Ass. Univ. Bull. Environ. Res. Vol. 9 No. 1, March 2006

AUCES

VARIATION IN THE SUSCEPTIBILITY 0F SOME COWPEA (*VIGNA UNGUICULATA* (L.) WALP) GENOTYPES TO INFESTATION WITH CERTAIN PESTS IN UPPER EGYPT

N.A.Hafiz* and A.M.Damarany**

*Plant Protection, Research Institute, Agriculture Research Centre. Egypt

**Department of Horticulture, Faculty of Agriculture, Assiut University

ABSTRACT:

Five cowpea cultivars were evaluated to clear the reflex of their characteristics to the infestation caused by the main sucking pests, Whitefly, Thrips, Jassids, Aphids, and Spider mite in northern upper Egypt at Assiut governorate during the two successive seasons of 2001 and 2002. Results revealed that the highest pests' density were recorded on Tvu-21 cultivar. However, the lowest density were the most recorded on Six-Weeks and B-Crowder cultivars.

Regarding to the relative susceptibility to these pests six-Weeks and B-Crowder appeared to be resistant cultivars. However, Pinkeye and Ch-Reds appeared a low resistance. The Tvu-21 cultivar's appeared as susceptible one. Also, the results showed that Tvu-21 was the susceptible to *A.craccivora*. There were no significant differences in number of pods/plant and seeds/pod among the spraying and not spraying plots. Tvu-21 cultivar's produced the highest weight of 1000-seeds (g) in both seasons. On the other hand, the effects of 7 cowpea tested cultivars on development time, longevity and fecundity of *T.urticae w*ere evaluated at 25^0C. Ch-Reds and IT82 D889 had the shorter life cycle of *T.urticae* than the other cultivars. Mites reared on Tvu-21, Pinkeye and IT 82 D889 had the highest fecundity (17.22, 16.22, and 15.75 eggs/female, respectively).

The mites reared on Ch-Reds had the shorter life span (16.13 days). Based on the obtained results we concluded that the Tvu-21 and Pinkeye cowpea Cultivars were the most suitable hosts for the tested pests and Six-Weeks and B-Crowder were the least suitable.

INTRODUCTION:

Cowpea (*Vigna unguiculata* (L.)Walp) is one of the most important legume crops in Egypt as well as other tropic and sub-tropic countries (Damarany,1994, and Ofuya,1993). The common cowpea is grown in Egypt both as vegetable and plus corps is favorable to the Egyptian consumers especially in form of dry seeds. Its dry-seeds have high percentage of protein (20 to 30%), that characterized as a complete protein compared with those of other vegetables. Also, they are rich in the essential amino acid lysine (Steele, 1976).

Cowpea plants are subjected to be attacked by several insect pests, the most serious of which are the sucking piercing pests, tow-spotted spider mite, *Tetranychus urticae,*Koch, tomato whitefly, *Bemisia tabaci* (Gannadius),potato leafhopper, *Empoasca discipinens* Padi, and the bean aphid,*Aphids craccivora* Koch. The

common practice of controlling these pests in vegetable fields is mainly relying on the chemical insecticides (Gharib and Ali 1991, Abdel-Alim 1994, and Nosser 1996). The use of insect plant resistance has been used greatly day after day to avoid the use chemicals and their toxic effect on plant, animal, human being and environment (Metwally *et al* 1991, Farghali *et al*, 1996 and Amro, 2004).

The objective of this work was undertaken to test and screens some genotypes to certain pests' infestation under upper Egypt circumstance, and the effect of cowpea genotypes on the development, longevity and reproduction of *T.urticae.*

MATERIALS AND METHODS:

Five cowpea cultivars were tested and screened for their infestation by sucking pests. These cultivars and their original source are presented in Table (1).

This work was carried out at Experimental Agriculture Station in Assiut Governorate, during tow successive seasons (2001 and 2002). A randomized complete block design and three replicates were used. Each plot consisted of four ridges of 4 meters long and 60 cm apart. The seeds were sown on May 5 each season at 30 cm spacing within the rows. The normal cultural practices were followed in this work. Pesticides (malathion 500 EC) treatments were applied on half of each cultivar plots. For all genotypes, samples were randomly taken from three levels, i.e., the lower, middle and the top of plants. Each sample consisted of 10 leaves taken from each replicate, at 7-days intervals. Counts of whitefly (eggs, nymphs and pupal stages), Jassids (nymphs) and aphid (apterous) were carried out. Mites (eggs and mobile stages) were counted at the lower surface of leaves using stereomicroscope. At harvest, number of dry seeds per pod, and weight of 1000-seeds in gram were recorded.

All data were subjected to statistical analysis and means were compared using the Duncan multiple range test (DMRT).

Table (1): Name and source of the five genotypes (cultivars and breeding lines) of cowpea tested in this study

Genotypes	Source
1- Pinkeye Purplehul (BVR)	Dr. Miller, Texas, USA
2- Tvu-21	IITA*, Ibdan, Nigeria
3- Chinese Reds	Dr. Miller, Texas, USA
4- Six Weeks	Dr. Miller, Texas, USA
5- Black Crowder	Dr. Miller, Texas, USA

*** IITA, International Institute of Tropical Agriculture, Ibadan, Nigeria**

Biology of *T.urticae:*

Mites used in this study were derived from populations of the two-spotted spider mites*; T.urticae* reared on sweet potato plants. One hundred of discs with 100 mite eggs / each disc were kept at constant temperature (25^0C) photo 16: 8.RH. 70±5.

The individuals were observed twice daily with the aid of stereomicroscope. Date of hatching and the dates of successive moulting were recorded. The development of immature stages including larval, protonymph, and deoutonymph stages and quiescent periods of every stage were observed. Pre-oviposition, oviposition, post-oviposition periods, and number of eggs/female were recorded.

Data obtained were statistically analyzed by F-test. The means were compared according to the LSD (Snedecor and Cochran 1971).

RESULTS AND DISCUSSION:

Data in Table (2) and Figure (1-2) show the mean numbers of sucking pests (whitely, thrips, jassids, and spider mite), on the cowpea tested cultivars.

In the first season (2001), the highest number of these pests was recorded on Ch. Reds Cultivar which was 17.45, 7.50, 58.15, and 39.20 individuals for whitefly, thrips, jassids, and spider mite, respectively. Whereas, the lowest numbers was recorded on Six-Week and B-Crowder cultivars. The two other cultivars Pinkeye and Tvu-21 revealed moderate numbers.

The same trend of infestation was recorded on 2002 season (Table 2). Statistical analysis of the data revealed highly significant differences between all tested cultivars during 2001 and 2002 growing seasons.

Table (2): Mean number of pests on five cowpea cultivars under field conditions in Assiut (upper Egypt) during 2001 and 2002 seasons.

Genotypes	Mean number of pests /leaf											
	Whitefly			Thrips			Jassids			Spider mite		
	2001	2002	Avg.	2001	2002	Avg.	2001	2002	Avg.	2001	2002	Avg.
Pinkeye	12.65	10.2	11.4a	5.65	6.25	5.95b	41.35	49.50	45.43b	11.50	20.20	15.85b
Tvu-21	19.80	8.9	14.35b	6.75	7.5	7.125a	45.15	44.05	44.60b	15.65	15.35	15.50b
Ch-Reds	17.45	7.4	12.43b	7.5	7.75	7.625a	58.15	49.00	53.58a	39.20	32.42	35.81a
Six-Weeks	8.60	7.9	8.25c	2.15	5.25	3.70c	36.95	37.7	37.33c	4.80	11.70	8.25c
B-Crowder	10.40	8.5	9.45c	3.2	5.40	4.30c	34.50	41.2	37.85c	5.35	13.45	9.40c

According to the result of sucking pests density, B-Crowder and Six-Weeks showed resistant cultivars which harboured the least numbers. However, Pinkeye Cultivar exhibited moderate resistant Cultivar, while Tvu-21 and Ch -Reds appeared as susceptible ones.

These variations in cultivars susceptibility to infestation caused by these insect pests may be due to the presence of antixenosis (non-preference) and/or antibiosis phenomena, as described by Van Emdan (1987), who indicated that antixenotic plants can be avoided or less colonized by pests seeking food or oviposition site. However, he described Antibiosis as the position of some property by the plant, which directly or indirectly affects the performance of pests in term of survival, growth, development rate, fecundity, etc.

These results are in agreement with those obtained by Aiman K. (1998), who reported that the most resistant cowpea cultivars to whitefly, thrips, jassids, and spider mite, were Sudani and B-Crowder, while the most susceptible ones were Tvu-21 and IT82 D889.

Fairs *et al.* (1987). Studied the relative susceptibility of 20 cowpea cultivars to infestation with *A.craccivora* and *T.urticae*, and stated that the cowpea cultivars can be arranged in a descending order according to their infestation with aphids as follows: the least susceptible cultivars were: Sabahia, IT–82 E-16, California black-eye Cream 7, and Black eye no.9 while the most susceptible were:IT-82 E-60 and TVX 3236 during two years.

Data in Table (3) represent the number of aphids per plant, pods per plant, seeds per pod, and weight of 1000 seeds on five cowpea tested cultivars sprayed and unsprayed plots, combined over two years (2001 and 2002).

Over both studied years, aphid numbers in sprayed plots were below 5 to 9 individuals per plant. Whereas, the aphid numbers in unsprayed plots was greater on Tvu-21 (183.5± 2.8) than on other cultivars plant.

When data were combined over cultivars for both years, none of the cultivars had yield increase per 1000 seeds, when aphid numbers were controlled. Also, in all tested cultivars, there were no significant differences between spray and unsprayed treatments in any of the yield components (Table 3).

The data of No. Of pods/plant, seeds/pod and i.e. weight of 1000-seeds were in agreement with those obtained by Gamil and Gad El-Hak (1984), Davis *et.al* (1986), Gad El Hak *et.al* (1988) and Damarany (1994).

The obtained results in Table (3) showed that the Tvu-21 cultivars was the most susceptible one because it was harbored the highly numbers of *A.craccivora* than the other cultivars. However, Six- weeks cultivar showed the lowest resistant to infestation with cowpea aphid.

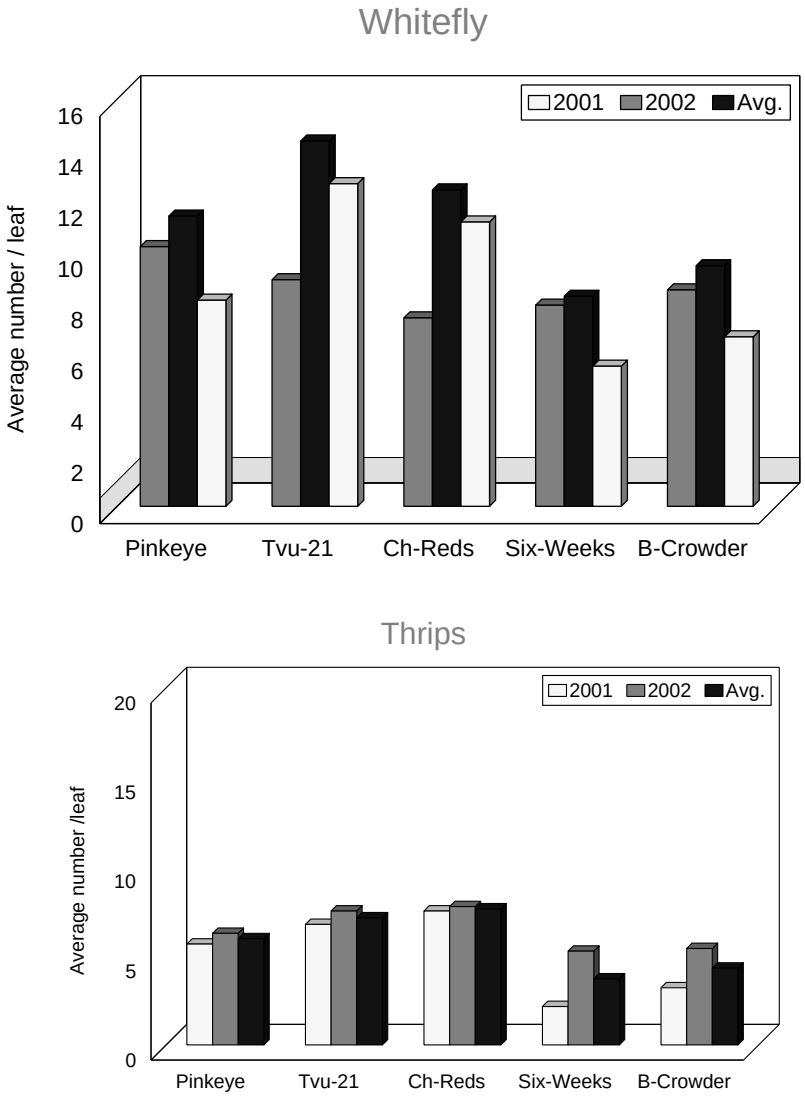

Fig. (1-2): Average number of pests (whitefly-thrips) on cowpea cultivars under field conditions during 2001 and 2002 seasons

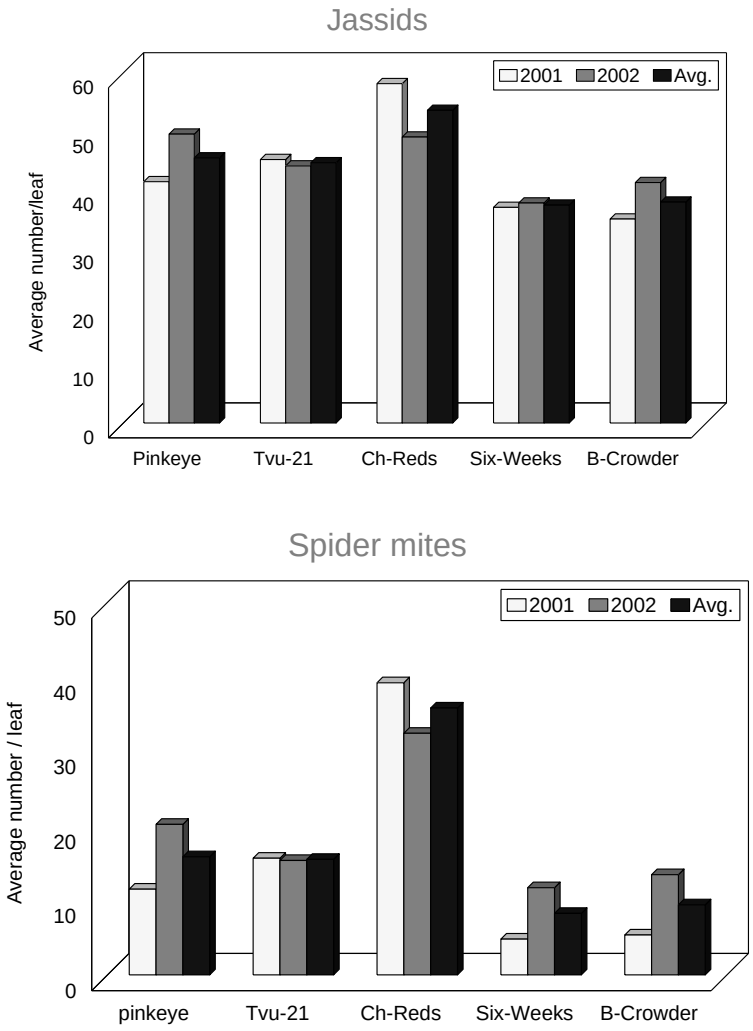

Fig (1-2): Average number of pests (jassids-spider mite) on cowpea cultivars under field conditions during 2001 and 2002 seasons.

Table (3): Maximum number of aphids ± SE/plant, and means ± SE of harvest components of cowpea genotypes under field conditions, combined two years (2001 and 2002).

Genotypes	Trt.*	No. aphids/ plant	No. pods/ plant	No. seeds/ pod	Weight of 1000 seeds (g)
Pinkeye	NS	50.5 ± 3.5	18.6 ± 1.5	8.6 ± 1.0	161.2 ± 3.6
	SP	7.6 ± 1.0	17.4 ± 2.1	8.2 ± 1.2	169.5 ± 3.5
Tvu-21	NS	183.5 ± 2.8	11.3 ± 1.4	9.5 ± 0.9	260.1 ± 3.9
	SP	31.2 ± 1.7	12.5 ± 1.2	9.0 ± 0.7	262.3 ± 3.7
Ch-Reds	NS	85.0 ± 1.6	24.9 ± 2.1	8.1 ± 0.6	145.5 ± 2.8
	SP	8.8 ± 0.6	22.4 ± 2.0	8.6 ± 0.8	147.2 ± 3.1
Six-Weeks	NS	42.0 ± 2.6	21.8 ± 1.6	8.2 ±1.0	137.0 ± 1.9
	SP	5.5 ±1.0	32.1 ± 1.9	9.1 ± 1.2	146.6 ± 2.3
B-Crowder	NS	80.2 ± 1.9	28.9 ± 4.1	8.4 ± 1.4	200.2 ± 3.6
	SP	9.5 ± 1.1	29.4 ± 3.7	8.0 ± 1.0	204.7 ± 4.2

NS: Untreated **SP: Treated**

These results are in agreement with Aiman K. (1998), who showed that the most resistant cowpea cultivars to *A.craccivora* were Sudani and B-Crowder, whereas, the most susceptible cultivars were IT 82 D889, Tvu-21, and Black eye Crowders. In general, cowpea tested cultivars showed significant variation in their susceptibility to the infestation by piercing sucking pests. During the two-season study, Six-Weeks and Black Crowder were significantly resistant to infestation by sucking pests. While, other tested cultivars were in-between.

On the other hand, the effect of cowpea cultivars on oviposition, survival and development of spider mite (*T.urticae)* was tested under laboratory conditions at 25^0C.

The data was illustrated in Table (4) and Fig. (3), showed that the life cycle of *T.urticae* was significantly differences within the tested cultivars. *T.urticae* life cycle on Ch. Reds and IT 82 D889 was shorter compared with those on other cultivars.

The results obtained revealed that the development period (pre-oviposition, oviposition, and post-oviposition, periods) of adults were not significantly different among the tested cowpea cultivars. However, total adult longevity varied significantly between cowpea cultivars, and the mite reared on IT 82 D889 had the longest adult longevity. Total fecundity (No. of eggs / female) of *T. urticae* was significantly different among the 7 tested cultivars, the highest was on Tvu-21 followed by Pinkeye, IT 82 D889, Six-Week, Balady, and B-Crowder (Table 4).

Data revealed that the tested cowpea cultivars had a significant effect on *T.urticae* development and reproduction. Tvu-21 and Pinkeye were more suitable for mites than other cultivars with respect to development time, adult longevity, and reproduction and population growth.

In general, cowpea tested cultivars showed significant variation in their susceptibility to the infestation by piercing sucking pests. During the two-season study, Six-Weeks and Black Crowder were significantly resistant to infestation by mentioned sucking pests. While Tvu-21 was significantly susceptible, other tested cultivars were in-between.

The variation in cultivar susceptibility to pest infestation may be due to antibiosis, morphological and physiological character of plant, the number of glands and hairs, and plant age (Zaren1987).

Table (4): Mean of development, reproduction, and longevity of *T.urticae* on 7 cowpea Cultivars at 25^0C constant temperature.

Genotypes	Development period (in days)								
	Incubi.[1] Period	Immat.[2] Stage	Life Cycle	Preovip.[3] Period	Ovipos.[4] Period	Postovi.[5] Period	Longevity	Life Span	No. of Eggs/female
Pinkeye	3.25 a	10.75 a	14.00 a	0.75	5.50 a	1.0	7.25 a	21.25 a	16.22 a
Ch-Reds	3.00 a	9.25 b	10.25 b	1.00	4.50 b	0.38	5.88 b	16.13 b	11.25 b
Tvu-21	3.50 a	12.75 a	14.65 a	0.50	5.25 a	1.75	7.50 a	22.15 a	17.22 a
Six weeks	3.15 a	7.25 c	12.40 a	2.00	4.50 b	0.75	7.25 a	19.65 a	13.86 b
B-crowder	4.23 b	9.25 b	16.98 c	2.25	6.15 a	0.38	8.92 ab	25.76 c	8.72 c
Balady	3.63 a	8.76 b	12.39 a	2.38	5.88 a	1.66	9.92 ab	22.31 a	11.50 b
IT82D889	3.14 a	7.00 c	10.14 b	1.56	8.80 c	1.38	11.82 c	21.96 a	15.75 a

1-Incubation period 2- Immature stage 3- Preoviposition period
4– Oviposition period 5- Postoviposition period

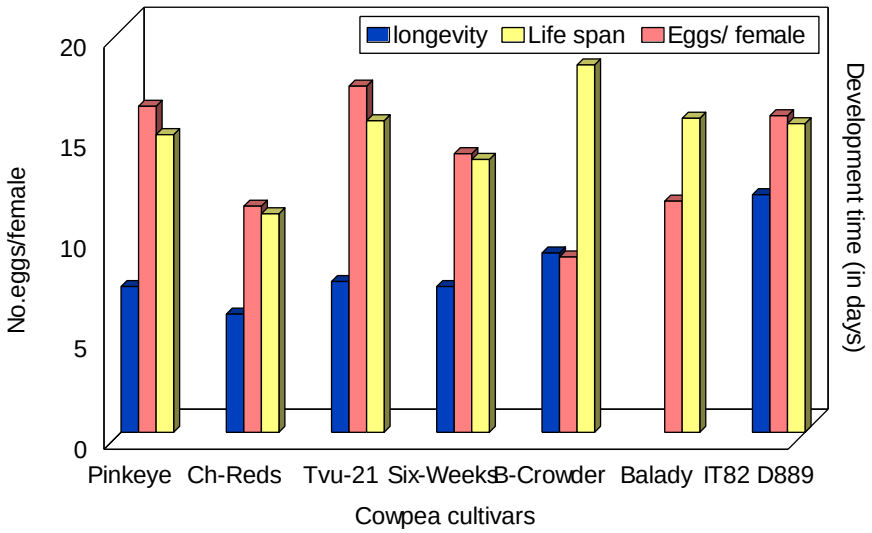

Fig. (3): Mean of longevity, life span, and number of eggs per female of *T.urticae* on 7 cowpea cultivars at 25^{0}C constant temperature.

REFERANCES:

Abdel Alim, A.A. (1994): Ecological studies on certain insects infesting cowpea plants In Minia regoin Minia J.Agric. Res.& Dev.VOL.16, No.2 (June 1994).

Aiman, K.E.G.(1998): Ecological studies on piercing sucking pests infesting cowpea and their control in Assiut governorate. M. Sc., Thesis, Fac. Agric. Assiut Univ. pp.169

Amro, M.R.M. (2004): The influence of plant characteristics on field infestation and resistance status of certain cowpea cultivars to the lima Bean pod borer Etiella zinckenella Treitschke and the southern cowpea weevil *Callosobruchus maculates* (Fabricius). Sec. Int. Conf. for develop. And the Arab World, Assiut Univ., March 23-25,2004; 375-384.

Damarany, A.M. (1994): Testing and screening of some cowpea (*vigna unguiculata* (L) Walp) genotypes under Assiut condition. Assiut Jour. of Agric. Sci. 25(4) 9-19.

Davis, D.W., D. B. Marsh and M.N. Alvarez. (1986): MN13 and MN150 cowpea breeding Lines HortScience 2(4):1080-1081.

Farghali, M.A., A.G. Ali and H. A. Hussein. (1996): Susceptibility of some mungbean cultivars to aphid infestation with special references to pod setting and seed yield. Assiut J. oF Agric. Sci., vol. 27(2):131-134

Faris, F.S., Safwat A. Doss, M. K. Nakhla and M. A. Zidan. (1987): Relative susceptibility of twenty cowpea cultivars to infestation by two pests and virus infection.2nd Nat. Conf. of Pests and Dis. of Veg. and fruits Ismailia Oct., 1987.

Gad El-Hak, S.H., S.H. Mohamoud, and R. A. Ragab. (1988): An Evaluation study of twenty four genotypes of cowpea (*vigna unguiculata* (L) Walp).. Minia J. Agric. Res. & Dev. 10 (1): 257-268.

Gamil, K.H., and Gad El-Hak. (1984): Genotypic evaluation for quantitative traits in cowpea (V*igna unguiculata*). Bull. Fac. of Agric., Univ. of Cairo, 35(3) 1471-1482

Gharib, A.H. And F.K. Aly. (1991): Population density and age structure of the whitefly,

Bemisia tabaci **on six field and vegetable crops in Minia region. Minia J.Agric. Res.&Dev., 13(4) 1451-1555.**

Metwally, S.A.G., M.K. Megali and F.S.Faris. (1991): Evaluation of some cowpea cultivars to infestation of some pests. Fourth Arab Congress of Plant Protection, Cairo, Dec. 1-5.1991.

Nosser, M.A. (1996): Mechanism of resistance in bean and cowpea to certain sucking insects infestation. M. Sc. Thesis, Fac. Agric., Cairo Univ., 137pp.

Ofuya, T.I. (1993): Evaluation of selected cowpea varieties for resistance to *Aphis craccivora* Koch at seedling and podding phase. Ann. Appl. Biol., 123 (1): 19-23.

Snedecor, G.W. and G.W. Cochran (1971): Statistical method. Iowa State Univ. Press. Amer. Iwoa, USA.

Steele, W.M. (1976): In "Evaluation of crop plant" (N. W. Simmonds, ed.) pp.339-343. Longman, London.

Van Emden, H.F. (1987): Cultural methods: the plant, In: Burn, A.J., T. H. Coaker and P.C. Jepson (Ed.) Integrated pest management, 27-67, Academic Pres, London, New York.

Zaren, N. (1987): Evaluation of six cotton cultivars to thrips and leafhopper. Iran Agricultural Research (1985, recd.1987) 4, 89-97.

الاختلافات في حساسية بعض أصناف اللوبيا للإصابة ببعض الآفات الرئيسية بمصر العليا

نشأت عبد الحافظ على* ، أبو المعارف محمد الضمرانى**

* معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – مصر

** قسم البساتين – كلية الزراعة – جامعة أسيوط

تم دراسة تأثير بعض الصفات النباتية لخمسة أصناف من اللوبيا على الإصابة ببعض الآفات الرئيسية وهى الذبابة البيضاء – التربس –الجاسيد – المن – اكاروس العنكبوت الأحمر في مصر العليا (محافظة أسيوط) خلال موسمين متتاليين ٢٠٠١ و ٢ ٢٠٠.

أظهرت النتائج أن أعلى تعداد لهذه الآفات والتي تواجدت على نباتات اللوبيا سجلت على الصنف Tvu-21. وسجل اقل تعداد لهذه الآفات على صنفي B-Crowder و Six-Weeks.

وبالنظر إلى قابلية الأصناف المختبرة للإصابة بالآفات الثاقبة الماصة وجد أن كلا من B-Crowder و Six-Weeks ظهرت كأصناف مقاومة لهذه الآفات بينما اظهر الصنف Pinkeye مقاومة منخفضة. كما أوضحت النتائج إن الصنف Tvu-21 قابل للإصابة بكل من الذبابة البيضاء – الجاسيد – التربس – العنكبوت الأحمر. كما أظهرت النتائج أيضا قابليته للإصابة بحشرة من البقوليات *A.craccivora*.

كما لوحظ أيضا عدم وجود اختلافات جوهرية بين جميع الأصناف المختبرة في عدد القرون/نبات وعدد البذور/قرن في الأجزاء المعاملة وغير المعاملة. أظهرت النتائج لهذه الصفات أن الصنف Tvu-21 كان أعلى الأصناف في وزن الحبة (٢٦٠.١ و ٢٦٢.٣ جرام/١٠٠٠ حبة للغير معامل والمعامل على التوالي).

ومن ناحية أخرى تم دراسة تأثير ٧ أصناف من اللوبيا على معدل النمو – طول فترة الحياة والكفاءة التناسلية لاكاروس العنكبوت الأحمر على درجة حرارة ٢٥ د رجة مئوية . أوضحت النتائج أن اقصر دورة حياة للاكاروس سجلت على أصناف Ch-Reds وIT 82 D889 بالمقارنة بالأصناف الأخرى. بينما سجلت أعلى كفاءة تناسلية للاكاروس على أصناف Tvu-21 – Pinkeye و IT 82 D889 (١٧.٢٢ –١٦.٢٢ –١٥.٧٥ بيضة على التوالي)، وسجلت أقصر فترة حياة (١٦.٣٣ يوم) على Ch-Reds.

وبناء على النتائج السابقة نستنتج إن الأصناف Tvu-21 و Pinkeye, كانت من الأصناف المفضلة لهذه الآفات بينما كان الصنف B-Crowder والصنف Six-Weeks اقلها تفضيلا.