J. Agric. Sci. Mansoura Univ., 34 (5): 5251 - 5257, 2009

EFFECT OF PLANT AGE AND CERTAIN WEATHER FACTORS ON THE POPULATION FLUCTUATIONS OF *Earias insulana* (BOISD) ON OKRA PLANT AND PRODUCTIVITY

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ABSTRACT

Field experiment was conducted at Qualubia Governorate during two successive seasons 2006and 2008 to study the population fluctuation of *Earias insulana* on two Okra varieties. In addition, to study the effect of certain weather factors (daily mean temperature, daily mean R.H.) and plant age on the two Okra cultivars during two seasons. The obtained results showed that: the number mean of *E. insulana* started to occur on July27th and increased gradually reaching the peak in September 14th or plant age (163 days from sawing). The high number of larvae was recorded (7.8 & 6.3 larvae/10pods and 7.7 &6.8larvae/10pods) during the first and second seasons on the Okra varieties (Eskandarani and Balady), respectively. The weather factors (mean Temp. and plant age) had significant effect on population of *E. insulana* larvae with two varieties (Eskandarani and Balady) also the relative humidity had negative significant effect on population of *E. insulana* during two successive seasons 2006 and 2007 on two cultivars, respectively. The percentage of variance explained by three tested factors during two seasons, was 52.6&52.0 % and (89.7 and 95.4%) for the two Okra varieties, (Eskandarani and Balady), during two seasons respectively. Balady variety gave the highest yield, then Eskandarani variety during two seasons respectively.

INTRODUCTION

Okra, *Abelmoschus esculentus*(L.) is one of the favorite vegetable crops grown in Egypt as well as in tropical and subtropical countries. The cultivated area of this crop was estimated at 11526 feddans produced 66922 tons with an average of 6.0 tons /feddan, (Eid 1985).

Okra varieties are greatly differed in plant growth, fruit quality,degree of ribbing and pubescence as well as fruit yield potential. Fruits are consumed in the immature stage, used fresh, canned or dehydrated in stews and soups or as a separate dish. The nutritive value of okra mainly due to its high Ca, P , K and vitamin content especially vitamin A, B1, B2, B7 and C (Watt and Merrill,1963).

The spiny bollworm*, E. insulana* is one of the most important insect pests infesting okra in Egypt, they causing considerable reduction in quantity and quality of okra yield .According to Dhawan and Sidhu (1984), *Earias spp*. are responsible for annual loss of 28.4% of okra yield. The present investigation was conducted to study the effect of certain weather factors and plant age on the population fluctuation of E.insulana on Okra plantation and its productivity.

MATERIALS AND METHODS

Experiments were carried out at the experimental Qalyubia Governorate during the two successive seasons of 2006 and 2007.Area was 1/4feddan sown of okra seeds (*Abelmoschus esculentus*. L) varieties (c.v. Eskandarani and Balady) on April 4 th during 2006 and 2007.Direct count (three replicates were inspected) of *Earias insulana* larvae was carried out in the field, Ten pods from each replicate of okra plant were randomly taken, then these samples were picked out and put in paper bags which transferred to the laboratory for investigations .

The records of meteorological data, the daily mean of minimum, maximum temperature and daily mean relative humidity, were obtained from the meteorological records of Central Laboratory for Agriculture Climate, Agriculture Research Center at Dokki, (preventative Shebien El-Qanater). The daily records of these factors were recalculated to get the daily averages within one week before the sampling date.

Chemical analysis of okra plants (cv. Eskandarani and balady) leaves:

The samples were cleaned and washed with distilled water. The fresh weight was determined, and then pods were put in a drying oven at 60°c for one day. The dry power of pods was stored in glass bottles to devote for total carbohydrate, total sugar (reduced sugar and non-reduced sugar), and total nitrogen.

Total nitrogen was determined according to the method of micro kjeldahl as described by Peach and Tracy (1956). Total carbohydrates were determined according to Forsee (1941). Readings were taken calorimetrically using spectoromic 20 with 420 mm wave length. It was calculated according to the following equation:

$$C/n = \frac{\text{carbohydrate content (gm)}}{\text{Nitrogen content (gm)}}$$

Phosphorus (gm/plant) was determined colorimetrically according to the method of Murphy and Riely (1962) as modified by John (1970).
Potassium (gm/plant) was determined flame photometrically as mentioned by Brown and Lilleland (1946).

Yield components:

At the end of each season, the weight of pods per feddan for each variety was calculated.

Statistical analysis:

To get idea about the effects of plant age, climatic factors and its correlation with the insects, simple correlation and partial regression were carried out by using a computer software package, “Costat“ a product of Cohort software In C., Barkeley, California, U.S.A.

RESULTS

Data showed in Fig.(1) in okra plant Eskandarani, the mean number of *E.insulana* individuals during 2006 season. It was 2 individuals / 10 pods on

July27th after 114 days from sowing. Values increased gradually by the time laps to reach its maximum (7.8 individuals / 10 pods) 163 days after sowing on September 14th.

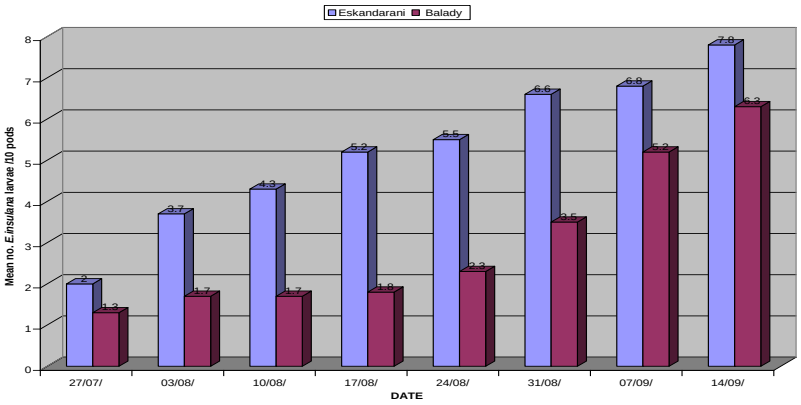

Fig (1): Susceptibility of the two okra varieties (Eskandarani & Balady) to infestation with *Earias insulana* larvae during 2006 seasons.

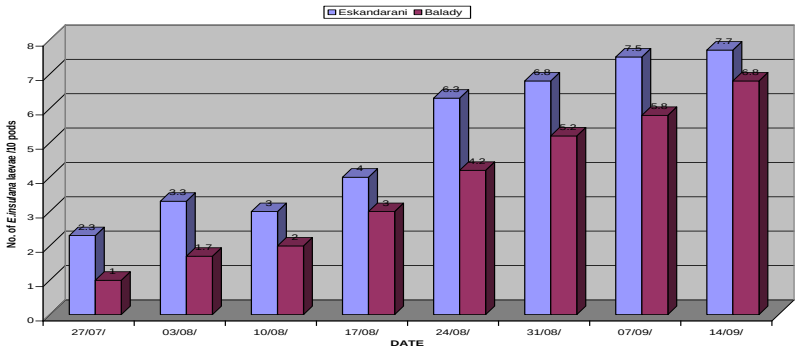

Fig (2): Susceptibility of the two okra varieties (Eskandarani & Balady) to infestation with *Earias insulana* larvae during 2007 seasons.

The mean number of *E .insulana* individuals, (larvae stages per pod) began low (1.3 individuals /10 pods) after 114 days from planting on July27th during 2006 season; then increased gradually to reach its maximum (6.3 individuals / 10 pod) on (September 14th) after 163 days from sowing in okra plant balady Fig (1).Generally, results of Okra plant Green and Balady showed that incidence infestation by *E .insulana* as expressed as mean number of larvae stages increased gradually with the increase of plant age of Okra to reach its maximum incidence at plant ages of 163 days during the two successive tested seasons respectively.

While the mean number of *E .insulana* individuals, (larvae / pod) began 2.3 &1.0 individuals/10 pods after 114 days from planting during 2007

season on c.v. Eskandarani and Balady then increased gradually to reach its maximum(7.7 &6.8 individuals / 10 pods) on (September 14th) after 163 days from sowing in okra plant c.v. Eskandarani and Balady during 2007 season..

Results indicated clearly that cv. Eskandarani was more susceptible to infestation by *E. insulana* larvae than the other cultivar, (balady), okra plants during the 2006 and 2007 seasons. The average number of larvae per 10 pods recorded during the two seasons was (5.15 individuals / 10 pods); (3.3 individuals / 10 pods) for Eskandarani and Balady cultivars, respectively. These results were in agreement with Jaydeb *et al*. (1999) ; Liu and Sengonca (2003) ;Abro *et al* (2004) and Mandal *et al*.(2006),The fruit borer (*Earias insulana* (Boisd). and *E. vittella* Fabr.) were observed at the end of the crop growth period, leaf rollers (*Sylepta derogata* Fabr. [*Haritalodes derogata*]) .

The simple correlation indicated significant positive correlation between the plant age and the insect *E .insulana* inspection population during the two seasons, (r = 0.983 & 0.945) and (0.916 &0.948) for 1st and 2nd seasons (2006 and 2007), on c.v Eskandarani and balady, respectively (Tables 1-2). The partial regression analysis for the effect of plant age on the *E .insulana* population revealed significant positive effect (b.reg. = 6.31 & 10.46)and (10.415 &12.9) on c.v Eskandarani and balady, respectively during 1st and 2nd seasons (2006 & 2007), respectively (Tables1-2).

Table (1): Effect of plant age and certain climatic factors on the population fluctuation of *E.insulana* on okra plants (cv. Eskandarani and Balady) during 2006 season at Qualubia Governorate.

Factors		Simple correlation and regression values				Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	T	b. reg.	S.E.	T	P	F	P	
Plant age		0.983	0.143	0.694	3.56*	6.31	0.306	2.064	0.05			
Eskandarani	Daily mean max. temp.	0.699	0.173	0.1.45	0.75	8.11	0.678	1.195	0.1			
	Daily mean min. temp.	0.441	0.211	0..306	0.872	3.76	0.546	1.690	0.09	12.11	0.09	82..6
	Daily mean R.H.	-0.747	0.559	0.286	1.86	8.21	0.420	1.954	0.06			
Plant age		0.916	0..209	0..932	3.34*	10.415	0.463	2.249	0.03			
Balady	Daily mean max temp.	0.890	0.167	0..283	1.169	4.1433	0. 242	2.192	0.04			
	Daily mean min. temp.	0.298	0.500	0..229	1.84	1`0.41	0. 477	2.183	0.04	12.1	0.09	88.2
	Daily mean R.H.	-0.783	0.245	0. 101	0.53	11.44	0. 729	2.420	0.02			

The results indicated significant positive correlation between the mean of daily maximum temperature and *E .insulana* population during the two seasons of 2006 and 2007 (r= 0.728 & 0.621 for 1st and 2nd seasons, respectively). Also there was significant positive correlation between the mean of daily minimum temperature and *E .insulana* population during 2006and 2007 seasons (r= 0.595 and 0.550 for 1st and 2nd seasons, respectively), These results were in agreement with Lal *et al.* (1999).

The percentage of variance explained by the three tested factors during the 1st and 2nd seasons of 2006 and 2007 were (82.6 and 88.2%) and (89.7 and 90.4%), for two okra varieties, (Eskandarani and balady), respectively (Tables1& 2)

Table (2): Effect of plant age and certain climatic factors on the population fluctuation of *E.insulana* on okra plants (cv. Eskandarani and Balady) during 2007 season at Qualubia Governorate.

Factors		Simple correlation and regression values				Partial regression values				Analysis of variance		E.V. %
		r	b	S.E.	T	b. reg.	S.E.	T	P	F	P	
Plant age		**0.945**	**0.0381**	**0.035**	**11.8***	**10.46**	**0.112**	**9.332**	**0.01**			
Eskandarani	Daily mean max. temp.	0.620	0.663	0.735	3.25*	22.4	0.248	3.09	0.05	32.51	0.01	89.7
	Daily mean min. temp.	0.445	22.6	15..52	2.05	2.91`	0.1998	1.45	0.1			
	Daily mean R.H.	-.0.639	0.003	0.144	3.43*	-4.03	0.153	3.262	0.04			
Plant age		0.948	0.133	0.0117	12.3*	12.9	0.113	11.342	0.01			
Balady	Daily mean max temp.	0.572	0.015	0.0156	2.88*	2.60	0.059	4.044	0.09	75.34	0.001	90.4
	Daily mean min. temp.	0.397	0.543	0.289	1.78	2.20	0.117	3.187	0.07			
	Daily mean R.H.	-0.729	0..201	0.127	4.43*	1.83	0.116	3.15	0.04			

r: Simple correlation value. **Tabulated T=2.36**
b: Simple regression coefficient value. **b. reg.: Partial regression coefficient value.**

Simple correlation analysis showed that, positive relation between carbohydrate and K contents by the total number of *E .insulana*, while this relation was not significant with *E .insulana* infestation and N & P for two varieties (Eskandarani, and Balady) during seasons 2006 and 2007. .(Table 3).

Table (3): Relation between phytochemical components of two varieties Okra pods and *E .insulana* infestation.

varieties	season	Total no. *E.insulana*	N/plant (gm.)	r.	P/plant (gm.)	r.	K/plant (gm.)	r.	Total carbohydrate	r.
Eskandarani	**2006**	41.9	0.83	0.48	0.21	0.23	2.03	0.51	4.0	0.69
	2007	40.9	0.80	0.45	0.20	0.161	2.00	0.50	3.8	0.67
Balady	**2006**	23.8	0.9	0.40	0.29	0.32	3.11	0.62	4.3	0.72
	2007	29.7	0.88	0.33	0.27	0.37	3.1	0.60	4.1	0.70

Phosphorus: P **Potassium: K** **Nitrogen: N**

Results in Table(4) indicated the yield of two okra varieties. Results showed that Balady variety gave the highest yield, then Eskandarani variety. The obtained yield was 2.48, 4.43and 3.23, 4.3 tons/feddan, during 2006 and 2007 years. The Balady variety gave loss of 26.2& 28.3% and the Eskandarani variety gave loss of 58.6& 46.2% of okra yield during 2006 and

2007 seasons, respectively.(Table 4). These results were in agreement with Dhawan and Sidhu (1984).

Table (4): Effect of insect *E .insulana* infestation on pods weight and yield, of Okra varieties during 2006 and 2007 seasons at Qalyubia Governorate.

varieties	Season	Area (Fed)	Production	Production (Ton/Fed)	Loss%
Eskandarani	2006	0.125	0.31	2.48	58.6
Balady		0.125	0.55	4.43	26.2
Eskandarani	2007	0.125	0.40	3.23	46.2
Balady		0.125	0.61	4.3	28.3

The effect of insect *E .insulana* infestation on pods weight and yield, showed the same line and trend for the two varieties during 2006 and 2007 seasons.(Table 4). The obtained data are in agreement with those of Otake and Yamada (2005).

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تـأثير عمـر النبـات و بعض العوامـل الجويـة علـى التذبـذب العـددى لـدودوة اللـوز الشوكيه على صنفين من نباتات البامية والإنتاجية

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يعتبر نبات البامية، أحد نباتات الخضر المفضّلة في مصر وكذلك في البلاد الإستوائية والشبه إستوائية. وتقدر المساحه المنزرعه من هذا المحصول 11526 فدان تنتج 66922 طن بمعدل من 6.0 طن / فدان, (عيد 1985).

تختلف أصناف الباميه كثيرا في نمو النبات، نوعية القرون ، درجة الزغب والتضليع بالإضافة إلى إمكانية استخدامات جديدة محصول القرون فى ا لتجفيّف في ا لطبخ. القيمة المغذّية للبامية بشكل رئيسي نسبه عالية من البوتاسيوم والفسفور وفيتامين ا ،ب 1, ب 2, ب 7 وس **Watt and Merrill** (1963).

دودة اللوز اشوكيه من أهم الحشرات التى تصيب نيات ا لبامية فى مرحلة القرون في مصر، تسبب خفض كبير في الكمية ونوعية محصول البامية**Dhawan and Sidhu** (1984)، و تسبب خسارة سنوية 28.4 % من محصول البامية.

مشكلة البحث: تحديد شدة الاصابه وفى اى عمر من النبات واى الصنفين (اسكندرانى وبلدى) أقل اصابه وأعلى أنتاجية

الهدف من البحث: تأثير عمر النبات و بعض العوامل الجوية (الحرارة الكبرى والصغرى والرطوبه النسبية) على التذبذب العددى لدودوة اللوز الشوكيه على صنفين من نباتات البامية والإنتاجية

أجريت تجربة حقلية في محافظة القليوبيه خلال موسمين متتاليين 2006, 2007 لدراسة التذبذب العددي لحشرة دودة اللوز الشوكية ***Earias insulana***.وتأثير العوامل الجوية (متوسط درجة الحرارة العظمي والصغري ومتوسط الرطوبة النسبية) وعمر النبات علي صنفين من الباميا (وهى اسكندرانى وبلدى)

وكان أهم النتائج كالتالي:

- تبدأ الإصابة بدودة اللوز الشوكية في أوائل شهر يوليور أي عند عمر النبات بعد 114 يوم، من الزراعة وقد تزداد تدريجيا لتصل ذروتها في نصف شهر سبتمبر أي عند عمر النبات 163 يوم من الزراعة وسجل أعلي تعداد (7.8, 6.3 يرقة/10قرن) ، (7.7, 6.8 يرقة/10 قرن) في السنة الأولي والثانية علي الصنفين (اسكندرانى وبلدى) علي التوالي.
- وجد إرتباط معنوي موجب بين عمرالنبات والمتوسط اليومي لدرجات الحرارة وتعداد يرقات دودوة اللوز الشوكيه خلال الموسمين وعلي الصنفين. أيضا كانت قيمة الإرتباط المعنوي عكسي (سالب) بين تعداد اليرقات والرطوبة النسبية خلال الموسمين وعلي الصنفين.
- وجد أن تأثير هذه العوامل مجتمعة علي نشاط الحشرة في كلا العامين كان معنوي 82.6٪, 88.2٪ , علي اسكندرانى وبلدى في العام الأول، 89.7, 90.4, ٪ علي الصنفين علي التوالي.أظهرت الدراسة أن الصنف بلدى أقل حساسيه من اسكندرانى بالاصابه بيرقات اللوز الشوكيه خلال عامى الدراسة (6 200 و 2007) .

أثبتت النتائج أنه يوجد علاقة ارتباط معنوية موجبة بين المحتوي الكربوهيدراتي والبوتاسيوم وتعداد الآفة ومستوى الأصابة بدودة اللوز الشوكيه مع نبات الباميا فى الصنفين (اسكندرانى و بلدى) بينما العلاقة بين تعداد والأصابة بدودة اللوز الشوكيه مع المحتوى النتيروجينى والفسفورى علاقة ارتباط غير معنوية .

وقد أعطى صنف بلدى أعلى أنتاجية من الصنف سكندرانى خلال السنتين 2006 و2007.