fertilization and Non-Nodulation + 100% N- fertilization during season 2010 and 2011. The relative abundance of species in each Nodulation had an effect on diversity index values.

Key words: Nodulation, Cowpea, Acari, Nitrogen Fertilization.

INTRODUCTION

Cowpea is one of the most important leguminous vegetable crops in Egypt. Recently, its cultivated area was rapidly increasing. However, the Acari, insect pests and diseases, cause serious damage to cowpea. The total number of Acari, pest, predator and parasitoid species, differs among crops and proportion of species also varied (El – Hawary *et al*. 1995). The relationship between species diversity and ecological processes can change quantitatively and qualitatively with environmental context (Cardinale & Nelson, 1999). Survey of Acari, insect pests, predators and parasitoids associated with cowpea varieties were reported by Saleh *et al*., 1972; Rahman,1977; Helaly *et al*., 1982-83; Hassan *et al*., 1985; Hamouda, 1993; El-Sayed, 1993; Abdel Alim, 1994; Gamieh and Saadon, 1998; Helal *et al*., 2003 and Abo- El Naga, 2011. It was stated that it can derive nitrogen from soil fertilizers and through dinitroge – fixation by symbiosis with the specific micro partner *Brdyrhizobium japonicum* increase of plant nitrogen content to certain level was found to induce the severity of infestation with major soybean pests such as the red spider mite *Tetranychus cucurbitacearum* (Mathys *et al*. 1968, Farrag *et a*l. 1980; Yanni *et al*. 1987 a & c; English-loeb. 1990; Yanni *et al*. 1991; Gamieh & Saadon, 1995 and Hegazy *et al*. 1997). Therefore many investigators made up their minds to control the red spider mite on soybean plants to get best yield (Attiah *et al.* 1976; Mohamed & Abdel Hafez, 1981; Ismail& Hoda, 1985; Hoda *et al*. 1986; Yanni *et al.* 1987 b and Singh *et al*., 1990). Therefore, the present investigation aims to study Acari fauna, insect pests, beneficial insects and visitor insects, as affected by nodulation and N- fertilization treatments of cowpea in Egypt and to see if species diversity as related to cowpea Nodulation and fertilization.

MATERIALS AND METHODS

This study was conducted at the experimental farm, Sakha Agricultural Research Station, Kafer El-Sheikh, Egypt. Experiments were carried out in two summer plantations 2010 and 2011. Cowpea variety Doki 331 was sown 1st June 2010 and in May 28 th, 2011 in clay-loamy alluvial soil in a split-split plot design with four replicates. Each sub – plot (21 m^2) contained 10 rows. The main- plot treatments were seed inoculation (or not) with the micro symbiont *Bradyrhizobium sp* using a peat – based inoculum (8.4×10^8 CFU/ g) at the rate of 200 g inoculum/ 40 kg seeds. The plots were irrigated just after sowing. The sub – plots were assigned to the urea fertilization (46% N) at 40 and 80 kg N/ fed applied in two equal doses 30 and 45 days after sowing.

The used cultural practices (treatments) were as follows:

1) Nodulation + 50% N- fertilization (40 kg/ fed).
2) Nodulation + 100% N- fertilization (80 kg/ fed).
3) Non- Nodulation + 50% N- fertilization (40 kg/ fed).
4) Non-Nodulation + 100% N- fertilization (80 kg/ fed).

Sampling started after one week of sowing. An area of one feddan was chosen for carrying out the present study. Samples were taken four times monthly. Fertilizers and the other cultural practices were applied according to the common recommendations without pesticidal treatments throughout the experiment. Population densities of *Empoasca spp* (nymph and adults) and *Cosmolyce bacticus* (L.) (adults) and *Nezara viridula* (L.) adults and all beneficial insects (adults) and visitor insects (adults) were estimated by the sweep net as 10 double strokes/ plot. Densities of *Aphis craccivora* koch. (nymphs and adults) *Spodoptera littoralis* (Bosid) and *Spodoptera exiqua* (Bosid) *Autoqrapha spp* larvae were evaluated in 10 caged cowpea plants/ plot. Each plant was caged into a plastic bag, and cut at the soil surface. The bag, harboring cowpea plant was transferred to the laboratory for the examination of larvae numbers of *Liriomyza spp*. and *Bemisia tabaci* (Genn) (nymphs and adults) and *Thrips tabaci* (lind) adults, *Tetranychus urticae* (sayed) adults, nymphs and *Amblyseius sp*, *Tydeus sp* and *Eupodes sp* adult were counted on leaves/ plot. Shannon – Weaner diversity (S.W.I) was used to measure diversity of arthropod pest species as it is the one most commonly used (Price, 1984). The Shannon – Weaner index was calculated according to the following equation

$$\mathbf{Hs = \sum_{i}^{s} Pi \log Pi}$$

Hs = The symbol for the amount of diversity in a group of species in this case, The category of classification used in the species (hence the sub – scripts) but other categories could be used as well, it may be applicable families, orders, …. etc.

S = Number of species with sample.

Pi = The proportion of the 1st species in the total sample. It measure the relative abundance and ranges between 0.00 to 1.00.

Log_e = Natural logarithm. The negative sings in added to make the come out positive value= 2.718.

The function was derived independently by Shannon and Weaner and other is sometimes mislabeled as the Shannon- Weaner function in the ecological literature (Kerbs, 1978).

RESULTS AND DISCUSSION

1-Survey of Acari and insect species in nodulation and N- fertilization of cowpea:

a. Acari species:

Results in table (1) revealed the presence of 4 species of mites affiliated to 4 families and one order arised from the all nodulation and N-fertilization practices of cowpea in both season 2010 & 2011. Infestation intensity of the spider mite *Tetranychus urticae* (koch) is presented in table (1) at counts through 20 days begining from the 30 up to 50 days after sowing. This period is known to be the maximum vegetative growth due to nodulation and N-fertilization along with favourable environmental factors, like temperature and relative humidity, which is responsible of infestation intensity with the mites. However, the data revealed apositive relationship between number of mites and cowpea nodulation regardless N- fertilization application. The dominant recorded species were *T. urticae* (koch) reaching 84.42%, 77.08%, 87.26% and 82.76% of the total mites in nodulated + 50% N- fertilization, nodulated + 100% N- fertilization, Non – nodulated + 50% N- fertilization and non-nodulated + 100% N- fertilization, while, the least record was *Eupodes sp.* reaching 1.81%, 3.44%, 2.20% and 2.47%. *Tydeus sp*. came second in rank, *Amblyseius sp.* 5.63%, 6.68%, 3.46% and 5.71% the third in rank during season 2010. While, during season 2011, the dominant recorded species was *T. urticae* (koch) reaching 74.04%, 50.00%,77.88% and 67.46% of the total mites in the all treatments mentioned before. While, the least record was *Eupodus sp*. reaching 5.61%, 11.17%, 5.46% and 8.00% *Tydeus sp.* came second in rank. *Amblyseius sp.* 9.19%, 16.66%, 6.83% and 11.14% had the third rank. Our results agree with those obtained by Farrag *et al.* (1980); Zaher *et al*. (1980), as they recorded apositive relationship between nitrogen status of soybean leaves and intensity of infestation with spider mite. Also, Yanni *et al.* (1987 a&c), Yanni *et al.* (1991) and Gameih and saadon (1995) mentioned that total N- content fluctuated through plant growth and infestation with phytophagous mites followed apositively correlated mode of changes as that detected for plant N- content percentage. Yanni *et al.* (1996) recorded that nodulation of soybean enhanced nodule number and

weight, plant dry weight, N- content, seed yield (100 seed weight), the relative fertilizer, N- use efficiency population density of phytophagous mite, *T. cucurbitacearum*.

b- Insect pests:

Results in table (1) showed the presence of 10 species of insect pests belonging to 9 families and 5 orders from the nodulation and N- fertilization of cowpea in nodulated + 50 % N- fertilization and nodulated + 100 % N- fertilization. While, in Non – nodulated + 50 % N- fertilization and non– nodulated + 100 % N- fertilization, it had 9 species of insect species affiliated to 8 families and 5 orders in the first season 2010 compared with 10 species of insect pests belonging to 9 families and 5 orders in the second season, 2011 at kafer El- Sheikh region. In the first and second seasons, order Homoptera was the most dominant which includes families of Aphididae, Aleyrodidae and Cicadellidae Aphididae was represented by *Aphis craccivora* (koch) showing 34.43%, 30.85%, 39.04%, 38.37% and 29.23%, 25.48%, 31.86%, 29.85% as total with the two seasons. Aleyrodidae was represented by *Bemisia tabaci* (Genn.) and accounted for 27.33%, 24.87%, 26.26%, 23.66% and 24.15%, 21.07%, 24.12%, 20.86% as total through the two seasons. The least recorded homopterous family was Cicadellidae represented by *Empoasca spp*. and comprised 16.92%, 15.78%, 15.09%, 17.40% and 16.53%, 15.32%, 14.17%, 16.76%. Order Diptera ranked the second place and was represented by family Agromyzidae (*Liromyza spp*). reaching 14.04%, 14.87%, 13.64%, 13.62% and 14.00%, 13.97%, 13.26%, 13.65% followed by order Lepidoptera and represented by three families. Noctuidae included the cotton leaf worm; *Spodoptera littoralis* (Boisd.) and the lesser cotton leaf worm *S. exiqua* (Hubner) (larvae) composing 3.21%, 4.91%,2.32%,4.19% and 4.94%,6.19%, 4.52%, 5.73% and 0.42%, 1.29%, 0.72%, 0.68% and 2.17%,3.31%, 2.51%, 3.16%, respectively. Agrotidae was represented by *Autographa spp.* and accounted for 0.93%, 1.54%, 0.29%, 0.13% and 2.65%, 4.00%, 2.41%, 2.28% as a total. Lycaenidae was represented by *Cosmolyce baeticus* L. achieving 0.16%, 0.43% and 1.23%,2.13, 1.61%, 1.63%. Thysanoptera ranked the fourth order and was represented by family Thripidae, *Thrips tabaci* (Lind.) reaching 2.03%, 4.76%, 2.46%, 1.78% and 3.70%, 6.19%, 3.82%,3.77%. Hemiptera was the least abundant order and was represented by Pentatomidae, *Nezara viridula* (L.) comprizing 0.51%, 0.67%, 0.14%, 0.13% and 1.41%, 2.31%, 1.71%, 2.28% against nodulated + 50 % N-fertilization, nodulated + 100 % N-fertilization, non – nodulated + 50 % N- fertilization and Non – nodulated + 100 % N- fertilization, respectively. Several investigators recorded many insect pests associated with Leguminous vegetable crops, i.e. El – Kifl *et al.* (1974) recorded 19 insect species on faba bean plants at Giza governorate. El– Sayed (1993) recorded 21 insect species in cowpea early and late summer plantations at Shebin El– Kom, Menoufia governorate. While, El– Hawary *et al*. (1995) recorded 13 insect pests on soybean plants at Kafer El– Sheikh. Variation in the recorded insect pests among investigators may be due to type of crop, location differences and annual weather fluctuations, type and level of fertilization and probably some unknown factors.

C. Beneficial insects:

Data in table (1) show the presence of 8 species of beneficial insects in 6 families and 5 orders in nodulated + 50 % N- fertilization compared with 9 species of beneficial insects in 7 families and 6 orders in nodulated + 100 % N- fertilization, while, in Non – nodulated + 50 % N- fertilization revealed the presence of 5 species of beneficial insects in 5 families and 4 orders compared with 8 species of beneficial insects in 6 families and 5 order in the first season 2010. While, in the second season 2011, showed the presence of 9 species of beneficial insects in 7 families and 6 orders in nodulated + 50 % N- fertilization, nodulated + 100 % N-fertilization, Non – nodulated + 50 % N-fertilization and Non – nodulated + 100 % N-fertilization, respectively. Coleoptera was the dominant order and was represented by two families being Coccinellidae and Staphylinidae. Coccinellidae is represented by *Coccinella undecimpunctata* (R.), *Cydonia* (Chilomenes) *Vicina nilotica* (muls) and *Scymnus interruptus* (Goez.) in 9.43%, 14.94%, 10.00%, 1.88%, 2.29%, 15.38%, 2.00 and 3.77%, 6.32%, 4.00%, respectively. Staphylinidae is represented by *Paederus alfierii* (koch.) 45.28%, 33.91%, 46.15, 40.00% as total nodulated + 50 % N- fertilization, nodulated + 100 % N- fertilization, Non – nodulated + 50 % N- fertilization and non – nodulated + 100 % N- fertilization, respectively. Order Diptera ranked the second place and represented by family Syrphidae (*Syrphus corollae* F.) reaching 15.09%. Odonta ranked the third category and was represented by family Aeschnidae (*Hemianex ephippiger* (Steys) reaching 11.32%. Hymenoptera had the fourth order and was represented by family Vespidae (*Polistes gallica* L.) reaching 7.55%. Neuroptera was the least abundant order and was represented by Chrysopidae [*Chrysopa vulgaris* (Schm.)] composed 5.66% in nodulated + 50 % N-fertilization, while, in nodulated + 100 % N-fertilization, order Hymenoptera ranked the second place and represented by family Vespidae (*Polistes gallica* L.) reaching 13.79%. Diptera ranked the third category and was represented by Syrphidae (*Syrphus corollae* F. reaching 12.06%. Odonta ranked the fourth order and was represented by Family Aeshnidae (*Hemianex ephippiger* (Steys)

reaching 10.92%. Neuroptera was the least abundant order and was represented by Chrysopidae (*Chrysopa vulgaris* (Schm.) reaching 4.59%. Also, in Non – nodulated + 50 % N- fertilization. Order Diptera and Neuroptera ranked the second place and represented by Syrphidae (*Syrphus corollae* L.) and Chrysopidae, *Chrysopa vulgaris* (Schm.) reaching 15.38%. Odonta was the least abundant order and was represented by Aeschnidae (*Hemianex ephippiger* (Steys) reaching 7.69%. Finally in Non – nodulated + 100 % N- fertilization, order Diptera and Hymenoptera ranked the second category and represented by family Syrphidae *Syrphus corollae* (F.) and Vespidae (*Polistes gallica* L.) reaching 16.00%. Odonta ranked the third category and was represented by Aeschnidae (*Hemianex ephippiger* (Steys) reaching 8.00%. Neuroptera was the least abundant order and was represented by Chrysopidae (*Chrysopa vulgaris* (Schm.) reaching 4.00% during the first season. In the second, 2011 data in table (1) indicate Coleoptera was the largest group represented by two families, Coccinellidae as *Coccinella undecimpunctata* (R.) which was considered as the most dominant species 14.87%, 13.74%,9.52%, 12.75%, *Cydonia* (Chilomens) *Vicia nilotica* (Muls) 7.59%, 6.75%, 6.55%, 7.52% and *Scymnus interuptus* (Geoz) 9.81%, 8.88%, 9.52%, 7.52%. Staphylinidae (*P. alfierii* (koch.) as 20.56%, 17.53%, 17.26%, 21.18% in nodulated + 50 % N-fertilization, nodulated + 100 % N- fertilization, Non – Nodulated + 50 % N- fertilization and Non – nodulated + 100 % N- fertilization, respectively. Order Hemiptera was the second group represented by Anthoconidae as *Orius spp,* 11.71%. Neuroptera was the third largest group and contained only one family, being Chrysopidae, represented by *C. carnae* 10.75% as total. Diptera ranked the fourth and represented by family Syrphidae only represented *S. corollae* (F.) comprising 9.81% of the total beneficial insects. Order Hymenoptera ranked the fifth and represented by family Vespidae only represented *P. gallica* (L.) comprising 8.23% as total. Order Odonta was the least recorded order represented by *H. ephippiger* (Steys) 6.64% in nodulated + 50 % N- fertilization. While, in nodulated + 100 % N- fertilization, order Diptera was the second group represented by Syrphidae as *S. corollae* (F.) 13.62% as total. Order Hemiptera ranked the third and represented by family Anthoconidae only represented *Orius spp.* comprising 11.61%. Order Neuroptera ranked the fourth and represented by Chrysopidae only *C. vulgaris* (Schm.) comprising 10.31%. Order Odonta ranked the fifth and represented by Aeschnidae only, *H. ephippiger* (Steys) comprising 10.18%. Hymenoptera was the least abundant order and was represented by Vespidae (*P. gallica* L.) composed 7.34% in odulated + 100 % N- fertilization.

Several investigators recorded many beneficial species associated with Leguminous vegetable crops, i.e. El–Sayed (1993) recorded 8 predators and 10 parasites species in cowpea early and late summer plantations at Shebin El– Kom, Menoufia governorate. Sherif *et al*. (1994) recorded ten species of predators and three Hymenopterous parasitois on faba bean at Kafer El– Sheikh. While, El– Dakhakhni *et al.* (1995) recorded 13 beneficial Insect pests on soybean plants at the same region in the current study. The beneficial insects were minor in comparison with insect pests in the first and second season. This may be due to species composition, crop duration and toxic applicatios of pesticides (El – Mezayyen, 1998).

D. Visitor insects

Data in table (1) revealed the presence of 4 species of visitor insects belonging to 4 families and 2 orders in nodulated + 100 % N- fertilization compared with 3 species of visitor insects affiliated to 3 families and 2 orders in nodulated + 50 % N-fertilization, Non– nodulated + 50 % N- fertilization and Non – nodulated + 100 % N- fertilization during the first season 2010. While, in the second season, 2011, show the presence of 4 species of visitor insects, belonging to 4 families and 2 orders in nodulated + 50 % N- fertilization, nodulated + 100 % N- fertilization, Non– nodulated + 50 % N-fertilization and non– nodulated+ 100 % N-fertilization at Kafer El– Sheikh, respectively. Hymenoptera was the major order represented by two families, Apidae as *Apis mellifera* (L.) 47.06%, 51.02%, 66.66%, 46.66% and 30.86%, 30%, 21.74%, 27.96%. Formicidae as *Monemorium pharaonis* (L.) 41.17%, 38.77%, 16.66%, 46.66% and 33.33%, 19%, 23.91%, 27.96% as total in the first and second season, in nodulated + 50 % N-fertilization, nodulated + 100 % N- fertilization, non – nodulated + 50 % N- fertilization and non – nodulated + 100 % N- fertilization respectively. Order Lepidoptera ranked second and represented by two families i.e. Pieridae and Nymphalidae which included one species each, being *Pieris rapae* (L.) as 11.76%, 8.16%, 16.66% and 17.28%, 33%,34.78%,25.42%. Nymphalidae represented by *Vanesa cardui* (L.) as 2.04%, 6.66% and 18.52%, 18%, 19.56%, 18.64% in nodulated + 50 % N-fertilization, nodulated + 100 % N- fertilization, non – nodulated + 50 % N- fertilization and non – nodulated + 100 % N- fertilization, respectively. Sherif *et al.* (1994) recorded 6 visitor insects of faba bean plants at Kafer El–Sheikh, while El–Mezayyen (1993) recorded 3 visitor insects on soybean plants at the same region.

Table 1: Population density of Acari, Insect pest Beneficial and Visitoros insects on cowpea leaves as affected by nodulation and fertilization during 2010 and 2011 seasons at kafr El- Sheikh region.

	Order	Family	Species	Season 2010							
				*		**		***		****	
				Mean	%	Mean	%	Mean	%	Mean	%
Acari		Tetranychidae	*Tetranychus urticae(koch)*	84.40	84.42	121.10	77.08	55.50	87.26	76.86	82.76
		Phytoseiidae	*Amblyseius sp*	5.60	5.63	10.50	6.68	2.20	3.46	5.30	5.71
	Acarina	Tydeiae	*Tydeus sp*	7.70	7.74	20.10	12.79	4.50	7.07	8.40	9.05
		Eupodidae	*Eupodes sp*	1.80	1.81	5.40	3.44	1.40	2.20	2.30	2.47
Insect pests	Diptera	Agromyzidae	*Liromyza spp*	16.60	14.04	30.90	14.87	9.40	13.64	19.80	13.62
	Homoptera	Aleyrodidae	*Bemisia tabaci(Genn)*	32.30	27.33	51.70	24.87	18.10	26.26	34.40	23.66
		Aphididae	*Aphis craccivora (koch)*	40.70	34.43	64.10	30.85	26.90	39.04	55.80	38.37
		Cicadellidae	*Empoasca spp*	20.00	16.92	32.80	15.78	10.40	15.09	25.30	17.40
	Lepidoptera	Noctuidae	*Spodoptera littoralis(B oisd)*	3.80	3.21	10.20	4.91	1.60	2.32	6.10	4.19
			Spodoptera exigua(Hudner)	0.50	0.42	2.70	1.29	0.50	0.72	1.00	0.68
		Agrotidae	*Autographa spp*	1.10	0.93	3.20	1.54	0.20	0.29	0.20	0.13
		Lycaenidae	*Cosmolyce baeticus (L.)*	0.20	0.16	0.90	0.43	0	00	0	0
	Hemiptera	Pentatomidae	*Nezara viridula(L.)*	0.60	0.51	1.40	0.67	0.10	0.14	0.20	0.13
	Thysanaptera	*Thripidae*	*Thrips tabaci(lind)*	2.40	2.03	9.90	4.76	1.70	2.46	2.60	1.78
Beneficial insects	Coleoptera	Coccinelldae (muls)	*Coccinella undecimpun (L.)*	0.50	9.43	2.60	14.94	0	0	0.50	10.00
			Eydonia(chilomens)Vicina	0.10	1.88	0.40	2.29	0.20	15.38	0.10	2.00
			Scymnus Interuptus(Geoz)	0.20	3.77	1.10	6.32	0	0	0.20	4.00
		Staphylinidae	*Paederus alfierii(koch)*	2.40	45.28	5.90	33.91	0.60	46.15	2.00	40.0
	Diptera	Syrphidae	Syrphus corollae(F.)	0.80	15.09	2.10	12.06	0.20	15.38	0.80	16.0
	Odonta	Aeschnidae	*Hemianex Ephippiger(steys)*	0.60	11.32	1.90	10.92	0.10	7.69	0.40	8.0
	Neuroptera	Chrysopidae	Chrysopa vulgaris(schm)	0.30	5.66	0.80	4.59	0.20	15.38	0.20	4.00
	Hymenaptera	Vespidae	*Palistes gallica(L.)*	0.40	7.55	2.40	13.79	0	0	0.80	16.00
	Hymenapter	Anthoconidae	*Orius spp*	0	0	0.20	1.15	0	0	0	00
Visitor	Lepidoptera	Pieridae	*Pieris rapae (L.)*	0.20	11.76	0.40	8.16	0.10	16.66	0	0
		Nymphalidae	*Vanesa mellifera(L.)*	0	0	0.10	2.04	0	0	0.10	6.66
	Hymenoptera	Apidae	*Apis mellifera(L.)*	0.80	47.06	2.50	51.02	0.40	66.66	0.70	46.66
		Formicidae	*Monmorium pharaonis*	0.70	41.17	1.90	38.77	0.10	16.66	0.70	46.66

*= Nodulated +50%N- fertilization
**= Nodulated +100%N- fertilization
***= Non- Nodulated +50%N- fertilization
*** *= Non- Nodulated +100%N- fertilization

Table 1: Continued

	Order	Family	Species	Season 2011							
				*		**		***		****	
				Mean	%	Mean	%	Mean	%	Mean	%
Acari		Tetranychidae	*Tetranychus urticae(koch)*	91.00	74.04	74.70	50.0	62.70	77.88	90.20	67.46
		Phytoseiidae	*Amblyseius sp*	11.30	9.19	24.90	16.66	5.50	6.83	14.90	11.14
	Acarina	Tydeiae	*Tydeus sp*	13.70	11.15	33.10	22.15	7.90	9.81	17.90	13.38
		Eupodidae	*Eupodes sp*	6.90	5.61	16.70	11.17	4.40	5.46	10.70	8.00
Insect pests	Diptera	Agromyzidae	*Liromyza spp*	23.80	14.00	44.70	13.97	13.20	13.26	29.30	13.65
	Homoptera	Aleyrodidae	*Bemisia tabaci(Genn)*	41.00	24.15	67.40	21.07	24.00	24.12	44.80	20.86
		Aphididae	*Aphis craccivora (koch)*	49.70	29.23	81.50	25.48	31.70	31.86	64.10	29.85
		Cicadellidae	*Empoasca spp*	28.10	16.53	49.00	15.32	14.10	14.17	36.00	16.76
	Lepidoptera	Noctuidae	*Spodoptera littoralis(B oisd)*	8.40	4.94	19.80	6.19	4.50	4.52	12.30	5.73
			Spodoptera exigua(Hudner)	3.70	2.17	10.60	3.31	2.50	2.51	6.80	3.16
		Agrotidae	*Autographa spp*	4.50	2.65	12.80	4.00	2.40	2.41	4.90	2.28
		Lycaenidae	*Cosmolyce baeticus (L.)*	2.10	1.23	6.80	2.13	1.60	1.61	3.50	1.63
	Hemiptera	Pentatomidae	*Nezara viridula(L.)*	2.40	1.41	7.40	2.31	1.70	1.71	4.90	2.28
	Thysanaptera	*Thripidae*	*Thrips tabaci(lind)*	6.30	3.70	19.80	6.19	3.80	3.82	8.10	3.77
Beneficial insects	Coleoptera	Coccinelldae (muls)	*Coccinella Undecimpun (L.)*	4.70	14.87	11.60	13.74	1.60	9.52	5.60	12.75
			Eydonia(chilomens)Vicina	2.40	7.59	5.70	6.75	1.10	6.55	3.30	7.52
			Scymnus interuptus(Geoz)	3.10	9.81	7.50	8.88	1.60	9.52	3.30	7.53
		Staphylinidae	*Paederus alfierii(koch)*	6.50	20.56	14.80	17.53	2.90	17.26	9.30	21.18
	Diptera	Syrphidae	Syrphus corollae(F.)	3.10	9.81	11.50	13.62	1.00	5.95	6.70	15.26
	Odonta	Aeschnidae	*Hemianex ephippiger(steys)*	2.10	6.64	8.60	10.18	1.30	7.74	4.10	9.34
	Neuroptera	Chrysopidae	Chrysopa vulgaris(schm)	3.40	10.75	8.70	10.31	1.80	10.71	2.90	6.60
	Hymenaptera	Vespidae	*Palistes gallica(L.)*	2.60	8.23	6.20	7.34	2.30	13.69	3.50	7.97
	Hymenapter	Anthoconidae	*Orius spp*	3.70	11.71	9.80	11.61	3.20	19.05	5.20	11.84
Visitor	Lepidoptera	Pieridae	*Pieris rapae (L.)*	1.40	17.28	6.60	33.00	1.60	34.78	3.00	25.42
		Nymphalidae	*Vanesa mellifera(L.)*	1.50	18.52	3.60	18.00	0.90	19.56	2.20	18.64
	Hymenoptera	Apidae	*Apis mellifera(L.)*	2.50	33.33	6.00	30.00	1.00	21.74	3.30	27.96
		Formicidae	*Monmorium pharaonis*	2.70	30.83	3.80	19.00	1.10	23.91	3.30	27.96

*= Nodulated +50%N- fertilization ***= Non- Nodulated +50%N- fertilization
= Nodulated +100%N- fertilization * *= Non- Nodulated +100%N- fertilization

2. Population density of Acari, Insect pests, beneficial insects and visitor insects on cowpea plants affected by Nodulation and N-fertilization:

Data in table (2) show the population density of mites, insect pests beneficial and visitor insects/ 4 replications started to appear with high numbers in nodulation + 100 % N- fertilization with percentage 38.04%, 38.46%, 60%, 56.32% and 30.71%, 39.77%, 47.76%, 44.94% in two season 2010 & 2011, respectively. After that, the population decreased to the lowest number in non– nodulated + 50 % N- fertilization with percentage 15.39%, 12.75%, 4.48%, 6.89% and 16.55%, 12.37%, 9.51%, 10.34% in two seasons as above mentioned. While, in nodulated + 50 % N- fertilization ranked the second in proportion to mites, beneficial insects and visitor insects and comprised 24.09%, 18.27% and 19.54% in the first season. In the second season, in nodulated + 50 % N- fertilization ranked the third category composed 23.26%, 21.14%, 17.88% and 18.20% in mites, insect pests, beneficial insects and visitor insects, respectively. Finally, in non– nodulated + 100 % N- fertilization ranked third in mites, beneficial and visitor insects and comprised 22.46%, 17.24% and 17.24% respectively in the first season. While, in the second season, in non – nodulated + 100 % N- fertilization ranked the second and composed 27.48%, 26.70%, 24.84% and 26.52% in mites, insect pests, beneficial insects and visitor insects. It is noticeable that insect pests were higher than Acari, beneficial insects and visitor insects composing 52.60%, 44.28%, 2.36%, 0.75% & 51.11%, 36.95%, 9.50%, 2.43% and 53.66%, 40.57%, 4.49%, 1.26% & 55.75%, 26.05%, 14.71%, 3.48% and 51.26%, 47.32%, 0.96%, 0.45% & 49.40%, 39.97%, 8.34%, 2.28% and 59.42%, 37.92%, 2.04%, 0.61% & 53.13%, 33.08%, 10.86%, 2.92% of the total catch in the first and second season in Nodulated + 50 % N- fertilization, nodulated + 100 % N- fertilization, Non – nodulated + 50 % N- fertilization and non – nodulated + 100 % N-fertilization, respectively. Several investigators recorded many insect pests associated with Leguminous vegetable crops, i.e. El – Sayed (1993) recorded 21 insect species in cowpea early and late summer plantations at Shebin El- Kom, Menoufia governorate EL – Hawary *et al*. (1995) recorded 13 insect pests on soybean plants at Kafer EL – Sheikh. Variation in the recorded insect pests among investigators may be due to crop, location differences and annual weather fluctuations or probably other undetected factors.

3. Population density of Acari, Insect pests, beneficial insects and visitor insects on cowpea plants affected by nodulation and N-fertilization during months June–July-August, 2010 & 2011:-

A. Season 2010

The population density of Acari reached its maximum in July with the means of 151.25, 213.50, 88.75, 133.75/ 4 treatment on cowpea plants, while, in June ranked the second with means 53.25, 97.00, 38.25, 56.25/ 4 treatments (table 3). In August ranked the third with means 44.05, 82.25, 32.00, 42.00/4 replications in nodulated + 50 % N-fertilization, nodulated + 100 % N- fertilization, non– nodulated + 50 % n- fertilization and non– nodulated + 100 % n- fertilization respectively. Insect pests species reached its maximum on cowpea plants in July with the means 164.25, 261.50, 92.00, 179.00/4 replications. While, in August ranked the second with means 80.00, 184.00, 61.25, 135.75/ 4 replications. After that, in June ranked the third with means 51.25, 74.00, 19.00, 48.75/ 4 replications in nodulated + 50 % N-fertilization, nodulated + 100 % n- fertilization, non– nodulated + 50 % n- fertilization and non – nodulated + 100 % n- fertilization.

B. Season 2011:-

Results presented in table (3) show that the population dynamics of Acari associated with cowpea plants reached the maximum in July with the means of 186.25, 280.00, 108.50, 184/ 4 replications. While, in June ranked the second with means 61, 130.50, 50, 81.50/ 4 replications. On the other hand, in August ranked the third with means 60, 127.50, 42.75, 68.75/ 4 replications in nodulated + 50 % N- fertilization, nodulated + 100 % N-fertilization, non – nodulated + 50 % N- fertilization and non– nodulated + 100 % N- fertilization**,** respectively. Insect pests species reached its maximum on cowpea plants in July with the means 232.75, 411.50, 131.50, 274/ 4 replications. While, in August ranked the second with means 120.25, 264.50, 76, 172.75/ 4 replications. After that, in June ranked the third with means 72, 123.50, 41.25, 90/ 4 replications in nodulated + 50 % N-fertilization, nodulated + 100 % N- fertilization, non– nodulated + 50 % N- fertilization and Non– nodulated + 100 % N- fertilization, respectively. The forementioned results were in agreement with data of survey recorded by several authors, i.e. Harranger (1964), El– Atrouzy (1968), Guitierrez (1970), Wahab et al. (1974), Abdel – Salam *et al*. (1980) for phytophagous mites and Wahab *et al*. (1974), Abdel– Salam *et al*. (1980) for predacious mites. They recorded that our surveyed mite species were found infesting or inhabiting different vegetables crops.

4. Shannon– Weaner diversity index (S.W.I) OF Acari, insect pests, beneficial insects and visitor insects:-

a. In the first season 2010:

Data in table (4) presented the computed values of the Shannon– Weaner diversity indices in relation to cowpea in which samples were taken.

Table 2: Population density of Acari , insect pest, beneficial and visitoros insects on cowpea plants as affected by nodulation and fertilization.

Treatment		Season2010				Season 2011			
		Acari	Insect pests	Beneficia Insects	Visitor Insects	Acari	Insect pests	Beneficia Insects	Visitor Insects
Nodulated + 50%N-	Mean	99.50	118.20	5.30	1.70	122.90	170.00	31.60	8.10
fertilization	%	44.28	52.60	2.36	0.75	36.95	51.11	9.50	2.43
(40kg/feddan)	%	24.09	21.87	18.27	19.54	25.26	21.14	17.88	18.20
Nodulated + 100%N-	Mean	157.10	207.80	17.40	4.90	149.40	319.80	84.40	20.00
fertilization	%	40.57	53.66	4.49	1.26	26.05	55.75	14.71	3.48
(80kg/feddan)	%	38.04	38.46	60.00	56.32	30.71	39.77	47.76	44.94
Nodulated + 50%N-	Mean	63.60	68.90	1.30	0.60	80.50	99.50	16.80	4.60
fertilization	%	47.32	51.26	0.96	0.45	39.97	49.40	8.34	2.28
(40kg/feddan)	%	15.39	12.75	4.48	6.89	16.55	12.37	9.51	10.34
Nodulated + 100%N-	Mean	92.80	145.40	5.00	1.50	133.70	214.70	43.90	11.80
fertilization	%	37.92	59.42	2.04	0.61	33.08	53.13	10.86	2.92
(80kg/feddan)	%	22.46	26.91	17.24	17.24	27.28	26.70	24.84	26.52

Table 3: Population density of Acari, Insect pest, Beneficial and Visitors insects on cowpea plants as affected by nodulation and N-fertilization during three months.

	Treatment		Season2010				Season 2011			
			Acari	Insect pests	Beneficia Insects	Visitor Insects	Acari	Insect pests	Beneficia Insects	Visitor Insects
June	Nodulated+ 50%N-	Mean	53.25	51.25	1.50	1.25	61.00	72.00	6.50	2.25
	fertilization	%	49.65	47.78	1.39	1.16	43.03	50.79	4.58	1.58
	(40kg/feddan)	%	21.76	26.55	24.00	100.00	18.88	22.03	13.61	47.36
	Nodulated+ 100%N-	Mean	97.00	74.00	3.25	0.0	130.50	123.50	18.50	0.50
	fertilization	%	55.66	42.46	1.86	0.0	47.80	45.25	6.77	0.18
	(80kg/feddan)	%	39.63	38.34	52.00	0.0	40.40	37.79	38.74	10.53
	NonNodulated+50%	Mean	38.25	19.00	0.50	0.0	50.00	41.25	6.50	0.0
	N- fertilization	%	66.23	32.90	100.00	0.0	51.15	42.19	6.65	0.0
	(40kg/feddan)	%	15.63	9.84	8.00	0.0	15.47	12.62	13.61	0.0
	NonNodulated+100%	Mean	56.25	48.75	1.00	0.0	81.50	90.00	16.25	2.00
	N- fertilization	%	53.06	45.99	0.94	0.0	42.95	47.43	8.56	1.05
	(80kg/feddan)	%	22.98	25.26	16.00	0.0	25.23	27.54	34.03	42.10
JULY	Nodulated+ 50%N-	Mean	151.25	164.25	9.00	2.50	186.25	232.75	55.50	12.75
	fertilization	%	46.25	50.23	2.75	0.76	38.22	47.76	11.39	2.62
	(40kg/feddan)	%	25.75	23.57	19.78	15.38	24.55	22.17	19.22	15.00
	Nodulated+ 100%N-	Mean	213.50	261.50	26.50	9.75	280.00	411.50	136.00	40.50
	fertilization	%	41.46	51.15	51.80	1.91	32.26	47.41	15.66	4.66
	(80kg/feddan)	%	36.35	37.53	58.24	60.00	36.90	39.19	47.09	47.65
	NonNodulated+	Mean	88.75	92.0	2.00	1.00	108.50	131.50	28.25	9.50
	50%N- fertilization	%	48.29	50.06	1.08	0.54	39.00	47.34	10.17	3.42
	(40kg/feddan	%	15.11	13.20	4.39	6.15	14.29	12.53	9.78	11.17
	NonNodulated+	Mean	133.75	179.00	8.00	3.00	184.0	274.00	69.00	22.25
	100%N- fertilization	%	41.31	55.28	2.47	0.93	33.50	49.88	12.56	4.05
	(80kg/feddan	%	22.77	25.69	17.58	18.46	24.25	26.10	23.89	26.17

Table 3: Continued

	Treatment		Season2010				Season 2011			
			Acari	Insect pests	Beneficia Insects	Visitor Insects	Acari	Insect pests	Beneficia Insects	Visitor Insects
August	Nodulated + 50%N-fertilization (40kg/feddan)	Mean	44.25	80.00	2.75	0.50	60.00	120.25	17.00	5.25
		%	34.75	62.74	2.15	0.39	29.63	59.38	8.39	2.59
		%	22.06	17.35	13.25	11.76	20.06	18.98	16.15	24.42
	Nodulated + 100%N-fertilization (80kg/feddan)	Mean	82.25	184.00	13.75	2.50	127.50	264.50	56.50	9.00
		%	29.11	65.13	4.86	0.88	27.86	57.81	12.36	1.96
		%	41.02	39.91	66.26	58.82	42.64	41.75	53.68	41.86
	Nonnodulated+50%N-fertilization (40kg/feddan)	Mean	32.00	61.25	0.75	0.50	42.75	76.00	7.25	2.00
		%	33.86	64.81	0.79	0.53	33.39	59.37	5.66	1.56
		%	15.96	13.28	3.61	11.76	14.29	11.99	6.88	9.30
	Nonnodulated+100%N-fertilization (80kg/feddan)	Mean	42.00	135.75	3.50	0.75	68.75	172.75	24.50	5.25
		%	23.07	74.60	1.92	0.41	25.34	63.68	9.03	1.93
		%	20.95	29.45	16.86	17.65	22.99	27.26	23.27	24.42

Table 4: Shannon-Weaner index as computed from related species of Acari, Insect pest, Beneficial and Visitor from cowpea field as affected by nodulation and N- fertilization during seasons 2010 & 2011.

Treatment	Acari			Insect pests			Beneficia Insects			Visitor Insects		
	Mean no	No. of species	SW	Mean no	No. of species	SW	Mean no	No. of species	SW	Mean no	No. of species	SW
2010												
Nodulated+ 50%N- fertilization	99.50	4	0.2484	118.20	10	0.6905	5.30	8	0.7248	1.70	3	0.4219
Nodulated+ 100%N- fertilization	157.10	4	0.3302	207.88	10	0.7617	17.40	9	0.8137	4.90	4	0.4318
NonNodulated+50%N - fertilization	63.60	4	0.2198	68.90	9	0.6579	1.30	5	0.6155	0.60	3	0.3765
NonNodulated+100% N- fertilization	92.80	4	0.2730	145.40	9	0.6586	5.00	8	0.7472	1.50	3	0.3873
2011												
Nodulated+ 50%N- fertilization	122.90	4	0.3682	170.00	10	0.7986	31.60	9	0.9277	8.10	4	0.5839
Nodulated+ 100%N- fertilization	149.40	4	1.3311	319.80	10	0.8656	84.40	9	0.9356	20.00	4	0.5866
NonNodulated+ 50%N- fertilization	80.50	4	0.3319	99.50	10	0.7966	16.80	9	0.9216	4.60	4	0.5908
NonNodulated+ 100%N- fertilization	133.70	4	0.4260	214.70	10	0.8226	43.90	9	0.9217	11.80	4	0.5965

The S.W. diversity index for Acari in the sampled cowpea was highest in nodulated + 100 % N- fertilization, non – nodulated + 100 % N- fertilization and nodulated + 50 % N- fertilization being 0.3302, 0.2730 and 0.2484, respectively, while, in non – nodulated + 50 % N- fertilization it was the lowest, 0.2198 at Kafer El – Sheikh. The number of species was 4 species for the former nodulation and N- fertilization. Also, the S.W. diversity index for insect pests in the sampled cowpea was highest in nodulated + 100 % N- fertilization, nodulated + 50 % N- fertilization, and Non– Nodulated + 100 % N- fertilization being 0.7617, 0.6905 and 0.6586 at Kafer El– sheikh. The number of species in it were 10 and 9 species for the former nodulation and N- fertilization. On the other hand, the S.W. diversity index for beneficial insects in the sampled cowpea was highest in nodulated+100 % N- fertilization, non – nodulated + 100 % N- fertilization and nodulated + 50 % N- fertilization being 0.8137, o.7472 and 0.7248 at Kafer El – Sheikh. The number of species in it were 9, 8 and 5 species for the former nodulation and N- fertilization. Also, the S.W. diversity index for visitor insects in the sampled cowpea was highest in nodulated+100 % N- fertilization, nodulated + 50 % N- fertilization and non – nodulated + 100 % N- fertilization being 0.4318, 0.4219 and 0.3873 at Kafer El – Sheikh. The number of species in it were 4 and 3 species for the former nodulation. It could be concluded that cowpea has dominant and subdominant Acari, insect pests, benesicial insects and visitor insect species which can affect diversity index values. The relationship between species and ecological process can change quantitatively and qualitatively with environment context (Cardinale & Nelson, 1999).

b. In the second season 2011:-

Data in table (4) revealed that S.W. diversity index for Acari species was the highest in nodulated+100 % N- fertilization, non – nodulated + 100 % N- fertilization and nodulated + 50 % N- fertilization being 1.3311, 0.4260 and 0.3682, respectively. While, in non - nodulated + 50 % N- fertilization it was the lowest 0.3319 at Kafer EL – Sheikh. The number of species in it was 4 species for the former nodulation. Also, the S.W. diversity index for insect pests in the sampled cowpea was highest in nodulated + 100 % N- fertilization, non – nodulated + 100 % N- fertilization, nodulated + 50 % N- fertilization and non – nodulated + 50 % N- fertilization being 0.8656, 0.8226, 0.7986 and 0.7966 respectively. The number of species in it was 10 species for the former nodulation and N- fertilization. On the other hand, the S.W. diversity index for beneficial insects in the sampled cowpea was highest in nodulated + 50 % N- fertilization, nodulated +100 % N- fertilization, Non – nodulated + 100 % N- fertilization and non– nodulated + 50 % N- fertilization being 0.9356, 0.9277, 0.9217 and 0.9216, respectively. The number of species in it was 9 species for the former nodulation and N- fertilization. Similar results were obtained by El – Dakhakhni *et al*. (1995) who reported that clover had the highest number of beneficial insect species, 22 while cotton and soybean had the lowest one, 12 for each one. The S.W. for natural enemy species in the sampled crops was the highest in clover being 2.52 while in maize it was the lowest being 1.81. As for cotton and soybean it was 2.08 and 2.41, respectively. Also, El– Mezayyen (2001) indicated that the S.W. diversity index for pests, beneficial and visitors species in the sampled crops was the highest in alfalfa at Sebha being 1.664, 0.6129 and 0.8222 while in the Egyptian clover at Kafer El– Sheikh, it was the lowest, being 0.6154, 0.5152 and 1.1480 and the number of species were 14,11 and 5 for alfalfa. While, they were 13.8 and 6 for the Egyptian clover, respectively. In the current study, it was anticipated that the relative predacious mites abundance of species on tomato crop may have an effect on diversity index values of S. W. support such suggestion.

REFERENCES

Abdel– Alim, A.A.(**1994**). Ecological studies on certain insects infesting cowpea plants in Minia region. Minia. J. Agric. Res. & Dev. **2(10)**: 261 – 273.

Abdel-Salam, A.L.; A.M. Metwally; A.A. Yousef; N.A. El-Baghdady and M.F.A. Hegab (**1980**). Mites associated with vegetable plants in Egypt. Proc. 1st Conf., Plant their associated predators at Kafer El– Sheikh Prot. Res. Inst., Cairo, Egypt, **3**: 61-79.

Abo EL– Naga, A. M.M. (**2011**). Insect pests infesting cowpea and governorate. Ph. D. Faculty of Agriculture, Tanta University. 220 pp.

Attiah, H.H.; F.M. Hoda and M.K. El–Masry (**1976**). Testing acaricides against common spider mites infesting cotton in lower and upper Egypt. Agric. Res. Rev., Egypt. 54:197 – 215.

Cardinale, B.J. and K. Nelson (**1999**). The effects of spatial variation and disturbance on the relationship between species diversity and ecosystem function. Ecol. Soc. Amer. 84th Ann. Meeting, August **8 - 12**, Abstract.

El– Atrouzy, N. A. (**1968**). Ecological studies on mites associated with Truck crop. M. Sc. Thesis. Fac. Agric. Cairo Univ., 126 pp.

El-Dakhakhni, T.N.; I.S. El-Hawary; M.S. Tadros; M.B. Shawer and G.A. El-Mezayyen (**1995**). Studies on the beneficial insects on the Egyptian clover, cotton, maize and soybean at Kafr El-Sheikh. Agric. Sci., Mansoura Univ., **20(6)**: 3125-3133.

El–Hawary, T.S.; T.N. El–Dakhakhni; M.B. Shawer; M.S. Tadros and G. A. El – Mezayyen (**1995**). Insect pests of the Egyptian clover, cotton, maize and soybean at Kafer El– Sheikh district, Egypt. S. Agric. Sci. Mansoura Univ. **20(6)**: 3097 – 3105.

El-Kifl, A. H.; A. E. A. Wahab; M. A. A. Assem and A. A. Metwally (**1974**). List of insects, mites and pests associated with leguminous crops in Egypt. Bull. Soc. Ent. Egypt. 58: 297-302.

El-Mezayyen, G.A. (**2001**). Field studies on the insect species on two forage crops, the Egyptian clover in Egypt and alfalfa in Libya. Egypt. J. Agric., **79(3)**: 983-934.

El-Mezayyen, G.A. (**1998**). Population fluctuation of main insect pests and their predators on clover and alfalfa plants as influenced by different environmental conditions. S. Agric. Sci. Mansoura Univ., **23(8)**: 2953 – 3962.

El-Mezayyen, G.A. (**1993**). Studies on some beneficial insects in Kafer EL– Sheikh. Ph.D. Thesis Fac. Of Agric. Tanta Univ. Kafer El – Sheikh: 261pp.

El – Sayed, A.E.M. (**1993**). Insect pests and their associated natural enemies on cowpea (*Vigna unquiculata* L. Walp) plants Zagazig J. Agric Res. **20 (3)**: 1175 – 1183.

English – Loeb, G.M. (**1990**). Nonlinear response of the two spotted spider mite to nitrogen stress in bean plants (Acari: Tetranychidae) internat.J. Acarol. **16(2)**: 77 – 83.

Farrag, A.M.; A.S. Abdel– Salam; M. L. Wahba and M. S. Abul – Ela (**1980**). Effect of soil fertilization on the population density of the spider mite *Tetranychus arabicus* (Attiah) on soybean plants. Proc. 1st Conf. pI. Proc. Res. Ins. Cairo Egypt. **3**:31 – 39.

Gamieh, G.N. and S.E. Saadon (**1998**). The effect of Nodulation, N-fertilization and certain Acaricides on Phytophagous and soil mites in soybean fields. S. Agric.Res. Tanta Univ., **24(2)**: 137 – 149.

Gamieh, G.N. and S.E. Saadon (**1995**). Population density of mites in soybean fields as affected by nodulation, Coating seeds with trace elements and nitrogenous fertilization. S. Agric. Res. Tanta Univ., **2(1)**: 165 – 173.

Guitierrez, S. (**1970**). A note on some phytophagous mite from the island of Renion with the description of a new species of the genus Eutetranychus Acarologia. **10(3)**: 443 – 445.

Hamouda, S. H.H. (**1993**). Studies on some important natural enemies associated with aphids infesting certain vegetable crops in El–Minia region, ph.D. Thesis, Fac. Of Agric. Minia Univ., 211 pp.

Harranger, J. (**1964**). Some pests of market garden produce grown in glasshouses phytoma, **16(154)**: 13 – 25.

Hassan, M.M.; M.M. Tantaway; F. k. Aly and G.A.I. Karaman (**1985**). Contributions of the effect of macroelements and insecticides on sucking insects and yield components of cowpea. Minia. J. Agric. Res& Dev., **7**: 383 – 389.

Hegazy, M.H..; Fatma, A. Sherif; Faiza, K. Abdel El– Fattah and G.N. Gamieh (**1997**). Response of soybean to bio-fertilization, levels of phosphorus and its relationship with spider mits infestation. J. Agric. Sci. Mansoura Univ. **22(7)**: 2207 – 2216.

Helal, R.M.Y.; G. A. El– mezayyen and A. M.Nassef (**2003**). Studies on the insect species in different genotypes of cowpea at Kafer El – Sheikh. S. Agric Sci. Mansoura Univ., **28(4)**: 3071 – 3082.

Helaly, M.M.; A.E.Ibrahim and M.R.I.Saleh (**1982**-83). Fluctuations of population densities of *Empoasca sp*., *Apis craccivora* koch. and *Tetranychus arabicus* Attiah attacking cowpeaplant in Zagazig, Egypt. Bull. Soc. ent. Egypt, **64**: 34 – 43.

Hoda, F.M.; A.A. Hassan; Z.R.Sawires; H.A. Taha and G.A.Ibrahim (**1986**). Effect of some acaricides on the number of spider mites infesting soybean plants in lower and upper Egypt. Bull. Ent. Soc. Econ. Ser., **15**: 253 – 262.

Ismail, I. and F.H. Hoda (**1985**). Effect of nineteen acaricides of the green spider mite *Tetranychus urticae* koch. Infesting soybean plants at Gemmeiza Agric. Res. Station, Gharbia Governorate, Egypt Proc. Egypt's National Conf. Ent. Doc. **1982**, vol. **11**: 787 – 793.

Kerbs, C.J. (**1978**). Ecology: The experimental analysis of distribution and abundance 2nd ed. Harper and Row. Publishers, Inc. New york, USA. 678PP.

Mathys, G.; M. Baggiolini and J. Stahl (**1968**). The influence of pesticides and fertilizers on the behaviour of phytophagous mites in orchard and under laboratory conditions. Entomophage, **13**: 357 – 372.

Mohamed, I.I.; and M.A.Abdel – Hafez (**1981**). The effect of some acaricides on the green mite *Tetranychus arabicus* Attiah on soybeans. Agric. Res. Rev. Egypt. **59(1)**:39 – 41.

Rhaman, K.W. (**1977**). Leaf hopper resistance to cowpea varities (Tropical Grain Legume). Bull. No. **8**: 14, International institute of tropical Agriculture, Ibadan, Nigeria.

Saleh, R.A.M.; H.M.Hassanien and H.A. El – Sebae (**1972**). Population dynamics of *Apis craccivora* koch. on broad bean and cowpea in upper Egypt – Bull. Soc. Ent. Egypt, **56**: 135 – 138.

Sherif, M.R.; I.I.Mesbah and G.N. Gamieh (**1994**). Survey and population densities of insects and mites associated with faba bean at Kafr El–Sheikh region. S. Agric. Res. Tanta Univ. **20(3)**: 553- 560.

Singh, O.P.; K.J.Singh and K.N. Kapoor (**1990**). Seasonal incidence and chemical control of red spider mite, *Tetranychus telarius* L. on soybean in Madhya Pradesh India. Ind. Jour. Of Entomol. **52(1)**: 57 – 62.

Wahab, A.E.A.; A.A.Yousef and H.M. Hemaeda (**1974**). Mites associated with vegetable and ornamental plants in lower Egypt. (Acarina – Parasitiformes, Acariformes). Bull. Soc. Ent. Egypt, **43**: 359 – 366.

Yanni, Y.G.; M.M.El – Behairy and A.A. Hassan (**1987 a**). Intensity of spider mite infestation on nodulated soybean as affected by nitrogen fertilization and foliar spraying of trace elements. In proc. 1st Con. of Fert. Cairo, Egypt. Pp. 572 – 587.

Yanni, Y.G.; M.M.El – Behairy and A.A. Hassan (**1987b**). Growth nitrogen and fl–fixation uctuation of spider mite infestation in soybean as influenced by inoculation with *Bradyrhizobium jabonicum*, N– fertilization and some pesticides. Soil and water Res. Inst. 1st Con. Of fertilizers "Availability & Need" Cairo, April 1987 paper No. **41**: 558 – 571.

Yanni, Y.G.; M.M. El– Behairy and F.M. Hoda (**1987c**). Nodulation, vegetative growth, infestation with the spider mite *Tetranychus cucurbitacearum* (Sayed) and seed yield of N – fertilized soybean plants in the Nile Delta. MIRCEN. J. Appl. Microbiol & Biotechnol, **3**: 297 – 306.

Yanni, Y.G.; G.N.Gamieh and S.E.Saadon (**1996**). Alteration in population densities of soil and phytophagous mites with soybean nodulation and possible contribution of mites to crop performance. 2nd European Nitrogen fixation Conf. and NATO Advanced Research workshop biological fixation of Nitrogen for Ecology and sustainable Agric. Poznan, Poland. Abstracts, P. 198.

Yanni, Y.G.; A.A. Hassan; M.M.El – Behairy and M.E. Hassan (**1991**). Relation between soybean and intensity of infestation with the spider mite *Tetranychus cucurbitacearum* (Sayed) under different sowing dates and increasing amounts of nitrogenous fertilizer. World J. of Microbiol & Biotechnol, **1**: 37 - 42.

Zaher, M.A.; M.A. Hanna; I.I. Mohamed and Z.R.Sawires (**1980**). Relative susceptibility of ten soybean varieties to mite infestation and probable causes of resistance Proc. 1st Conf. P1. Proc. Res. Ins. Cairo, Egypt, **3**: 41-51.

الملخص العربى

تأثير التلقيح البكتيري والتسميد النتروجينى على الأكاروسات والحشرات فى حقول اللوبيا

محسن عطية محمد ابو طايش[١]، عبير سليمان الناصر[٢]، حسن محمد احمد النعناعى[١]،

سعيد عبد العظيم محمد علام

[١]معهد بحوث وقاية النباتات– مركز البحوث الزراعية – مصر

[٢] قسم الاحياء- كلية العلوم التطبيقية – جامعة ام القرى- مكة المكرمة

أجريت هذه التجربة بمحطة البحوث الزراعية بسخا محافظة كفر الشيخ فى حقول منزرعة بمحصول اللوبيـا (*Vigna unquiculata* L. walp.) صنف دقى ٣٣١ فى موسمين زراعيين ٢٠١٠، ٢٠١١ وقد تم تلقيح بـذور اللوبيـا بمثبت الأزوت التكافلى Brady rhizabivm sp وسمدت النباتات بمعدلات ٤٠، ٨٠ كيلو جـرام أزوت للفـدان علـى دفعتين عند ٣٠، ٤٥ يوم من الزراعة وقد إستمر البحث لمدة موسمين زراعيين صيفيين ٢٠١٠، ٢٠١١ حيث جرى حصر الأكاروسات والأفات الحشرية والحشرات النافعة وكذلك الحشرات الزائرة الموجودة فى معاملات الملقحـات والأسمدة الأزوتية: ملقح + ٥٠% أزوت، ملقح + ١٠٠% أزوت، غير ملقح +٥٠% أزوت، غير ملقـح + ١٠٠% أزوت وكذلك تأثيرها على تعـداد الأكاروسـات والحشـرات. شـملت الدراسـة أيضـا التنـوع فـى الأنـواع (Diversity in species) بالنسبة للمجاميع المختبرة.

سجلات أعداد الأكاروسات المصاحبة لنبات اللوبيا أعلى تعداد لها فى الملقح + ١٠٠% أزوت يليها الملقح + ٥٠% أزوت يليها الغير ملقح + ١٠٠% أزوت فى حين سجلات أقل أعداد للأكاروسات فى القطع المعاملة بالغير ملقح + ٥٠% أزوت. كذلك أمكن تسجيل ٤ أنواع من الأكاروسات تتبع ٤ عائلات خلال موسم ٢٠١٠م الدراسة. كذلك سجلات أعداد الأفات الحشرية أعلى تعداد لها فى الملقح + ١٠٠% أزوت يليها الغير ملقح + ١٠٠% أزوت يليها الملقح + ٥٠% أزوت بينما سجلات أقل أعداد الأفات الحشرية فى القطع المعاملة ببذور اللوبيا الغير ملقحة + ٥٠% أزوت كذلك أمكن تسجيل ١٠ أنواع من الأفات الحشرية تتبع ٩ عائلات خلال موسم ٢٠١٠م. بينما فى خلال موسم ٢٠١١م سجلات أعداد الأكاروسات المصاحبة لنبات اللوبيا أعلى تعداد لها فى بذور اللوبيا الملقحة + ١٠٠% أزوت يليها الغير ملقح + ١٠٠% أزوت يليها + ٥٠% أزوت فى حين سجلات أقل أعداد الأكاروسات فى القطع المعاملة بالغير ملقح + ٥٠% أزوت. كذلك سجلات أعداد الأفات الحشرية أعلى تعداد لها فى الملقح + ١٠٠% أزوت يليها الغير ملقح + ١٠٠% أزوت يليها الملقح + ٥٠% أزوت وكانت أقلها تعداد فى الغير ملقح + ٥٠% أزوت.

ويبدو أيضا أن بعض الأنواع الحشرية والأكاروسية ذات سيادة أكثر من غيرها فى كل التلقيحات لبذور اللوبيا والتسميد الأزوتى حيث بلغت سيادة أربعة أنواع ٣٤.٤٣ ، ٤٥.٢٨، ٤٧.٠٦ ، ٨٤.٤٢% وهى من البقوليات وأسد المن ونحل العسل والعنكبوت الأحمر العادى على الترتيب فى الموسم الأول بينما كانت فى الموسم الثانى ٢٩.٢٣، ٢٠.٥٦، ٣٣.٣٣، ٧٤.٠٤% وهى من البقوليات وأسد المن ز نحل العسل والعنكبوت الأحمر العادى على الترتيب من جملة الأنواع المتحصل عليها بالنسبة للأفات والحشرات النافعة والزائرات والأكاروسات فى منطقة كفر الشيخ فى القطع المعاملة بتلقيح بذور اللوبيا + ٥٠% أزوت. كانت قيم دلائل التنوع خلال موسم ٢٠١٠م ٠.٢٤٨٤، ٠.٣٣٠٢، ٠.٢١٩٨، ٠.٢٧٣٠بالنسبة الملقح + ٥٠% أزوت والملقح + ١٠٠% أزوت والغير ملقح + ٥٠% أزوت والغير ملقح + ١٠٠% أزوت للأكاروسات بينما كانت قيم دلائل التنوع للأفات الحشرية ٠.٦٩٠٥، ٠.٧٦١٧، ٠.٦٥٧٩، ٠.٦٥٨٦ فى حين كانت قيم دلائل التنوع بالنسبة للحشرات النافعة ٠.٧٢٤٨، ٠.٨١٣٧، ٠.٦١٥٥، ٠.٧٤٧٢ بينما كانت قيم دلائل التنوع بالنسبة للحشرات الزائرة ٠.٤٢١٩، ٠.٤٣١٨، ٠.٣٧٦٥، ٠.٣٨٧٣ على الترتيب. في حين كانت قيم دلائل التنوع خلال موسم ٢٠١١م (٠.٣٦٨٢، ١.٣٣١١، ٠.٣٣١٩، ٠.٤٢٦٠ بالنسبة للأكاروسات بينما كانت قيم دلائل التنوع بالنسبة للأفات الحشرية٠.٧٩٨٦، ٠.٨٦٥٦، ٠.٧٩٦٦، ٠.٨٢٢٦ فى حين كانت قيم دلائل التنوع بالنسبة للحشرات النافعة ٠.٩٢٧٧، ٠.٩٣٥٦، ٠.٩٢١٦، ٠.٩٢١٧ وأخيرا كانت قيم دلائل التنوع بالنسبة للحشرات الزائرة ٠.٥٨٣٩، ٠.٥٨٦٦، ٠.٥٩٠٨، ٠.٥٩٦٥ على التوالى بالنسبة للملقحات والتسميد النيتروجينى فى محصول اللوبيا. وجد أيضا أن التواجد النسبى للأنواع الحشرية والأكاروسية فى محصول اللوبيا لها تأثير على قيم دليل التنوع.