OCCURRENCE OF *Enneothrips flavens* MOULTON AND *Stegasta bosquella* (CHAMBERS) AND ITS EFFECTS ON AGRONOMIC TRAITS OF WILD *Arachis* ACCESSIONS

OCORRÊNCIA DE Enneothrips flavens *MOULTON E* Stegasta bosquella *(CHAMBERS) E SEUS EFEITOS EM CARACTERES AGRONÔMICOS DE ACESSOS DE ESPÉCIES SILVESTRES DE* Arachis

Marcos Doniseti MICHELOTTO[1]; Ignácio José de GODOY[2]; Alessandra Pereira FÁVERO[3]; Willians Cesar CARREGA[4]; Everton Luiz FINOTO[1]

1. Engenheiro Agrônomo, Doutor, Agência Paulista de Tecnologia dos Agronegócios, Pólo Centro Norte, Pindorama, São Paulo, Brasil. michelotto@apta.sp.gov.br; 2. Engenheiro Agrônomo, Doutor, Instituto Agronômico de Campinas, Campinas, São Paulo, Brasil; 3. Engenheira Agrônoma, Doutora, Embrapa Pecuária Sudeste, São Carlos, São Paulo, Brasil; 4. Biólogo, Pós-graduando em Agronomia (Produção Vegetal), Faculdade de Ciências Agrárias e Veterinárias, FCAV, Universidade Estadual Paulista - UNESP, Jaboticabal, São Paulo, Brasil.

ABSTRACT: Some wild species of the genus *Arachis* have demonstrated potential for improvement of peanuts. This work was performed to evaluate the occurrence and symptoms of *Enneothrips flavens* and *Stegasta bosquella* and its effects on agronomic traits of wild *Arachis* accessions. Nine accessions of wild *Arachis* species and a commercial *A. hypogaea* variety were studied in a split plot statistical scheme with a completely randomized block design and four replications. The main plots consisted of plants sprayed or not sprayed for insect control, while the subplots comprised the peanut accessions. Accessions GKP10017 (*A. cardenasii*) and V7639 (*A. kuhlmannii*) showed the lowest percentages of leaflets with *E. flavens* and *S. bosquella*. Accessions V9912, V7639 and V8979 (all three *A. kuhlmannii*) and V13250 (*A. kempff-mercadoi*) showed the lowest responses to insecticide application among the various plant traits evaluated. These accessions are of interest for further studies to identify mechanisms of resistance, to be used in breeding programs for resistance to these insects.

KEYWORDS: Insect pests.Wild peanut. Plant resistance. Thrips. Rednecked peanutworm.

INTRODUCTION

The peanut (*Arachis hypogaea* L.) is a dicot from the Fabaceae family, subfamily Faboideae. The genus *Arachis* has 81 described species, which are widely distributed along the Brazilian *Cerrado* (savannah) and other environments with open vegetation, ranging from Marajo Island in the north of Brazil, Uruguay in the south, the Brazilian Northeast in the east and the foothills of the Andes in the west (KRAPOVICKAS; GREGORY, 1994; VALLS; SIMPSON, 2005).

In the 2010-2011 growing season, Brazil produced approximately 242.8 thousand metric tons of peanuts in an area of 91.6 thousand hectares. São Paulo is the main producing state, with approximately 192.7 thousand tons in a planted area of approximately 62.9 thousand hectares (CONAB, 2011).

There are several pests that attack the peanut crop. Currently in the state of São Paulo, the thrips, *Enneothrips flavens* Moulton (Thysanoptera: Thripidae), is considered the most important, due to the large damages caused by this species, its widespread occurrence and high population levels (GALLO et al., 2002). Besides thrips, great importance is attributed to the rednecked peanutworm, *Stegasta bosquella* (Chambers) (Lepidoptera: Gelechiidae), identified as a relevant pest of the peanut crop in São Paulo (BONDAR, 1928, CARVALHO et al. 1968; LARA et al., 1970, GALLO et al., 2002).

Symptoms of thrips attack are visible after the opening of the leaflets, when the leaves show clear deformation, curling and silvering. This damage impairs the absorption of light by the plant, reducing photosynthesis, plant development and production (ALMEIDA; ARRUDA, 1962).

Symptoms of rednecked peanutworm attack have been described by several authors. When the newly attacked leaflets are open, they show symmetrical lesions. Superficial lesions and holes, usually surrounded by dark debris produced by the insect, can also be found in leaflets that are still closed (SICHMANN, 1963). With these attacks, plants give rise to new branches, delaying their development (BONDAR, 1928). CALCAGNOLO et al. (1974) stated that rednecked peanutworm attack reduced the pod yield by 65%.

Received: 30/11/11
Accepted: 06/05/12

The utilization of insect resistant peanut varieties is considered an ideal method of controlling these pests because it keeps them below the economic threshold, does not pollute or cause impact on the environment, and reduces the cost of crop management (LARA, 1991).

Some cultivated peanut varieties have shown different responses to thrips infestation. GABRIEL et al. (1996) observed that late-maturing varieties, such as IAC Caiapó and IAC Jumbo, tended to be less infested by the insect in the absence of chemical control, while early-maturing varieties such as IAC Tatu were more infested.

Many wild species of the *Arachis* genus have been reported to have higher levels of resistance to pests and diseases compared to accessions of *A. hypogaea* (COMPANY et al., 1982; STALKER; CAMPBELL, 1983; STALKER; MOSS, 1987, FÁVERO et al., 2009).

Little is known about resistance of wild germplasm to *E. flavens* and *S. bosquella*. This work aimed to investigate resistance to these insects in nine *Arachis* spp. accessions, as well as to observe the effects of these pests on vegetative and reproductive traits.

MATERIAL AND METHODS

Nine accessions of six wild species (VSW9912, VKSSv8979 and VRGeSv7639 - *Arachis kuhlmannii* Krapov. & W.C. Greg.; WPz421 and VSPmSv13832 - *Arachis stenosperma* Krapov. & W.C. Greg.; V13250 - *Arachis kempff-mercadoi* Krapov., W.C. Greg. & C.E. Simpson; GKP10017 - *Arachis cardenasii* Krapov. & W.C. Greg.; VSGr6389 - *Arachis gregoryi* C.E. Simpson, Krapov. & Valls, and VGaRoSv12549 - *A. hypogaea*) and IAC Caiapó (*A. hypogaea*) cultivar were field evaluated.

Before planting, seeds were first treated with the fungicide Plantacol® (100 g of cp per kg of seed) and germinated in plastic bags (200 ml) containing soil and manure (3:1). The seedlings were kept in a greenhouse until reaching a height of about 15 cm. Thirty days after emergence they were transplanted to the field.

The experiment was set up using a split-plot scheme, with a completely randomized block design and four replications. The main plots were either treated (sprayed) or not with insecticides and the subplots consisted of the ten accessions. The values obtained from the sprayed plots were used to estimate the reduction in plant growth and production due to insect attack by comparing with the data obtained in the unsprayed plots. The experimental units consisted of four rows of four plants each, spaced 0.8 m between rows and 0.5 m between plants.

Seven insecticide applications were done in the plots of the sprayed treatment along the plant cycle, to control thrips and rednecked peanutworms using products that were recommended for the peanut crop. All plots were sprayed every 15 days with fungicides to prevent the development of diseases such as late leaf spot, *Cercosporidium personatum* (Berk. & Curt.) Deighton, early leaf spot, *Cercospora arachidicola* Hori, web blotch, *Phoma arachidicola* Marasas, Pauer & Boerema, scab, *Sphaceloma arachidis* Bit. & Jenk, and rust, *Puccinia arachidis* Speg .

Weed control was done by applying pre-planting herbicide and by hand weeding during plant growth, as necessary.

Parameters Evaluated

Plants were evaluated during their development for the following parameters:

a. Percentage of leaflets that were damaged by thrips and rednecked peanutworms: these insects are found in young still closed leaflets, and feeding on them, thus, the evaluations consisted of identifying the presence or absence of insects in ten terminal buds (closed leaflets) randomly collected from the line of plants in each plot.

b. Damage evaluation of thrips and rednecked peanutworm attacks: for evaluation of damage symptoms, ten newly opened leaves were randomly sampled in each plot and compared with a specific scale for visual symptoms of attack by thrips (Figure 1, adapted from MORAES, 2005) and rednecked peanutworms (Figure 2), ranging from 1 to 4, where 1 means a lack of damage and 4 means thrips damage symptoms observed along the whole leaf and, in the case of *S. bosquella*, leaf severely damaged.

c. Number of terminal buds in a sampled area of 1 m^2 per plot.

d. Vegetative dry weight, and average weight and number of seeds after pod hand shelling in one m^2 per plot.

e. Reduction (%) in number of terminal buds, vegetative dry weight, weight and number of seeds without chemical control, as compared with the sprayed plots.

The data were submitted to analysis of variance and the means were compared by the Tukey test at 5% probability. Data of the percentage of leaves with thrips and rednecked peanutworms and the percentages of reduction in the vegetative and reproductive variables were transformed to arcsin$[(x+5)/100]^{1/2}$.

Figure 1. Scale of visual symptoms of attack by *E. flavens*: 1. Absence of visual symptoms of attack, 2. Beginning of silvering symptoms on the leaflets, 3. Silvering and early curling of the leaflets, 4. Silvery and shriveled leaves.

Figure 2. Scale of visual symptoms of attack by *S. bosquella*: 1. Absence of visual symptoms of attack, 2. Small holes in some leaves, 3. Small holes in all the leaflets, 4. Leaflets severely damaged.

RESULTS AND DISCUSSION

The thrips, *E. flavens,* were observed in all accessions (Figure 3) except in V7639 and V8979 (both *A. kuhlmannii*), which did not show leaflets with thrips in the first evaluation (30 DAT - days after transplanting). In the second, third and fourth evaluations, accession V7639 showed again the lowest percentage of thrips occurrence (2.5%).

In the fifth evaluation (80 DAT), accession V8979 showed no leaflet with thrips. In the sixth evaluation (105 DAT), an increase of thrips occurrence was observed and the accession with the lowest percentage of leaflets with the insect was GKP10017 (*A. cardenasii*), with 13.3% (Figure 3). When the data of occurrence along all evaluations were analyzed together, the lowest percentage of leaflets with thrips presence was also observed in this accession, with 5.0%. The highest infestations were found in the accessions belonging to *A. hypogaea*, V12549 and cv. IAC Caiapó, with 17.9% and 17.5% of the leaflets infested, respectively (Table 1). The *A. cardenasii* behavior add to JANINI et al. (2010) findings. They evaluated 40 accessions of different *Arachis* species and found V14957 (*A. gregory*), V13832 and W421 (both *A. stenosperma*), V8979 (*A. kuhlmannii*) and KG35005 (*A. benensis*) as presenting the lowest percentage of leaflets with the presence of thrips and lowest visual damage grades.

Considering the rednecked peanutworm, *S. bosquella*, the accession V7639 did not show leaflets infested with this insect any evaluation (Figure 3). In V 8979 and V9912 (both *A. kuhlmannii*), W421, V13832 (*A. stenosperma*) and GKP10017 (*A. cardenasii*), the insect was observed in only one evaluation. The highest occurrences were found in the *A. hypogaea* accessions (IAC Caiapó and V12549) as well as in *A. gregory* (V6389), as observed in Figure 3 and Table 1.

When considering the combined infestations of thrips and rednecked peanutworms, accessions GKP10017 and V7639 were the least infested to with 6.1% and 6.3% of the leaflets with the presence of the insect, respectively. In contrast, the accessions IAC Caiapó and V12549 had the highest percentage of both insects (Table 1).

The scores for symptoms of thrips attack were below 1.7 for all accessions except V6389, V12549 and IAC Caiapó. As to the scores for symptoms of *S. bosquella*, only the accessions of *A. hypogaea* (IAC Caiapó and V12549) differed from the others, with the highest scores, above 2.0. When the data from both insects were summed, the scores followed the same trend of the individual notes (Table 1).

The vegetative growth is seriously affected, because these insects feed on the terminal buds (ALMEIDA; ARRUDA, 1962). In this experiment, plots where the insects were controlled presented an average of 14.7 buds/m^2, and accessions of *A.*

hypogaea showed the highest means (Table 2). Without the control with insecticides, accession V12549 had a drastically reduction in the number of buds (31.6%), while the reductions were significantly lower in accessions GKP10017 (0.4%) and V7639 (1.7%).

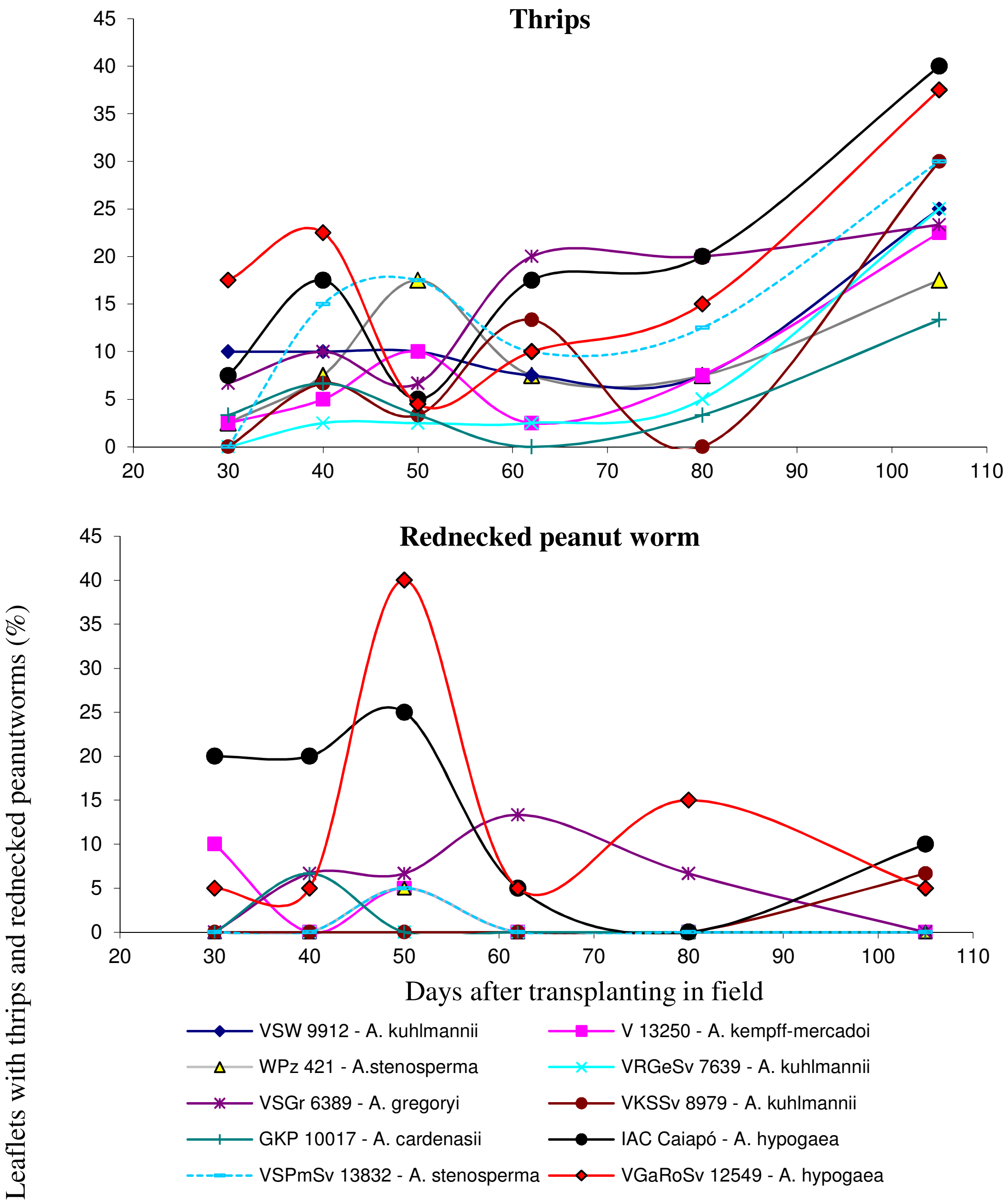

Figure 3. Percentage of leaflets with the presence of thrips and rednecked peanutworms in accessions of peanut wild species and *A. hypogaea* cultivars without insect control. Pindorama (SP). 2008/2009.

Table 1. Percentage of leaflets (± standard error) with *E. flavens* and *S. bosquela* and scores for visual symptoms of attack (± standard error) in accessions of peanut wild species and *A. hypogaea* cultivars without insect control. Pindorama (SP). 2008/2009

Accessions	Species	Percentage of attacked leaflets [1,2]			Scores for visual symptoms of attacks [1,2]		
		E. flavens	*S. bosquella*	*E. flavens* + *S. bosquella*	*E. flavens*	*S. bosquella*	*E. flavens* + *S. bosquella*
IAC Caiapó	*Arachis hypogaea*	17.9 ± 4.53 a	13.3 ± 2.36 a	31.2 ± 4.32 a	2.73 ± 0.15 a	2.23 ± 0.10 a	4.96 ± 0.18 a
VGaRoSv12549	*A. hypogaea*	17.5 ± 4.93 a	12.5 ± 0.83 ab	30.0 ± 5.40 a	2.73 ± 0.13 a	2.53 ± 0.10 a	5.26 ± 0.13 a
VSGr6389	*A. gregoryi*	14.4 ± 1.42 ab	5.6 ± 1.57 bc	20.0 ± 1.18 ab	2.21 ± 0.15 a	1.58 ± 0.15 b	3.79 ± 0.35 b
VSPmSv13832	*A. stenosperma*	14.2 ± 1.44 ab	0.8 ± 0.83 c	15.0 ± 2.04 abc	1.62 ± 0.09 b	1.37 ± 0.06 bc	2.99 ± 0.10 c
VSW9912	*A. kuhlmannii*	11.7 ± 2.45 ab	0.8 ± 0.83 c	12.5 ± 3.08 bc	1.36 ± 0.07 b	1.23 ± 0.07 bc	2.59 ± 0.04 c
WPz421	*A. stenosperma*	10.0 ± 1.80 ab	0.8 ± 0.83 c	10.8 ± 2.59 bc	1.42 ± 0.09 b	1.27 ± 0.06 bc	2.69 ± 0.16 c
VKSSv8979	*A. kuhlmannii*	8.9 ± 1.71 ab	1.1 ± 0.79 c	10.0 ± 1.18 bc	1.30 ± 0.08 b	1.16 ± 0.03 c	2.46 ± 0.05 c
V13250	*A. kempff-mercadoi*	8.3 ± 2.81 ab	2.5 ± 1.60 c	10.8 ± 3.76 bc	1.44 ± 0.10 b	1.18 ± 0.03 c	2.62 ± 0.14 c
VRGeSv7639	*A. kuhlmannii*	6.3 ± 0.80 ab	0.0 ± 0.00 c	6.3 ± 0.80 c	1.33 ± 0.06 b	1.18 ± 0.08 c	2.51 ± 0.15 c
GKP10017	*A. cardenasii*	5.0 ± 1.36 b	1.1 ± 0.79 c	6.1 ± 2.08 c	1.45 ± 0.08 b	1.30 ± 0.08 bc	2.75 ± 0.08 c
Average		11,42 ± 1,01	11.42 ± 1.01	3.86 ± 0.83	15.28 ± 1.61	1.76 ± 0.08	1.50 ± 0.07
F Test		3,91**	3.91**	11.39**	9.65**	26.38**	42.07**
CV (%)		20,01	20.01	44.79	18.58	12.72	9.97

[1] Means followed by same letter in the column do not differ by the Tukey test at 5% level of probability; [2] Average of six evaluations; CV = coefficient of variation (%), **= significant at 1%.

Table 2. Number of terminal buds and dry weight (g/m^2) of vegetative parts (± standard error) and the respective percentages of reduction due to attack by *Enneothrips flavens* and *Stegasta bosquella* in accessions of peanut wild species and *A. hypogaea* cultivars, submitted or not to insect control. Pindorama (SP). 2008/2009

Accessions	Species	Number of branches [1,2]		Dry weight of vegetative parts (g/m^2) [1]	
		Sprayed	Reduction (%)	Sprayed	Reduction (%)
IAC Caiapó	*Arachis hypogaea*	18.5 ± 2.22 a	15.6 ± 2.16 abc	353.8 ± 47.89 abcd	4.4 ± 3.79 b
VGaRoSv12549	*A. hypogaea*	18.0 ± 2.70 a	31.6 ± 4.87 a	561.9 ± 79.11 a	8.6 ± 3.67 b
VSGr6389	*A. gregoryi*	6.8 ± 0.84 c	7.9 ± 2.49 bcd	106.7 ± 13.89 d	2.7 ± 2.73 b
VSPmSv13832	*A. stenosperma*	16.2 ± 1.76 ab	3.8 ± 2.81 cd	373.8 ± 92.56 abc	9.2 ± 3.67 b
VSW9912	*A. kuhlmannii*	16.3 ± 3.19 ab	6.9 ± 3.33 cd	528.8 ± 57.57 ab	44.0 ± 2.61 a
WPz421	*A. stenosperma*	14.6 ± 3.45 abc	5.1 ± 3.11 cd	303.8 ± 33.13 bcd	3.4 ± 3.38 b
VKSSv8979	*A. kuhlmannii*	17.1 ± 1.11 ab	22.1 ± 0.62 ab	328.8 ± 31.84 abcd	3.5 ± 2.66 b
V13250	*A. kempff-mercadoi*	13.5 ± 1.03 abc	3.9 ± 2.32 cd	205.0 ± 23.00 cd	0.0 ± 0.00 b
VRGeSv7639	*A. kuhlmannii*	17.1 ± 1.52 ab	1.7 ± 1.51 d	321.3 ± 19.51 abcd	8.1 ± 4.68 b
GKP10017	*A. cardenasii*	8.4 ± 0.72 c	0.4 ± 0.38 d	216.3 ± 27.94 cd	8.2 ± 5.04 b
Average		14,7 ± 0,84	9.9 ± 1.71	334.8 ± 25.39	9.2 ± 2.15
F Test		4,90**	11.10**	7.36**	9.24**
CV (%)		24,69	21.61	31.14	21.27

[1] Means followed by same letter in the column do not differ by the Tukey test at 5% level of probability; [2] Average of three evaluations;
CV = coefficient of variation (%), **= significant at 1%.

The highest vegetative dry weight was observed in accession V12549 of *A. hypogaea,* with 561.9 g/m^2, while the lowest was noted in V6389 (*A. gregory*), with 106.7 g/m^2 (Table 2). Regarding the reduction in vegetative growth when comparing the treatments with and without chemical control, the highest decrease was noted in accession V9912, with 44.0% reduction in vegetative dry weight. The other accessions showed reductions ranging from 2.7% to 8.6%, except the accession V13250 (*A. kempff-mercadoi*), in which the absence of insect control resulted in no reduction in vegetative weight (Table 2).

Although yield is not a variable too important when looking for resistance in wild germplasm, characterizing the plants as to the reproductive potential helps to evaluate their agronomic behavior in field conditions. With the insect controlled, average seed dry weight of IAC Caiapó, a *hypogaea* cultivar of known yield performance, was 186.5 g/m^2. *A. gregoryi* (V6389) produced only 6.5 g of seeds/m^2 (Table 3). With no insect control, the accessions V12549, V13832 and V6389 showed the largest seed weight reductions (Table 3). Despite having the highest percentage of leaflets with both thrips and rednecked peanutworm, IAC Caiapó, along with some accessions, showed the lowest response to chemical control. These results indicate that there may be some mechanism of tolerance related to insect resistance in these genotypes. Tolerance of cultivar IAC Caiapó was also suggested by MORAES (2005).

The average number of seeds/m^2 in the insect controlled treatments also varied among accessions. The highest seed number was observed in *A. kuhlmannii* (V9912), with 427.9 seeds/m^2. Accessions belonging to this species tended to be the most productive. The accession with the lowest seed production was V6389 (*A. gregory*), with 20.3 seeds/m^2 (Table 3). In the absence of control, as compared to the insect controlled treatments, accessions V12549 and V13832 had the greatest reduction in seed number (62.9% and 49.4% respectively) while the other accessions were little affected, with reductions ranging from 0.0 to 9.8% (Table 3).

Table 3. Weight and number of seeds (± standard error) and their percentage of reduction due to attack by *Enneothrips flavens* and *Stegasta bosquella* in accessions of peanut wild species and *A. hypogaea* cultivars, submitted or not to insect control. Pindorama (SP). 2008/2009

Accessions	Species	Seed weight (g/m^2) [1]		Number of seeds (m^2) [1]	
		Sprayed	Reduction (%)	Sprayed	Reduction (%)
IAC Caiapó	*Arachis hypogaea*	186.5 ± 5.55 a	6.8 ± 5.18 c	330.8 ± 31.38 abc	9.8 ± 3.65 c
VGaRoSv12549	*A. hypogaea*	117.0 ± 6.94 b	65.3 ± 4.48 a	88.3 ± 3.90 ef	62.9 ± 5.40 a
VSGr6389	*A. gregoryi*	6.5 ± 0.87 g	28.8 ± 5.05 ab	20.3 ± 4.21 f	49.4 ± 9.71 ab
VSPmSv13832	*A. stenosperma*	86.3 ± 5.54 bcd	56.0 ± 6.38 a	385.0 ± 20.31 ab	37.5 ± 4.20 b
VSW9912	*A. kuhlmannii*	64.5 ± 6.41 cde	3.6 ± 3.57 c	427.9 ± 16.11 a	0.0 ± 0.00 c
WPz421	*A. stenosperma*	45.0 ± 6.45 ef	13.9 ± 8.33 c	235.0 ± 13.23 cd	9.6 ± 3.88 c
VKSSv8979	*A. kuhlmannii*	91.3 ± 5.15 bc	6.7 ± 3.92 c	290.0 ± 18.26 bc	5.9 ± 1.59 c
V13250	*A. kempff-mercadoi*	30.8 ± 3.94 f	2.0 ± 1.97 c	246.1 ± 19.58 cd	3.3 ± 3.34 c
VRGeSv7639	*A. kuhlmannii*	61.5 ± 4.91 de	0.0 ± 0.00 c	386.0 ± 20.25 ab	0.3 ± 0.24 c
GKP10017	*A. cardenasii*	43.3 ± 7.28 ef	0.0 ± 0.00 c	178.0 ± 39.88 de	0.0 ± 0.00 c
Average		14,7 ± 0,84	73.3 ± 7.90	258.7 ± 21.11	17.9 ± 3.72
F Test		4,90**	78.14**	40.33**	28.56**
CV (%)		24,69	8.51	16.20	22.60

[1] Means followed by same letter in the column do not differ by the Tukey test at 5% level of probability;
CV = coefficient of variation (%), **= significant at 1%.

Some accessions, such as GKP10017 (*A. cardenasii*), V7639 (*A. kuhlmannii*), V13250 (*A. kempff-mercadoi*) and W421 (*A. stenosperma*) were less affected in vegetative or reproductive variables without insect control as compared to the insect controlled treatment, indicating tolerance.

These results suggest that some of the wild accessions studied may carry resistance to *E. flavens and S. bosquella.* Some authors have previously reported resistance of wild species, including *A. cardenasii* and *A. kempff-mercadoi*, to other insects. LYNCH et al. (1981) found resistance to *Spodoptera frugiperda* (J. E. Smith) in *A. villosa*, *A. cardenasii* and *A. correntina*, suggesting that different resistance mechanisms are involved. *A. cardenasii* was also reported to be highly resistant to *Diabrotica undecimpuctata* Barber, and *Empoasca faba* (Harris), and moderately resistant to *Helicoverpa zea* (Boddie) and *Anticarsia gemmatalis* Hüebner (LYNCH and STALKER, 1997). MALLIKARJUNA et al. (2004) observed high mortality and decreased larval development of *Spodoptera litura* (Fab.) when the insects were fed with leaves of *A. kempff-mercadoi.* In this case, they attributed resistance to high levels of flavonoids in the leaves, while these compounds were low in leaves of *A. hypogaea*, susceptible to the insect.

In this research, some accessions such as V8979, V9912, V13250 and W421, showed the presence of the insects in moderate percentages, but the ratings for the damage symptoms were low. That is, the behavior of the insects varied according to the estimated variable. So, in some accessions, this variation should be investigated in more detail in future works.

As compared to the control cultivar IAC Caiapó and to the other accessions, GKP10017 (*A. cardenasii*) and V7639 (*A. kuhlmannii*) showed outstanding behavior in either *E. flavens* or *S.bosquella* evaluations (number of insects and damage symptoms), as well as in the responses to chemical control. The potential of *A. cardenasii* as source of resistance to both insects studied herein agrees with previous works with other insect pests, and this indicates that this species carries genes for resistance to a broad spectrum of insects. As to *A. kuhlmannii*, no previous report was found related to its evaluation as source of resistance to insects. The results of this research show that there may be variability among accessions of this species as to the level of resistance. Accession V7639 showed a promising source of resistance to both insects studied.

CONCLUSIONS

Accessions GKP10017 (*A. cardenasii*), V9912, V7639 and V8979 (*A. kuhlmannii*) and V13250 (*A. kempff-mercadoi*) showed low response to chemical control of *E. flavens* and *S. bosquella*, which suggests tolerance as a mechanism of resistance.

Accessions GKP10017 (*A. cardenasii*) and V7639 (*A. kuhlmannii*) showed outstanding behavior as to insect infestation and damage, and in response to chemical control.

The accessions cited above can be used in breeding programs aiming to incorporate resistance genes to *E. flavens* and *S. bosquella*, but it is necessary to investigate the resistance mechanisms involved.

RESUMO: Algumas espécies silvestres do gênero *Arachis* têm demonstrado potencial para melhoramento do amendoim cultivado. Objetivou-se avaliar a ocorrência e os sintomas de *Enneothrips flavens* e *Stegasta bosquella* e seus efeitos nos caracteres agronômicos de acessos de *Arachis* spp. O delineamento estatístico utilizado foi o de blocos ao acaso, em esquema de parcelas subdivididas, sendo a aplicação ou não de inseticidas as parcelas e os acessos (dez materiais) as subparcelas, com quatro repetições. Os acessos GKP10017 (*A. cardenasii*) e V7639 (*A. kuhlmannii*) apresentaram as menores percentagens de folíolos com presença de *E. flavens* e *S. bosquella* e os acessos V9912, V7639 e V8979 (todos *A. kuhlmannii*) e V13250 (*A. kempff-meradoi*) se destacaram por apresentarem baixa resposta em relação à aplicação de inseticidas nos diferentes parâmetros avaliados. Esses acessos são de interesse para estudar os possíveis mecanismos de resistência às pragas e aproveitá-los em programas de melhoramento visando resistência.

PALAVRAS-CHAVE: Insetos-praga. Amendoim silvestre. Resistência de plantas. Tripes-do-prateamento. Lagarta-do-pescoço-vermelho.

REFERENCES

ALMEIDA, P. R.; ARRUDA, H. V. Controle de tripes causador do prateamento das folhas do amendoim por meio de inseticidas. **Bragantia**, Campinas, v. 21, p. 679-687, 1962.

BONDAR, G. Uma praga do amendoim *Parastega (Gelechia) bosquella* Chambers. **Chácaras e Quintaes**, Rio de Janeiro, v. 38, p. 5, 1928.

CALCAGNOLO, G.; RENSI, A. A.; GALLO, J. R. Efeitos da infestação do tripes nos folíolos do amendoinzeiro *Enneothrips* (*Enneothripiella*) *flavens* Moulton, 1941, no desenvolvimento das plantas, na qualidade da produção de uma cultura "das águas". **O Biológico**, São Paulo, v. 40, p. 241-42, 1974.

CARVALHO, R. P. L.; BERTI FILHO, E.; BATISTA, G. C. Ensaio comparativo de inseticida no controle da lagarta-do-pescoço-vermelho do amendoim. **Ciência e Cultura**, São Paulo, v. 20, p. 259, 1968.

COMPANY, M.; STALKE, H. T; WYNNE, J. C. Cytology and leafspot resistance in *Arachis hypogaea* x wild species hybrids. **Euphytica,** Wageningen, v. 31, p. 888-893, 1982.

CONAB **- Acompanhamento da safra brasileira: grãos. 2010/11**. Brasília. Available from: <http://www.conab.gov.br/OlalaCMS/uploads/arquivos/11_06_02_10_59_38_graos_-_boletim _maio-2011.pdf> access on 06 Jun. 2011.

FÁVERO, A. P.; MORAES, S.A.; GARCIA, A.A.F.; VALLS, J.F.M.; VELLO, N.A. Characterization of rust, early and late leaf spot resistance in wild and cultivated peanut germplasm. **Scientia Agricola**, Piracicaba, v. 66, p. 110-117, 2009.

GABRIEL, D.; NOVO, J. P. S.; GODOY, I. J.; BARBOZA, J. P. Flutuação populacional de *Enneothrips flavens* Moulton em cultivares de amendoim. **Bragantia**, Campinas, v. 55, p. 253-257, 1996.

GALLO, D.; NAKANO, O.; SILVEIRA NETO, S.; CARVALHO, R. P. L.; BATISTA, G. C.; BERTI FILHO, E.; PARRA, J. R. P.; ZUCCHI, R. A.; ALVES, S. B.; VENDRAMIN, J. D.; MARCHINI, L. C.; LOPES, J. R. S.; OMOTO, C. **Entomologia Agrícola**. Piracicaba: FEALQ. 2002. 920p.

JANINI, J. C.; BOIÇA JÚNIOR, A. L.; GODOY, I. J.; MICHELOTTO, M. D.; FAVERO, A. P. Avaliação de espécies silvestres e cultivares de amendoim para resistência a *Enneothrips flavens* Moulton. **Bragantia,** Campinas, v. 69, p. 31-38, 2010.

KRAPOVICKAS, A.; GREGORY, W. C. Taxonomía del género *Arachis* (Leguminosae). **Bonplandia**, Corrientes, v. 8, p. 1-186, 1994.

LARA, F. M.; CARVALHO, R. P. L.; SILVEIRA NETO, S. Ensaio de controle de tripes e da lagarta-do-pescoço-vermelho em amendoim e seus efeitos na produção. **O Solo**, Piracicaba, v. 62, p. 17-21, 1970.

LARA, F. M. **Princípios de resistência de plantas a insetos.** São Paulo: Ícone. 1991. 336p.

LYNCH, R. E.; BRANCH, W. D.; GARNER, J. W. Resistance of *Arachis* species to the fall armyworm, *Spodoptera frugiperda*. **Peanut Science**, Raleigh, v. 8, p. 106-109, 1981.

LYNCH, R. E.; STALKER, H. T. Evaluation of *Arachis hypogaea* x *A. cardenasii* interspecific lines for resistance to insect pests. **Peanut Science**, Raleigh, v. 24, p. 89-96, 1997.

MALLIKARJUNA, N.; PANDE, S.; JADHAV, D. R.; SASTRI, D. C.; RAO, J. N. Introgression of disease resistance genes from *Arachis kempff-mercadoi* into cultivated groundnut. **Plant Breeding**, Berlin, v. 123, p. 573-576, 2004.

MORAES, A. R. A. **Efeito da infestação de *Enneothrips flavens* Moulton no desenvolvimento e produtividade de seis cultivares de amendoim em condições de campo.** 2005. 104 f. Dissertação (Mestrado em Agricultura Tropical e Subtropical) - Instituto Agronômico de Campinas. Campinas, 2005.

SICHMANN, W. Principais pragas da cultura do amendoim. **Boletim do Campo**, Rio de Janeiro, v.19, p.18-25, 1963.

STALKER, H. T.; CAMPBELL, W. V. Resistance of wild species of peanut an insect complex. **Peanut Science**, Raleigh, v. 10, p. 30-33, 1983.

STALKER, H. T.; MOSS, J. P. Speciation, citogenetics and utilization of *Arachis* Species. **Advances in Agronomy**, San Diego, v. 41, p. 1-40, 1987.

VALLS, J. F. M.; SIMPSON, C. E. New species of *Arachis* (Leguminosae) from Brazil, Paraguay and Bolivia. **Bonplandia**, Corrientes, v. 14, p. 35-63, 2005.