IMPROVEMENT QUALITY AND QUANTITY OF OKRA SEED YIELD (*ABELMOSCHUS ESCULENTUS L.*) THROUGH CONTROL OF COTTON SEED BUG (*OXYCARENUS HYALINIPENNIES* COSTA)

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ABSTRACT

The present study aimed to (I) Determine the effect of cotton seed bug infestation on yield and quality of okra seeds. (II) Evaluate the efficacy of some treatments on reducing seed damage caused by cotton seed bug. (III) Determine the effect of preventing the cotton seed bug control at beginning of the pods dryness. To achieve these goals, the behavior of viability of okra seeds was study under the three methods of control cotton seed bug infestation. Treatment (1): floral buds were bagged from beginning of its formation until beginning of the pods dryness, treatment (2): floral buds were bagged from beginning of its formation until beginning of the floral bud formation to the completely pods dryness treatment (3): insecticide spraying treatment on Balady "red" genotype. This study was carried out during two successive seasons. Results showed significant differences between number and weight of perfect seeds, number and weight of damaged seeds, damaged seed percentage, seed germination percentage, weight of 1000 seeds, crude fat and crude protein percentage were significantly increased by the treatment (2). The check treatment resulted in maximum number of damaged seed per plant, highest weight of damaged seeds per plant and also highest damaged seed percentage. In addition that, mass and density of seeds (physical properties) were increased by treatment (2). Preventing the cotton seed bug control at beginning of the pod dryness led to low quality and quantity of okra seed yield.

Key words: Okra; Seeds; and *Oxycarenus hyalinipennies.*

INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is an important vegetable crop at tropical and sub-tropical altitude regions in Asia, Africa and America, It is one of the most popular vegetable in Egypt. Okra fruits are rich in calcium (90mg/ 100g fresh weight) and provide a valuable supplementary item in the tropical diet. In Egypt, ecotypes or landraces so called "Balady" are popular and dominating for cultivation as a summer crop. A total area of okra were 7033 ha of okra are cultivated in Egypt during 2008 **(Statistics of Ministry of Agriculture, 2008).** The total seeds required to cultivate this extent is about 42 Ton. Given for the low percentage of okra seeds germination, Egyptian seeds law and rules has determined the minimum percentage of okra seed germination 65% **(El-Wakaea El-Massria, 1997**). Also, Minnesota seed law and rules has identified the minimum percentage of okra seed germination 50% (**Minnesota Seed Law and Rules, 2006)**. This means that there is a problem affecting the viability of okra seed. The problem had been raised when access to this ratio has become difficult – Although a small percentage of these – leading to presence of financial loss when producing okra seed because these seed rejected. Oviposition and feeding by *Oxycarenus*

hyalinipennis Costa occur almost exclusively on seeds of members of the Malvaceae (**Dimetry, 1971**). A new distribution map is provided for *Oxycarenus hyalinipennis* Costa (Hem., lygaeidae) (cotton seed bug). *Oxycarenus hyalinipennis* has numerous synonyms and common names, but as an important pest of cotton worldwide, it is comm. only referred to as "The cotton seed bug". It not only feeds on other plants in the order Malvales, especially in the family Malvaceae, but also in Tiliaceae and sterculiaceae **((Slater and Baranowski 1994) (C.A. Smith and Brambila, 2008)).** There are several reports on the effect of the cotton seed bug (*Oxycarenus hyalinipennies*) on the cotton seed **Ananthakrishnan *et al*. (1982)** mentioned that adults and nymphs suck oil from mature seeds and fluid from leaves of young stems to obtain moisture. **Hill (1975)** found that the cotton seed show brown discoloration and severe shrinking, and seed germination is severely reduced.

Willcocks and Bahgat (1937) mentioned that the reducing of both weight and germination capacity of cotton seeds was attributed to *Oxycarenus hyalinipennis* feeding.

On the other hand, no research has been made to study the effects of *O.hyalinipennis* on okra seeds. As a pre- requisite to okra seed improvement, The aim of this research was to (I) Determine the effect of cotton seed bug infestation on yield and quality of okra seeds. (II) Evaluate the efficacy of some treatments on reducing seed damage caused by cotton seed bug. (III) Determine the effect of preventing the cotton seed bug control at beginning of the pods dryness.

MATERIALS AND METHODS

This study carried out at Qaha Horticulture Research Station (Qaluobia governorate, Egypt) during the years of 2006 and 2007. the soil type of the experimental site classified as a clay soil. Balady "red" okra genotype was used in this study. Seeds were sown in seedling trays on 15th March 2006 and 2007 and kept in a greenhouse for 15 days until were transplanted to the field. The treatments were replicated four times in a complete block design. Each 16 plots consisted of 6 rows 3.5 m. long and 70 cm wide. The seedlings were transplanted two weeks after nursery sowing to each treatment plot on only one side of the ridge at distance of 50 cm. All experimental units received identical care regarding cultivation, manuring, fertilization, irrigation and all other agricultural practices; that were performed as recommended. In the two seasons all the experimental plots received the following treatments:

1- Treatment (1): The floral buds were placed in Agryl bags measuring 15 x 25 cm (Width x length). The bags were closed tightly and were left from beginning of its formation until beginning of the pods dryness. No spraying with insecticide after ruled out the bags.
2- Treatment (2): floral buds were bagged from beginning of its formation until the completely pods dryness. The aim of this treatment to prevent the presence of any insects over the pods to the harvest of seed yield plants of the bagging treatments had not sprayed with any insecticide.
3- Treatment (3): Plants in the middle row of each plot were selected randomly and sprayed – once in two weeks- with Admire 20% SC. (Imidacloprid); 1.25 ml/liter immediately after transplanting the seedling till the end of season.
4- Check (Untreated treatment): plants were left free of any applications as bud bagging or insecticide spraying. Insects were observed weekly.

10 plants were selected randomly and examined for each replicate in all treatments. Number and weight of perfect seeds and number and weight of damaged seeds were recorded for each plant. Percentage of damaged seeds and germination were calculated. Weight of 1000 seeds, crude fat (g/100g) and crude protein (g/100g) were recorded . Average of adults and nymphs of cotton seed bug on pods of 5 plants per replicate were recorded

Reproduction and feeding behavior of *Oxycarenus hyalinipennis* were described by **Samy (1969), Dimetry (1971), Hammad *et al.* (1972)**, and **Awan and Qureshi (1996).**

The crude fat content was determined according to the method described by **Pearson (1970).**

The crude protein content of the different fractions for each treatment was determined by Kjeldahl methods as described by **Pearson (1970)** in which percent nitrogen (N) was multiplied by 6.25, since this value applies for many proteins from seeds.

Some selected relevant physical properties of each treatment were determined on each 100 representative seeds randomly selected the different treatments (**Olajide and Ade–Omowaye, 1999**). The diameter of each 100 seeds from the different treatments was measured with a micrometer reading to 0.001mm. To obtain the mass, each seed was weighted with a precision electronic balance reading to 0.001g. The procedure described by **Dutta *et al.* (1988)** was used to determine the volume and consequently the density of each seed. The surface area, S (cm^2), of each seed was determined by assuming spherical surface for the samples and the expression given in EQ. (1) as described by **McCabe *et al.* (1986)** was employed.

$$S = \prod D^2_e \qquad (1)$$

Where S is the surface area, D_e is the geometric mean diameter of the seed, mm.

$$Dg + (LWT)^{1/3} \qquad (2)$$

Where Dg – geometric mean diameter (mm), L- length (mm), w- width (mm), T- thickness (mm) **(Galendar *et al.*, 2008).** Percentage of seed germination was determined according to **ISTA (1993).** Germination percentage was calculated due to the following equation:

$$\text{Germination \%} = \frac{\text{Total number of normal germinated seed}}{\text{Total number of sowing seeds}} \times 100$$

Based on following specifications have been identified damaged seed: the seeds show brown discoloration and sever shrinking, and seed germination is severely reduced ((**Hill, 1975; Nakache and Klein 1993) (C.A. Schaefer and Panizzi, 2000**)).

Statistical analysis: the data collected were analyzed statistically using fisher's analysis of variance technique by using combined ANOVA over year and Duncan's multiple range test was employed to compare the different among the treatments means at 5% level of probability. The data of seed germination percentage and damaged seed percentage were based on data transformed to log (X – 1) before ANOVA analysis. All computations were performed using the Minitab software (**Minitab inc., 2006**).

RESULTS AND DISCUSSION

1- Efficacy of different of controlling methods against the cotton seed bug on okra seed yield.

Results in Table (1) showed that, mean number of cotton seed bug per plant equal 4966, 1361, 603 and zero bugs per plant in check, treatment (1),

insecticides sp. and treatment (2), respectively. Any insects were not noticed among pods with the exception of cotton seed bug. Perfect seed numbers in treatment (2) was the highest; (388.6) whereas the check was the lowest; (46.1) with respect to weight of damaged seeds by cotton seed bug per plant were also significantly lower in treatment (2);(3.98). Concerning the proportion of number of damaged seeds by cotton seed bug was highest in check; (400.1) followed by treatments (2); (68.6). In the percentage of seed germination all treatments differed significantly, the treatment (2) was the highest; (85.25%) and check was the lowest; (10%). As for the mean values of the thousand seed weight, the treatment (2) recorded the highest value; (82.93) while, the check recorded the lowest value; (47.49). The percentage of crude fat and crude protein in seeds, results showed that the treatment (2); (20.55 and 25.37, respectively) had the highest mean value; while, the lowest values were those of check and treatment (1); (14.516, 17.579 and 15.591, 19.541 respectively). these results agreed with that of **Hargreaves (1948 C.A. Schaefer and Panizzi, 2000)** who mentioned that the question can be fairly raised, given that *O. hyalinipennis* can fed on the plant for water with no ill effect, and the plant does indeed carry valuable sugars and amino acids in the sap, why then does not the bug feed on the plant when seeds are not yet formed or after the seeds have been shed, but instead goes into facultative diapauses? True, the seeds are very rich food. Also, **Kirkpatrick 1993) (C.A. Schaefer and Panizzi, 2000)** demonstrated the bug avoid feeding on the plant as much as possible, utilizing rainwater, dew, and extra floral nectarines, and draw on the plant as last resource. A working hypothesis is proposed: the bug avoid feeding on the plant to avoid harming the hosts that will produce much more valuable food seeds at a later time. This is the strategy of a good parasite: do not kill the goose that lays the golden eggs. A similar trend was obtained by **Ananthakrishnan *et al.* (1982)** who reported that adults and nymphs such oil from mature seeds and fluid from leaves of young stems to obtain moisture. The combined ANOVA of all parameters over years in Table (2) showed that all the traits of okra seeds varied significantly among the treatments. There was no significant difference over years for all the traits. There were no significant interaction among years between treatments * years. The absence of treatments * years interaction indicates that results were similar in both years.

2- Efficacy of different of controlling methods against the cotton seed bug on physical properties of okra seed.

The measured average diameter recorded for the samples of the different control methods of cotton seed bug infestation ranged from 0.404±0.0024 to 0.467±0.0017 cm (Table 3). This suggests that seed diameter may be possible to separate okra seeds from other extraneous materials through the design of effective screen for sorting purposes. However, the surface area ranged from 0.566±0.0050 to 0.703±0.0066 Cm^2. The surface area is a relevant tool in determining the shape of the seeds. This could be an indication of the way the seeds would be have on oscillating surfaces during processing as reported by **Alonge and Adigum (1999).** Thus, the average mass of the seeds as indicated in Table (3) ranging from 0.050±0.0006 and 0.081±0.0005 g could be pertinent in cleaning with aerodynamic forces. These results agreed with those of **Annecke and Moran (1982 C.A. Schaefer and panizzi, 2000)** who mentioned that the gregarious feeding of the bug seriously promotes this damage, producing light seeds. Also the average seed densities as presented in

Table 1, 2

Table 3

Table (3) ranged from 0.685±0.0100 to 1.247±0.0125 g/cm^2. The both check and treatment (1) are lower than the density of water indicating that the seed would float on water and this characteristic may be partly used to separate he seeds from other foreign materials.

It could be concluded that the resulted revealed significantly differences among the treatments in all studied parameters. Number and weight of perfect seeds, seed germination percentage, weight of 1000 seeds, crude fat and crude protein were significantly increased by the treatment(2). The check resulted in maximum number of damaged seed per plant, the highest weight of damaged seeds per plant and also highest damaged seed percentage. In addition that, mass and density of seed (physical properties) were increased by treatment(2). Preventing the cotton seed bug control at beginning of pod dryness let to low quality and quantity of okra seed yield.

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تحسين كميه وجوده بذور البامية من خلال مكافحه بق بذره القطن

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أجريت هذه الدراسة بمحطة بحوث البساتين بقها خلال الموسم الصيفي لعامي ٢٠٠٦، ٢٠٠٧ لدراسة تأثير تغذيه بق بذره القطن على بذور البامية وأثر ذلك على كميه وجوده المحصول البذري للبامية. كذلك تقييم فعاليه بعض المعاملات على تقليل الضرر الناتج من بق بذره القطن بالإضافة إلى دراسة تأثير التوقف عن مكافحه بق بذره القطن عند بداية جفاف القرون وذلك للتغلب على انخفاض نسبه إنبات بذور البامية أثناء إنتاجها وليس من مشكلات ناتجة من ظروف التخزين أو مدته وتلك المشكلة تنعكس بدورها على انخفاض المردود المالي لمنتج التقاوي من وحده المساحة كذلك عدم توفر الكميات المطلوبة للسوق المحلي وبالتالي زيادة الكميات المستوردة بالرغم من رغبه المستهلك المصري للبامية البلدية ويؤكد ما سبق أن نسبه الإنبات اللازمة لقبول تقاوي البامية هي ٦٥% (جريده الوقائع المصرية ١٩٩٧) وقد أجريت ثلاث معاملات في هذا البحث: هي ١- تكييس القرون بداية من تكون البرعم الزهري إلى بداية جفاف القرون.٢- تكييس القرون بداية من تكون البرعم الزهري إلى تمام جفاف القرون. ٣- الرش بأحد المبيدات الحشرية.

وقد أستخدم الصنف البلدي " أحمر بنواره" في هذه التجربة.

وكانت أهم النتائج المتحصل عليها كالأتي:

١- أظهرت النتائج وجود فروق معنوية بين المعاملات في قيم كل الصفات المدروسة وهي: وزن وعدد البذور السليمة– عدد ووزن البذور التالفة– النسبة المئوية للبذور التالفة على النباتات – النسبة المئوية لإنبات البذور – وزن الألف بذره – نسبه الدهون الكلية – نسبه البروتينات الكلية – الصفات الطبيعية للبذور (الطول والقطر والعرض ومساحه السطح وحجم وكتله وكثافة البذور).

٢- أدت معامله تكييس القرون بداية من تكون البرعم الزهري إلى تمام جفاف القرن إلى أعلى زيادة معنوية مقارنه ببقية المعاملات في صفات عدد ووزن البذور السليمة على النبات وكذلك نسبه الإنبات للبذور و وزن الألف بذره و نسبه الدهون الكلية و نسبه البروتينات الكلية.

٣- أظهرت النتائج أن معامله تكييس القرون بداية من تكون الزهرة إلى تمام جفاف القرن أدت إلى أكبر زيادة مقارنه ببقية المعاملات في صفات كتله وكثافة البذور.

٤- أدى إيقاف مكافحه بق بذره القطن عند بداية جفاف القرون إلى تدني كميه وجوده المحصول البذري للبامية.

عموما فقد أظهرت النتائج أن هناك علاقة وثيقة بين تغذيه بق بذره القطن على بذور البامية وبين تدهور كميه وجوده المحصول البذري للبامية كذلك أظهرت الدراسة ضرورة مكافحه هذه الحشرة إلى تمام جفاف القرون.