*Minufiya J. Agric. Res. Vol. 32 No.2: 491 - 502 (2007)*

# INSECT SURVEY AND THE EFFECT OF THE CORN BORER INJURIES TO THE YIELD COMPONENTS OF SOME SWEET SORGHUM VARIETIES

**G. A. Shalaby[(1)] and Kh. A. Aboushady[(2)]**
**Sugar Crops Res. Inst. Agric. Res. Cent. Egypt.**
**[(1)] Plant Protection Department**
**[(2)] Physiol. and Chem. Department**

**(Received: Mar. 6, 2007)**

**ABSTRACT:** ***Arthropod pests and predators occurring in sorghum fields were surveyed at Kafr El-Sheikh Governorate (Sakha Agricultural Research Station) from mid-July up to early November in 2003 and 2004 seasons. In addition, four sorghum varieties were evaluated to corn borer infestation and correlations between borer infestation and yield components were computed. The obtained results revealed the occurrence 22 of insect pest species belonging to thirteen families and six orders and one mite specie.***

***Order Lepidoptera had the highest number of species (ll) followed by Orthoptera (five species), each of Hemiptera and Homoptera were represented by two species of each. Three orders; Thysanoptera, Diptera and Acarina were each represented by one specie. On the other hand, thirteen predatory arthropod species were surveyed; the majority was for family Coccienllidae (order Coleoptera). Four sorghum varieties were evaluated to infestation with Chilo agamemnon Bels., Ostrinia nubilalis Hbn and Sesamia cretica Led. Williams variety was the highest infested with the combined borers (overall average of 35.00 larvae/60 sorghum plants), followed by Brands (34.33 larvae/60 plants), Honey (31.17 larvae/60 plants), while Deal was the least infested one (19.00 larvae/60 plants). Generally, negative correlations were found between corn borer infestation parameters and yield and yield components. However, the main parameter; number of larvae per 100 internode, could be more independent in such correlation. Thus, Deal variety that harboured the lowest larval population (6.36-10.01 larvae/100 internodes) produced the highest yield and yield components.***

**Key words: Insect pest, predators and susceptibility.**

## INTRODUCTION

**Sorghum sorghum, *Sorghum bicolor* (L.) Moench comes as the third sugar crop, following sugar cane and sugar beet, in Egypt (about 91540 ton of sugar) as well as allover the world (Sugar Crops Council, 2005). The sorghum plants, like different corn crops, attract numerous insect species coming to satisfy their needs of living. However, many of these insects, including stem**

**borers, result in economic damage to sorghum plants. Sithole *et al*. (1987) surveyed 11 insects pest species attacking sorghum in Zimbabawee and Batswana. In Egypt, 17 arthropodian pest species were surveyed from Alexandria region (Gohar,1995).**

**Fortunately, the insect pests inhabiting sorghum plants were usually associated with natural enemies that have an important role in regulating these pests. Halie and Hofsvang (2001), surveyed four species of corn borers attacking sorghum, detected two predator and four parasitoid species associated with the insect pests. In Ethiopia, Getu *et al.* (2001) recorded six species of stem borers attacking sorghum plants. In addition, they surveyed 20 species of primary parasitoids attacking different stages of borer insects, as well as predators, fungi and nematodes were surveyed.**

**Sorghum varieties varied in susceptibility to insect infestations. Gohar (1995) classified response of sorghum plants to insect infestations as tolerant, less moderate, moderate and high moderate. Ghuguskar *et al.* (1999) reported that only one, out of 26 promising sorghum hybrids, had low infestation with the stem borer, *Chilo partellus* (Nofus and Schreiner, 1991).**

**The insect pests attacking sorghum plants affect negatively on the quantity and quality of sorghum plants. The sugar yield of sorghum in Louisiana was reduced by 46% when it was highly infested with *Diatraea saccharalis* (Fuller *et al.*, 1988). Sorghum yield components were considerably reduced due to infestation of *Ortrinia furnacalis*.**

**The current investigation was carried out at Sakha Agricultural Research Station farm during 2003 and 2004 summer seasons to study the following items: 1) survey insect pests habitant or attacking sorghum plants and their associated predators, 2) evaluate the relative susceptibility of sorghum varieties to corn borers, and 3) find out the losses caused by the insect borer infestations yield and yield components.**

## MATERIALS AND METHODS

**This work was conducted at the experimental farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate. Four sorghum varieties; Honey, Brands, Williams and Deal were sown on 20 June in both seasons; 2003 and 2004. The experimental area was laid out as randomized complete block design with 12 plots (4 varieties x 3 replicates), each plot measured 42 $m^2$. All recommended cultural practices were followed without pesticide applications.**

### 1. Survey of arthropods occurring in sorghum fields:

**Biweekly samples were taken two weeks after sorghum sowing, and continued till harvest. Each sample consisted of five sorghum plants; that were visually examined in the field to detect and recorded the arthropods that**

**may move away due to disturbance. Then, the same examined plants were cut at the soil surface to record other occurring insects, particularly corn borer larvae.**

## 2. Evaluation of varietal susceptibility of sorghum to corn borer infestations:

**Throughout sorghum season, four examinations were carried out. In each examination, 15 plants from each variety (five plants/plot) were cut above the soil surface. The criteria recorded were: total number of internodes, infested internodes, holes and number of larvae of each corn borer species. The considered corn borers were *Chilo agamemnon* Bles, *Ostrinia nubilalis* Hub, and *Sesamia cretica* Led. The infestation criteria were adjusted to infestations per 100 internodes.**

**3. Correlation between corn borer infestations and yield components of sorghum varieties:**

**At harvest, all sorghum plants in each plot were cut at the soil surface, at the dough stage which gave a good quality syrup (El-Maghraby *et al.,* 1992) and weighted. The plants were squeezed, and the resulting juice was weighed. The juice extraction was assessed by the following formula:**

$$\text{Juice extraction \%} = \frac{\text{Juice yield (ton / fed.)}}{\text{Stripped stalk yield (ton / fed.)}} \times 100$$

**The resulting juice of sorghum stalks was transformed to syrup, by evaporating the cleaned juice under noraml atmospheric pressure to 75% T.S.S. and the syrup extraction was evaluated as:**

$$\text{Syrup extraction \%} = \frac{\text{Syrup yield (ton / fed.)}}{\text{Stripped stalk yield (ton / fed.)}} \times 100$$

**Sucrose percentage was determined according to A.O.A.C. (1995).**

**All obtained parameters were transformed as per feddan. Data were analyzed by analysis of variance (Fisher (1944 and 1950), and significant means were compared using "F" test. Correlation coefficients were computed to clarify the relationships between corn borer infestation levels and sorghum yield components.**

## RESULTS AND DISCUSSION

## 1. Survey of arthropods occurring in sorghum fields:

### a. Harmful arthropods:

**Arthropod pests occurring in sorghum fields were surveyed from mid-July up to early November in 2003 and 2004 sorghum seasons. By the aid of**

**taxonomists from Plant Protection Research Institute, the collected arthropod species were identified. The 23 collected species (Table 1) were found belonging to seven orders and thirteen families. Most of surveyed species (11) were belonging to order Lepidoptera that contained three families. The three stem borers, *Sesamia cretica* Led., *Chilo agamemnon* Bles and *Ostrinia nubilalis* Hbn., that are considered important economic pests of sorghum, were included in this order. The second dominant order was Orthoptera, that contained five species classified into three families. This order had *Gryllotalpa gryllotalpa* L. that is seen as a common insect pest, however, it causes considerable losses for sorghum seedlings. Each of order Homoptera and order Hemiptera had two families and two species. *Rhopalosiphum maidis* was an important homopteran pest.**

**Table (1): Survey of arthropod pests occurring in sorghum fields at Kafr El-Sheikh region-2003 & 2004 seasons.**

| Order | Family | Species |
|---|---|---|
| Orthoptera | Acrididae | *Euprepocnemis plorans* (Charp.) |
| | Gryllotalpidae | *Gryllotalpa gryllotalpa* L. |
| | Gryllidae | *Liogryllus bimaculatus* (DeGeer)<br>*Gryllus domesticus* L.<br>*Homorocorypus nitidulus* (Scop). |
| Lepidoptera | Noctuidae | *Agrotis* spp.<br>*Spodoptera littoralis* (Boisd.)<br>*Spodoptera exigua* (Hb.)<br>*Sesamia cretica (*Led.)<br>*Heliothis armigera* (Hb.)<br>*Synographa circumflexa* (L.)<br>*Autographa gamma* (L.) |
| | Pyralidae | *Ostrinia nubilalis* (Hbn.)<br>*Chilo agamemnon* (Bles.)<br>*Leucania loreyi* (But.) |
| | Hesperiidae | *Parnarva mathias* (F.) |
| Homoptera | Cicadellidae<br>Aphididae | *Empoasca* spp.<br>*Rhopalosiphum maidis* (Fitch.) |
| Thysanoptera | Thripidae | *Limothrips cerealiu* Mal. |
| | Aleyrodidae | *Bemisia tabaci* (Genn.) |
| Hemiptera | Pentatomidae | *Nezara viridula* (L.) |
| Diptera | Muscidae | *Atherigona humeralis* (Wied.) |
| Acarina | Tetranychidae | *Tetranychus telarius* (Comp.) |

**The remaining three orders; Thysanoptera, Diptera and Acarina were each represented by only one family and one species. Gohar (1995) surveyed 17 arthropodian pests on sorghum plants in Alexandria region. The three corn borers were usually surveyed from sorghum fields; *Chilo partellus* (Mohan *et al.*, 1990); *Ostrinia farnacalis* (Nafus and Schreiner 1991), *Sesamia cretica* (El-Serwy and Saba, 1993).**

## b. Beneficial arthropods:

**Thirteen predatory species were surveyed from sorghum fields (Table 2). The majority of species (six) were included in order Coleoptera that was represented by two families; Coccinellidae five species and Staphylinidae only one species. The remaining insect orders; Hemiptera, Neuroptera, Dermaptera, and Diptera were each represented by one family and one species of each. However, the true spiders (order Aranea) were surveyed as two species; *Pardosa* sp. and *Lycosa* sp., both belonging to family Lycosidae. Thus, it is clear that sorghum plants have a rich fauna of arthropodian predators, that can effectively regulate the populations of harmful arthropods. This, in turn, puts limitations to the application of pesticides in sorghum fields to keep the vital role of such natural enemies.**

**Table (2): Survey of arthropod predators associated with sorghum pests at Kafr El-Sheikh region-2003 & 2004 seasons.**

| Order | Family | Species |
|---|---|---|
| Orthroptera | Mantidae | *Sphodromantis bimaculatus* Burm. |
| Coleoptera | Coccinellidae | *Coccinella septempunctata* L.<br>*Cocinella undecimpunctata* Reich.<br>*Scymnus* spp.<br>*Cydonia vicina nilotica* Muls.<br>*Cydonia vicina isis* (Crot.) |
| | Staphylinidae | *Paederus alfierii* Koch. |
| Hemiptera | Anthocoridae | *Orius* spp. |
| Neuroptera | Chrysopidae | *Chrysperla carnea* Steph. |
| Dermaptera | Labiduridae | *Labidura riparia* Pall. |
| Diptera | Syrphiae | *Syrphus corollae* F. |
| Aranea | Lycosidae | *Pardosa* sp.<br>*Lycosa* sp. |

## 2. Evaluation of varietal susceptibility of sorghum to corn borer infestation:

**Four sorghum varieties; Honey, Brands, Williams and Deal were evaluated for their susceptibility to three corn borers; *Chilo agamemnon* Bles., *Ostrinia nubilalis* Hbn. and *Sesamia cretica* Led. (Table 3). For *C. agamemnon*, over 2003 and 2004 season, the most susceptible variety was Brands, harbouring the highest larval populations (22.5 larvae/60 sorghum plants), followed by Williams (18.5 larvae/60 plants), Honey (17.0 larvae/60 plants), while the least infested variety was Deal (12.5 larvae/60 sorghum plants). However, statistical analysis showed no significant differences among Honey, Brands and Williams varieties. Both Williams and Brands, that had relatively high infestation with *C. agamemnon*, had also high infestation with *O. nubilalis*; with values of 38.5 and 24.0 larvae/60 sorghum plants, respectively. Again, Deal variety was the least infested (10.5 larvae/60 plants) with this borer. As for *S. cretica*, the highest infested variety was Brands (56.5 larvae/60 plants), followed by Honey (45.5 larvae), Williams (48.0 larvae) while the least was Deal (35.5 larvae). The three varieties; Honey, Brands, and Williams had statically the same susceptibility to both *O. nubilalis* and *S. cretica*. The calculation of overall average revealed that Williams variety had the highest combined corn borer infestation (35.00 larvae/60 sorghum plant), followed by Brands (34.33 larvae/60 plants), Honey (31.17 larvae/60 plants), while the least infested variety was Deal (19.0 larvae/60 sorghum plants). On the other hand, regardless of varieties, *S. cretica* dominated the corn borers (48.63 larvae/60 plants), followed by *O. nubilalis* (32.75 larvae), while the least occurring corn borer was *C. agamemnon* (17.63 larvae/60 plants).**

**Table (3): Susceptibility of sorghum varieties to corn borer infestation at Kafr El-Sheikh, region, 2003 & 2004 season.**

| Variety | No. of larvae/60 sorghum plants | | | | | | | | | Overall average |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Chilo agammnon* | | | *Ostrinia nubilalis* | | | *Sesamia cretica* | | | |
| | 2003 | 2004 | Average | 2003 | 2004 | Average | 2003 | 2004 | Average | |
| Honey | 22.0 | 12.0 | 17.0 ab | 21.0 | 23.0 | 22.0a | 57.0 | 52.0 | 54.5 a | 31.17 |
| Brands | 19.0 | 26.0 | 22.5 a | 25.0 | 230 | 24.0a | 69.0 | 44.0 | 56.5 | 34.33 |
| Williams | 15.0 | 22.0 | 18.5 ab | 23.0 | 54.0 | 38.5a | 46.0 | 50.0 | 48.0 ab | 35.00 |
| Deal | 15.0 | 10.0 | 12.5 b | 12.0 | 9.0 | 10.5 b | 37.0 | 34.0 | 35.5 b | 19.50 |
| Overall average | 17.63 | | | 23.75 | | | 48.63 | | | |

**The varietal differences of sorghum to corn borers were previously investigated. Sithole and Mtisi (1987) screened six varieties, out of 25 ones, as highly resistant to corn borers. Dhaliwal *et al.* (1988) evaluated 40 sorghum varieties and found that they exhibited variable reactions; from high susceptibility to resistance to dominant corn borers. A similar result was obtained by Gohar (1995), when assessing the susceptibility of sorghum varieties to eight insect species attacking this crop. For pests, other than corn borers, like armyworm, the resistance of sorghum varieties may vary according to the age of the evaluated plants.**

## 3. Correlation between corn borer infestations and yield components of sorghum varieties:

**Data in Table (4) show the corn borer infestations of sorghum varieties accompanied with yield components in 2003 season. Brands variety had the highest criteria of infestation; 15.74 infested internodes, 27.25 holes and 16.17 larvae, each per 100 internodes. For stalk yield, the varieties differed, but not significantly, with Honey and Deal being higher than Brands and Williams. When the stalks were squeezed to obtain juice, Deal variety exhibited the highest value (10.60 t/fed.), followed by Honey (8.60 ton/fed), Brands (8.05 ton/fed) and then Williams that yielded 7.00 t/fed. The differences in juice yield came significant. For juice extraction %, Deal variety occupied the top of the list (62.61%), while Honey came least (50.80%). However, the differences in juice extraction %were not significant (Table 4). The same trend was obtained with syrup yield, with Deal variety having the highest value (3.00 t/fed.) followed by Honey (2.45 t/fed.), while the least value (1.90 t/fed.) was that of Brands. Statistical analysis revealed that these differences proved to be significant. As a consequence, Deal variety produced the highest syrup extraction (17.72%), and Brands variety produced the least percentage (13.67%). The four tested varieties significantly differed in sucrose %, with Deal being the highest (8.28%), while Brands being the lowest one (7.30%).**

**In 2004 season (Table 5), Williams variety exhibited the highest infestation parameters; 15.33 infested internodes, 34.00 holes and 16.80 larvae, each per 100 internodes. On the other hand, Deal variety was the least infested with corn borers, with corresponding values of 8.81, 18.64 and 6.36. Since Deal variety had the lowest borer infestation, it was logic to be the yieldest for stalk (18.89t/fed.), and juice (9.80 t/fed.). For juice extraction, Honey variety came at the top of the list (53.20%), followed by Deal (51.88%), while Brands came the least (41.32%). The highest variety in syrup yield was Deal (2.90 t/fed), while Williams was the lowest (1.60 t/fed.). Honey variety produced the highest syrup extraction (17.32%), while Williams produced the lowest value**

**Table 4 , 5**

**(10.00%). Sucrose percentages of the tested varieties differed significantly, with Honey and Deal varieties being higher than Brands and Williams.**

**Correlation coefficients between corn borer infestation criteria and yield components of sorghum varieties are presented in Table (6). With the exception of juice yield and juice extraction %, all yield components negatively correlated with infested internodes. However, three correlations came insignificant. Also, the number of holes, due to corn borer infestations were insignificant negatively correlated with all yield components, except stalk yield. Larval population harboured in sorghum stalks negatively affected all yield components. The correlation was highly significant in case of syrup yield, and significant in sucrose percentage. However, the remaining values of correlation coefficients between larval population and yield components were not significant.**

**Table (6): Correlation coefficient values (r) among corn borer infestation and sorghum yield components (average & 2003 & 2004 seasons).**

| Item | (r) value |
|---|---|
| Infested internodes x stripped stalks yield | -0.331 |
| Infested internodes x juice yield | 0.010 |
| Infested internodes x juice extraction % | 0.328 |
| Infested internodes x Syrup yield | -0.485 |
| Infested internodes x syrup extraction % | -0.389 |
| Infested internodes x sucrose in juice % | -0.397 |
| Holes x stripped stalks yield | 0.076 |
| Holes x juice yield | -0.098 |
| Holes x juice extraction % | -0.189 |
| Holes x Syrup yield | -0.468 |
| Holes x syrup extraction % | -0.631 |
| Holes x sucrose in juice % | -0.335 |
| Larvae x stripped stalks yield | -0.552 |
| Larvae x juice yield | -0.496 |
| Larvae x juice extraction % | -0.092 |
| Larvae x Syrup yield | -0.874** |
| Larvae x syrup extraction % | -0.689 |
| Larvae x sucrose in juice % | -0.802* |

*, ** Significant and highly significant at 5% and 1% levels, respectively.

**Similar results were obtained by Fuller *et al.* (1988) who recorded negative correlations between bored internodes, because of corn borer infestation, and each of sorghum stalk weight, sucrose percentage and total sucrose.**

## REFERENCES

**A.O.A.C. (1995). Official Methods of Analysis Official Analytical Chemists, Kenneth Helrich (ed.). 15th and Association of Official Analytical Chemists Arlington, Virginia 22201 U.S.A.**

**Dhaliwal, J. S., P. D. Mehandiratta and B. S. Arora (1988). Reaction fo some promising sorghum fodder varieties to insects pests. J. of Res. Punjab Agric. Univ. 25(2): 280-286.**

**El-Maghraby, S. S., M. A. Gomaa, A. A. Gaber and M. E. Mohamed (1992). Effect of water table on sugar crops. III. Sugar sorghum. Egypt. J. Appl. Sci., 8(7): 77-84.**

**El-Serwy, S. A. and M. A. Saba (1993). Evaluation of certain varieties for susceptibility to infestation with the pink stalk borer *Sesamia cretica* Led. (Lepidoptera: Noctuidae) at Aswan Governorate. Bull. of Entomol. Soc. of Egypt. No. 71: 55-59.**

**Fisher, R. A. (1944). Statistical methods for research workers. Oliver and Boyed, Edinburgh and London.**

**Fisher, R. A. (1950). Statistical methods for research Workers. II. Rev. ed. Oliver and Boyed. London.**

**Fuller, B. W., T. E. Reagan and J. L. Flynn (1988). Economic injury level of the sugar can borer (Lepidoptera: Pyralidae) on sorghum sorghum bicolor(l) Moench. J. of Econ. Ent. 81(1): 349-353.**

**Getu, E., W. A. Overholt and E. Kairu (2001). Distribution and species composition of stem-borers and their natural enemies in maize and sorghum in Ethiopia. Insect Science and its applications. 21(4): 353-359.**

**Ghuguskar, H. T., P. V. Shende and A. D. Banginwar (1999). Field evaluation of promising hybrids and varieties of sorghum for tolerance to stem borer. PKV-Research. Journal. 3291): 53-54.**

**Gohar, I. M. (1995). Studies on sorghum sorghum pests. Thesis, M.Sc. Fac. of Agric. Saba Basha, Alex. Univ.**

**Halie, A., T. Hofsvang (2001). Surveyed of lepidopterous stem borer pests of sorghum, maize and pearl millet in Eritrea. Crop, Protection. 20(2): 151-157.**

**Mohan, B. R., A. N. Verma and S. P. Singh (1990). Population build up of *Chilo partellus* (Swin) on forage sorghum in Haryana. J. of Insect. Science and its Application. 11(4-5): 721-732.**

**Nofus, D. M. and I. H. Schreiner (1991). Review of the biology and control of the Asian corn borers *Ostrinia furnacalis* (Lep.: Pyralidae). Tropical Pest. Management, 37(1); 41-56.**

**Sithole, S. Z. and E. Mtisi (1987). Research activities in relation to sorghum/protection in Zimbabwe 1985/86. Cropping season. In proceedings of the 3rd regional workshop on sorghum and millets for southern Africa, Lusaka, Zambia, 1986. Bulawaya, Zimbabwe; SADCCC/ICRISAT sorghum and millet Improvement Programme (1987): 165-173.**

**Sithole, S. Z., W. A. J. De. Milliano, G. Kowla, B. Mota, Loote, E. Mtisi, S. Kunene and F. T. M. Lepheana (1987). The insect pest situation in sorghum at research station in SADCC countries during the 1985/86 cropping season. In proceedings of third regional workshop on sorghum and millets for Southern Africa, Lusaka, Zambia, 1986. Bulawage, Zimbabwe; SADCC/ICRISAT sorghum and millet improvement program: 375-381.**

**Sugar Crops Council (2005). Sugar Crops and Sugar Production in Egypt. 249 pp.**

# حصر للحشرات وألاضرار التى تحدثها الثاقبات للمحصول ومكوناته فى بعض أصناف الذرة السكرية

جمال عبد الجواد شلبى[١] ، خالد على ابو شادى[٢]

معهد بحوث المحاصيل السكرية مركز البحوث الزراعية مصر

[١] قسم بحوث وقاية النبات

[٢] قسم بحوث الفسيولوجى والكيمياء

## الملخص العربى

تم حصر الآفات والمفترسات الموجودة فى حقول الذرة السكرية بالمزرعة البحثية بمحطة بحوث سخا (محافظة كفرالشيخ) خلال الفترة من منتصف يوليو وحتى أوائل نوفمبر عامى ٢٠٠٣م ، ٢٠٠٤م. كما اختبرت أربعة أصناف من الذرة السكرية للإصابة بثاقبات الذرة: دودة القصب الصغيرة ، ودودة الذرة الأوربية ، ودودة القصب الكبيرة. هذا بالإضافة إلى حساب علاقة الارتباط بين حساسية الأصناف المختبرة للثاقبات ومحصول الذرة السكرية الناتج.

أمكن حصر ٢٢ نوعا من الحشرات التى تصيب الذرة السكرية وتنتمى إلى ست رتب وثلاثة عشر عائلة بالاضافة الى نوع من الاكاروس يتبع رتبه الاكارينا. احتوت رتبة حرشفية الأجنحة على احدى عشر نوعا منها وتلتها رتبة مستقيمة الأجنحة التى ضمت خمسة أنواع ثم رتبتى نصفية ومتشابهة الأجنحة نوعان لكل منهما. تم حصر نوع واحد من كل من رتب هدبية الأجنحة ، وذات الجناحين والأكارينا. كما أمكن حصر ١٣ نوعا من المفترسات ، تنتمى إلى سبع رتب وثمانى عائلات ، أغلبها ينتمى إلى عائلة أبى العيد التابع لرتبه غمدية الأجنحة.

وعند تقييم أصناف الذرة السكرية للإصابة بالثاقبات الثلاثة ، وجد أن الصنف **Williams** هو الأشد إصابة (٣٥ يرقة من الثاقبات مجتمعة/٦٠ نبات) تلاه الصنف **Brands** (٣٤.٣٣ يرقة/٦٠ نبات ، ثم الصنف **Honey** (٣١.١٧ يرقة/٦٠ نبات) ، بينما كان أقلها إصابة هو الصنف **Deal** (١٩.٠ يرقة/٦٠ نبات). وعند حساب علاقة الارتباط بين شدة إصابة الأصناف بالثاقبات ومكوناتها المحصولية ، أعطى الصنف **Deal** المحتوى على أقل عدد من يرقات الثاقبات (٦.٣٦ ١٠.٠١ يرقة/١٠٠ عقلة) أعلا محصول من السيقان والعصير والعسل الناتج.

**Table (4): Corn borer infestations and yield component loss of sorghum varieties at Kafr El-Sheikh, region 2003 season.**

| Variety | Average No./100 internodes | | | Yield components | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Infested internodes | Holes | Larvae | Stripped stalk yield/t/fed. | Juice yield t/fed. | Juice extraction %* | Syrup yields t/fed. | Syrup extraction %* | Sucrose in juice % |
| Honey | 12.24 | 25.38 | 12.76 | 16.93a | 8.60 ab | 50.80 a | 2.45 b | 14.47 a | 7.80 ab |
| Brands | 15.74 | 27.25 | 16.17 | 13.90 a | 8.05 a | 57.91 a | 1.90 a | 13.67 a | 7.30 a |
| Williams | 11.08 | 15.41 | 11.35 | 13.40a | 7.00 a | 52.24 a | 2.11 ab | 15.75b | 7.60 ab |
| Deal | 14.95 | 25.65 | 10.01 | 16.93 a | 10.60 b | 62.61a | 3.00 c | 17.72c | 8.28 b |

*** Juice or syrup extraction% =** $\frac{\text{Juice or syrup yield (ton / fed.)}}{\text{Stripped stalk yield (ton / fed.)}}$ **x 100**

**Table (5): Corn borer infestations and yield component loss of sorghum varieties at Kafr El-Sheikh, region, 2004 season.**

| Variety | Average No./100 internodes | | | Yield components | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Infested internodes | Holes | Larvae | Stripped stalk yield/t/fed. | Juice yield t/fed. | Juice extraction %* | Syrup yields t/fed. | Syrup extraction %* | Sucrose in juice % |
| Honey | 11.21 | 24.84 | 11.08 | 14.90 a | 7.90 a | 53.02 c | 2.58 c | 17.32d | 7.96 b |
| Brands | 12.55 | 28.76 | 12.16 | 16.70 b | 6.90 a | 41.32 a | 2.19 b | 13.11 b | 7.78 ab |
| Williams | 15.33 | 34.00 | 16.80 | 16.00 b | 7.87a | 49.19 b | 1.60 a | 10.00 a | 7.29 a |
| Deal | 8.81 | 18.64 | 6.36 | 18.89c | 9.80 b | 51.88 bc | 2.90d | 15.35 c | 7.96 b |

*** Juice or syrup extraction % =** $\frac{\text{Juice or syrup yield (ton / fed.)}}{\text{Stripped stalk yield (ton / fed.)}}$ **x 100**