DAMAGE BY THE NEOTROPICAL BROWN STINK BUG, *Euschistus heros* (F.)(HEMIPTERA:PENTATOMIDAE) TO SUNFLOWER IN BRAZIL

ANDREA B. MALAGUIDO, EMBRAPA SOJA,
P.O. BOX 231, 86001-970, Londrina-PR, BRAZIL
Email:panizzi@cnpso.embrapa.br

JOVENIL J. SILVA, EMBRAPA SOJA,
Email: jovenil@cnpso.embrapa.br

OSVALDO V. VIEIRA, EMBRAPA SOJA,
Email: osvaldo@cnpso.embrapa.br

ANTÔNIO R. PANIZZI, EMBRAPA SOJA,
Email: panizzi@cnpso.embrapa.br

Summary -The Neotropical brow stink bug, *Euschistus heros*, (F.) has been observed to feed on sunflower (*Helianthus annuus* L.) from the south to the central-west areas where this crop is cultivated in Brazil. To evaluate the damage caused by this bug to seeds and seedheads of sunflower, a field experiment was carried out from September 1998 to January 1999 at the Embrapa Field Experiment Station at Londrina, northern Paraná state. Cages (2 x 2 x 1,5m) with 6 plants were infested with 0; 2; 6; and 8 bugs/plant from R1 (inflorescence with immature bracts) to harvest, R2 (internode immediately below the inflorescence with 0,5 to 2 cm above the nearest leaf attached to the stem) to harvest, and R3 (internode below reproductive bud lift the inflorescence head above the leaves > 2 cm) to harvest. Each treatment (infestation levels and plant phenological stages) were replicated 4 times. Results indicated that seed weight, seed oil content, and seedhead size decreased significantly as the level (bugs/plant) and time of infestation increased. With 8 bugs/plant from R1-harvest, the weight of 1000 seeds was significantly reduced from 49.1 gr. to 34.4 gr.; the oil content in seeds varied from 44% to 40%; and seedhead size decreased from 14.4 cm. in diameter to 11.9 cm. compared to the control.

Introduction

Sunflower (*Helianthus annuus* L.) is a plant originated from North America, being cultivated worldwide. This crop has a wide adaptation to different environments producing a rich oil of high chemical, physical, and nutritional quality (Castiglioni et al.1994, Balla et al. 1995, Castro et al. 1996). In Brazil, the area cultivated with sunflower increased from 22,500 hectares in1998 to 82,000 hectares in 1999. This implement of the crop is occurring in the Cerrado area (savannah), in central Brazil, where the crop is well adapted to the soil and high temperature conditions.

The neotropical brown stink bug *Euschistus heros* (Fabr.), which is a major pest of soybean [*Glycine max* (L.) Merrill] in the Americas, and particularly in Brazil (Panizzi & Slansky 1985) was recorded feeding on sunflower in Brazil in the early 80's (Ferreira & Panizzi 1982). More recently, it was recorded on sunflower in the Londrina area (latitude 23^0 11'S, longitude 51^0 11'W), along with several other species of pentatomids (Malaguido & Panizzi 1998a).

In this paper, we report the results of field studies inwhere the damages to sunflower by several levels of infestations of *E. heros* at different phenological stages of plant development were evaluated.

Material and Methods

An experiment was conducted at the Embrapa Soja field station in Londrina, north of Paraná state, during October1998 to January 1999. A plot (20 x 20 m) was established with cv. Embrapa 122-V2000, with 3 plants/m in rows spaced 0.70 m. Cages (2,0 x 2,0 x 1,5 m) were put over two rows of plants, distributed following a completely randomized pattern, in four replications. Plants were infested with adult bugs of *E. heros* at three different levels, i.e., 4, 6 and 8 bugs/plant during the following periods of plant development: R1 (inflorescence with immature bracts) to harvest, R2 (internode immediately below the inflorescence with 0,5 to 2 cm above the nearest leaf attached to the stem) to harvest, and R3 (internode below reproductive bud lift the inflorescence head above the leaves > 2 cm) to harvest. Control cages were used without insects. Dead insects on infested plants were replaced to maintain the infestation levels.

After harvest, the following evaluations were conducted: seed yield (kg/cage), weight of 1000 seeds (g), diameter of heads (cm), and oil content (%) and seed germination (%). Seed humidity was leveled at 11 % for the correctness during weight. For the germination tests, 200 seeds (4 samples of 50 seeds) were used for each replication. Seeds were wrapped with humid filter paper and maintained at 25 ^{0}C, and 90-95% RH. Germinated seeds were recorded at days 4 and 10, and the percentage of germination was calculated. The oil content in seeds was determined using the nuclear magnetic resonance (NMR) test (Grimaldi 1995).

Data were analyzed using SANEST, and means for seed yield, weight of 1000 seeds, diameter of heads, and germination and seed oil content (%) were compared using Duncan's multiple range test ($P < 0.05$).

Results and Discussion

Results obtained demonstrated that seed yield and weigh of 1000 seeds were affected by the different levels of *E. heros* infestation (Table 1). Similar results were reported by other authors working with *E. heros* (Malaguido & Panizzi 1998b) and with other species of hemipterans (Gamundi et al. 1980, Forrester & Saini 1982).

Table 1. Weight (g) of total seeds and weight of 1000 seeds of sunflower (10 plants/cage) infested with different population levels of adult *Euschistus heros* during different phenological stages of plant development (n = 4).

Treatment	Total weight of seeds[1]	Weight of 1000 seeds[1]
Control	309.6a	49.1 a
4 bugs/plant (R1)	244.2 bc	40.0 b
4 bugs/plant (R2)	226.5 bc	39.4 b
4 bugs/plant (R3)	267.0ab	39.3 b
6 bugs/plant (R1)	195.6 c	38.6 b
6 bugs/plant (R2)	223.7 bc	38.4 b
6 bugs/plant (R3)	246.0 bc	38.2 b
8 bugs/plant (R1)	181.8 c	36.5 b
8 bugs/plant (R2)	231.2 bc	36.4 b
8 bugs/plant (R3)	206.2 bc	34.4 b

[1]Means followed by the same letter do not differ significantly using Duncan's multiple range test ($P < 0.05$). R1 = inflorescence with immature bracts to harvest; R2 = internode immediately below the inflorescence with 0,5 to 2 cm above the nearest leaf attached to the stem to harvest; and R3 = internode below reproductive bud lift the inflorescence head above the leaves > 2 cm to harvest.

Seed germination (%) decreased with 4 bugs/plant during R2 and R3 and 8 bugs/plant during R1 and R3 (Table 2). This reduction in seed germination was due to the feeding activity of bugs on seeds.

Oil content (%) in seeds was significantly lower with 6 and 8 bugs/plant, with infestations during R1, and with 6 and 8 bugs/plant, with infestations during R3, as compared to control plants, free of stink bug damage (Table 2). These results differ somewhat from those reported by Forrester (1980) and Malaguido & Panizzi (1998b), which did not observe drastic reductions in the oil content of sunflower seeds due to stink bug attack.

The size of seedheads was significantly smaller when 8 bugs/plant fed on plants at R1, R2 and R3 phenological stages of development (Table 3). This demonstrates that high infestations of *E. heros* are able to reduce the diameter of seedheads. The time of infestation is also important, and these two factors, i.e., time and level of infestation may make stink bugs to become major pests of sunflower (Arya et al. 1995).

Table 2. Oil content (%) and germination (%) of sunflower seeds infested with different levels of adul *Euschistus heros* during different phenological stages of plant development (n = 4).

Treatment	Oil content (%)	Germination (%)
Control	44.7a	96.5a
4 bugs/plant (R1)	42.7ab	89.5ab
4 bugs/plant (R2)	43.4ab	89.5ab
4 bugs/plant (R3)	43.1ab	76.0 c
6 bugs/plant (R1)	42.0 b	88.5ab
6 bugs/plant (R2)	43.0ab	89.0ab
6 bugs/plant (R3)	43.2ab	91.5ab
8 bugs/plant (R1)	40.0 c	69.5 c
8 bugs/plant (R2)	43.3ab	89.5ab
8 bugs/plant (R3)	41.5 bc	77.0 c

[1]Means followed by the same letter do not differ significantly using Duncan's multiple range test (P <0.05). R1 = inflorescence with immature bracts to harvest; R2 = internode immediately below the inflorescence with 0,5 to 2 cm above the nearest leaf attached to the stem to harvest; and R3 = internode below reproductive bud lift the inflorescence head above the leaves > 2 cm to harvest.

Table 3. Size of sunflower seedheads of plants infested with with different population levels of adult *Euschistus heros* during different phenological stages of plant development (n = 6).

Treatment	Seedheads size (cm)
Control	14.4 a
4 bugs/plant (R1)	13.8 ab
4 bugs/plant (R2)	13.4 ab
4 bugs/plant (R3)	13,5 ab
6 bugs/plant (R1)	13.4 ab
6 bugs/plant (R2)	13.7 ab
6 bugs/plant (R3)	12.8 ab
8 bugs/plant (R1)	11.9 b
8 bugs/plant (R2)	12.6 b
8 bugs/plant (R3)	12.3 b

[1]Means followed by the same letter do not differ significantly using Duncan's multiple range test (P <0.05). R1 = inflorescence with immature bracts to harvest; R2 = internode immediately below the inflorescence with 0,5 to 2 cm above the nearest leaf attached to the stem to harvest; and R3 = internode below reproductive bud lift the inflorescence head above the leaves > 2 cm to harvest.

Results obtained in this study confirm previous reports that the stink bug *E. heros* is becoming a major pest of sunflower, particularly in Central Brazil, which is now the most

important area under cultivation with this crop. The damage that this pentatomid may cause to sunflower certainly demands control measures to avoid economic losses.

References Cited

Arya, D.R. & Singh, H.V. 1995. Insect pest complex of sunflower in relation to crop phenology. Indian J. Entomol. 57:141-145.

Balla, A.J., Castiglioni, V.B.R. & Castro, C. 1995. Colheita do girassol. EMBRAPA-CNPSo, Londrina, PR, 27 p.

Castiglioni, V.B.R., Balla, A.J., Castro, C. & Silveira, J.M. 1994. Fases de desenvolvimento da planta de girassol. EMBRAPA-CNPSo, Londrina, PR, 24 p.

Castro, C., Castiglioni, V.B.R., Balla, A.J., Leite, R.M.V.B.C., Karam, D., Mello, H.C., Guedes, L.C.A. & Farias, J.R.B. 1996. A cultura do girassol. EMBRAPA-CNPSo. Londrina,Pr. Circ. Técnica, 13, 38 p.

Ferreira, B.S.C. & Panizzi, A.R. 1982. Percevejos-pragas da soja no norte do Paraná: abundância em relação à fenologia da planta e hospedeiros intermediários. An. II Semin. Nac. Pesq. Soja 2: 140-151.

Forrester, N. W. 1980. Insect pests of sunflowers. Agricult. Gazzette New South Wales 91:34-37.

Forrester, N.W. & Saini, H. 1982. Effect of moisture stress on damage to sunflowers by Rutherglen bug (*Nysius vinitor).* 10th Int. Sunflower Conf. Australia, p. 130-132.

Gamundi, J.C., Molinari, A. & Alvarez, J.A. 1980. Evaluacion de dãnos causados por la «chinche verde» *Nezara viridula* (L.) en girasol. Resumos Reun. Nac. Tecn. Soja y Girasol, p.90.

Grimaldi, R. 1995. Determinação do teor de gordura sólida por RMN (Solid Fat Content-SFC). ITAL. Curso de controle de qualidade de óleos e farelos vegetais. Campinas, SP. p. 101-103.

Malaguido, A.B. & Panizzi, A.R. 1998a. Pentatomofauna associated with sunflower in northern Paraná state, Brazil. An.. Soc. Entomol. Brasil 27: 473-475.

Malaguido, A.B. & Panizzi, A.R. 1998b. Danos de *Euschistus heros* (Fabr.) (Hemiptera:Pentatomidae) em aquênios de girassol. An. Soc. Entomol. Brasil 27: 535-541.

Panizzi, A.R. & Slansky, Jr. F. 1985. Review of phytophagous pentatomids associated with soybean in the Americas. Florida Entomol. 68: 184-214.