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OCCURRENCE OF *MICROTHECA PUNTIGERA* (ACHARD) AND *MICROTHECA SEMILAEVIS* STAL IN FIVE HOSTS IN THE FIELD

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ABSTRACT

Microtheca punctigera (Achard) (Coleoptera: Chrysomelidae) is a major pest of Brassicaceae family plants in Brazil and occurs together with *M. semilaevis*. Occurrence of larvae and adults of *M. punctigera* and *M. semilaevis* Stal in five host plants grown in closely patchs was investigated in three periods in the field [Fall/Winter 2001 (May 10 to July 21); Fall 2002 (April 3 to June 12), and Spring 2002 (September 20 to November 15)]. Treatments were Chinese cabbage, mustard, watercress, arrugula and radish. The standard of occurrences of larvae of *M. punctigera* + *M. semialevis* was not repeated in the three trials: Chinese and mustard were the preferred food in 2001 Fall Winter while in the 2002 Fall and 2002 Spring preference was predominated for mustard and arrugula. *M. punctigera* was the predominant species during the experiments and populations were higher in the winter periods. In general, *M. punctigera* beetles were found mostly on Chinese cabbage and mustard, but in some assessments populations were high also in other hosts (mostly arugula). *M. semialevis* beetles occurred mostly on Chinese cabbage and mustard.

KEY WORDS: Chrysomelidae, host preference, assessments, *Brassica juncea, Nasturtium officinale, Brassica pekinensis, Eruca sativa, Raphanus sativus*.

RESUMO

OCORRÊNCIA DE *MICROTHECA PUNTIGERA* (ACHARD) E *MICROTHECA SEMILAEVIS* STAL EM CINCO HOSPEDEIROS NO CAMPO. *Microtheca punctigera* (Achard) é praga primária de plantas da família Brassicaceae no Brasil e ocorre associada com *M. semilaevis* Stal. Ocorrência de larvas e adultos de *M. punctigera* e *M. semilaevis* em cinco plantas hospedeiras em parcelas próximas foi avaliada em três períodos no campo ([outono/inverno, 2001 (10 de maio a 21 de julho); outono, 2002 (3 de abril a 12 de junho), e primavera, 2002 (20 de setembro a 15 de novembro)]. Os tratamentos foram couve chinesa, mostarda, agrião, rúcula e rabanete. O padrão de ocorrência de larva de *M. punctigera* + *M. semialevis* não se repetiu nos três períodos de avaliação: couve chinese e mostarda foram os alimentos preferidos no outono/inverno de 2001, enquanto que no outono e primavera de 2002, mostarda e rúcula foram os hospedeiros preferidos. *M. punctigera* foi a espécie predominante durante os experimentos e as populações foram maiores no período de inverno. De maneira geral, besouros de *M. semialevis* foram encontrados principalmente em couve chinesa e mostarda, mas em algumas as avaliações populações foram superiores em outros hospedeiros (principalmente em rúcula). Besouros de *M. semialevis* ocorreram principalmente em couve chinesa e mostarda.

PALAVRAS-CHAVE: Chrysomelidae, preferência hospedeira, levantamento, *Brassica juncea, Nasturtium officinale, Brassica pekinensis, Eruca sativa, Raphanus sativus.*

INTRODUCTION

Microtheca punctigera (Achard) is a major pest of Brassicaceae family plants in Brazil. *M. semilaevis* Stal. is another species referred (Menezes Junior et al., 2005). *Microteca* Stal. genus includes multivoltine oligophagous insects that feed exclusively in plants of this family which primary allelochemical is mustard oil glucosides (Hicks, 1974). This species was referred damaging mustard (*Brassica juncea* Cosson), watercress (*Nasturtium officinale* L.) (Racca Filho et al., 1994; Zorzenon et al. 1996) and Chinese cabbage [*B. pekinensis* (Lour.) Rupr.] (Menezes Junior et al., 2005).

In a laboratory multiple-choice assay, isolated larvae of *M. punctigera* preferred mostly Chinese cabbage but groups of larvae preferred mustard and Chinese cabbage. However adults preferred mustard followed by arrugula (*Eruca sativa* L.) and Chinese cabbage (Menezes Junior et al., 2005).

In general, *M. punctigera* populations in the field are high and when control measures were not adopted, crops are completely devastated. This damage potential obligates growers to spray chemical insecticides in plants that are consumed as "greens". Hence occurrence of pesticide residues in these plants is a possibility (Menezes Junior et al., 2005). Neem based insecticides have caused repellent, antifeedant and insecticidal effects on *M. punctigera* larvae. For organic farming, attempts to control *Microtheca* Stal. beetles have failed. Intercropping and botanicals insecticides were not efficient strategies for *M. ochroloma* Stal. and *M. punctigera* in the field (Bowers, 2003) (Mikami;Ventura 2006 personal communication).

Insect feeding preference is an important information for configuring integrated pest management strategies. Studies on feeding preferences of *M. punctigera* are reported just in the laboratory (Menezes Junior et al., 2005). Confining insects in closed environments may reduce behavioral aspects of resistance (Romanow et al., 1991) and results in the laboratory and field may be conflicting. Differences in responses patters of Chrysomelidae beetles in the field and in the laboratory were reported for cruciferous plants (Tahvanainen, 1983). Occurrence of larvae and adult of *M. punctigera* and *M. semilaevis* in five host plants grown in closely patchs was investigated in three periods in the field.

MATERIAL AND METHODS

Experiment was carried out in the field in the Universidade Estadual de Londrina (UEL) School Farm in three periods, as follows: Fall/Winter 2001 (May 10 to July 21); Fall 2002 (April 3 to June 12), and Spring 2002 (September 20 to November 15). First and second periods were assessed during 11, and third, during 9 weeks. Five treatments were distributed in four stands (blocks) (0.2 m height, 1.0 m width and 8.2 m length) built with 0.5 m between then. Treatments were Chinese cabbage, mustard, watercress, arugula and radish (*Raphanus sativus* L.). Rocket and radish were sown one week before the onset of experiments (0.2 X 0.3 m). Chinese cabbage, mustard and watercress were sown 30 days before and transplanted in the onset of the experiments (0.3 X 0.3 m). After planting, the soil surface was covered with rice husk to maintain wetness. Plants were weekly irrigated by aspersion when necessary.

Each plot was composed of four lines of five plants. The six central plants composed the useful plot that was weekly assessed. Adults of *M. ochroloma* and *M. semilaevis* and larvae were counted. Individuals of each species were placed in the Taxonomy facility of the Laboratory of Entomology (Centro de Ciências Agrárias, Uel). Larvae of both species were assessed together because it was not possible to separate them in the field and the larvae removal to laboratory would affect next assessments.

Experiments were conducted in a four replicate randomized complete block design. Means and standard error were calculated. Goodman test was used to compare means (Curi, 1997).

RESULTS AND DISCUSSION

Infestation was higher in the first year winter study (2001) (Fig. 1). Lower number of insects was present in spring of second year replicate trial (2002). In general, *M. punctigera* have occurred mostly in winter seasons and high populations were reported yet in September (Imenes et al., 1993). *M. ochroloma* Stal, which is a closed species to *M. punctigera,* was referred as cool season beetle (Ameen; Story, 1997a; 1997b). An aestival diapause is referred for *Microtheca* spp. (Jolivet, 1951).

Larvae of *M. punctigera* and *M. semialevis* predominate on mustard and mostly Chinese cabbage in the Fall/Winter 2001 trial (Fig. 1) and (Table 1). Larval population peak was found on Chinese cabbage on July 13. In general, when population increased during this season, a greater number of larvae were observed on Chinese cabbage plants. In some assessments, the number of insects on mustard was also greater than the one recorded on arugula, watercress and radish. In the 2002 Fall period, in general, when population increased, on mustard, number of larvae was higher than on other hosts. Number of insects on arugula was higher than watercress, radish (8 assessments) and even in Chinese cabbage (5 times). In the 2002 Spring trial, larvae population on mustard was higher than on arugula (twice) and the other hosts.

M. punctigera was the predominant species during the experiments (Fig. 1 and Table 2). In the Winter 2001, population of *M. punctigera* beetles was, after the sixth assessment, significantly higher on Chinese cabbage than on other treatments (Fig. 1), (Table 2). However population peak was observed on mustard. Mean number of insects was, in some assessments higher on watercress than on arugula and radish. In the Fall 2002 trial, mustard, Chinese cabbage and arugula were the preferred food by *M. punctigera* beetles, alternating the higher number of insects throughout the season. In the third period (Spring 2002), insects were found in higher numbers on arugula (3 assessments) and afterwards on mustard.

Higher number of *M. semialevis* beetles werefound mostly on Chinese cabbage and mustard than on the other hosts on some assessments during the three periods evaluated (Fig. 1), (Table 3).

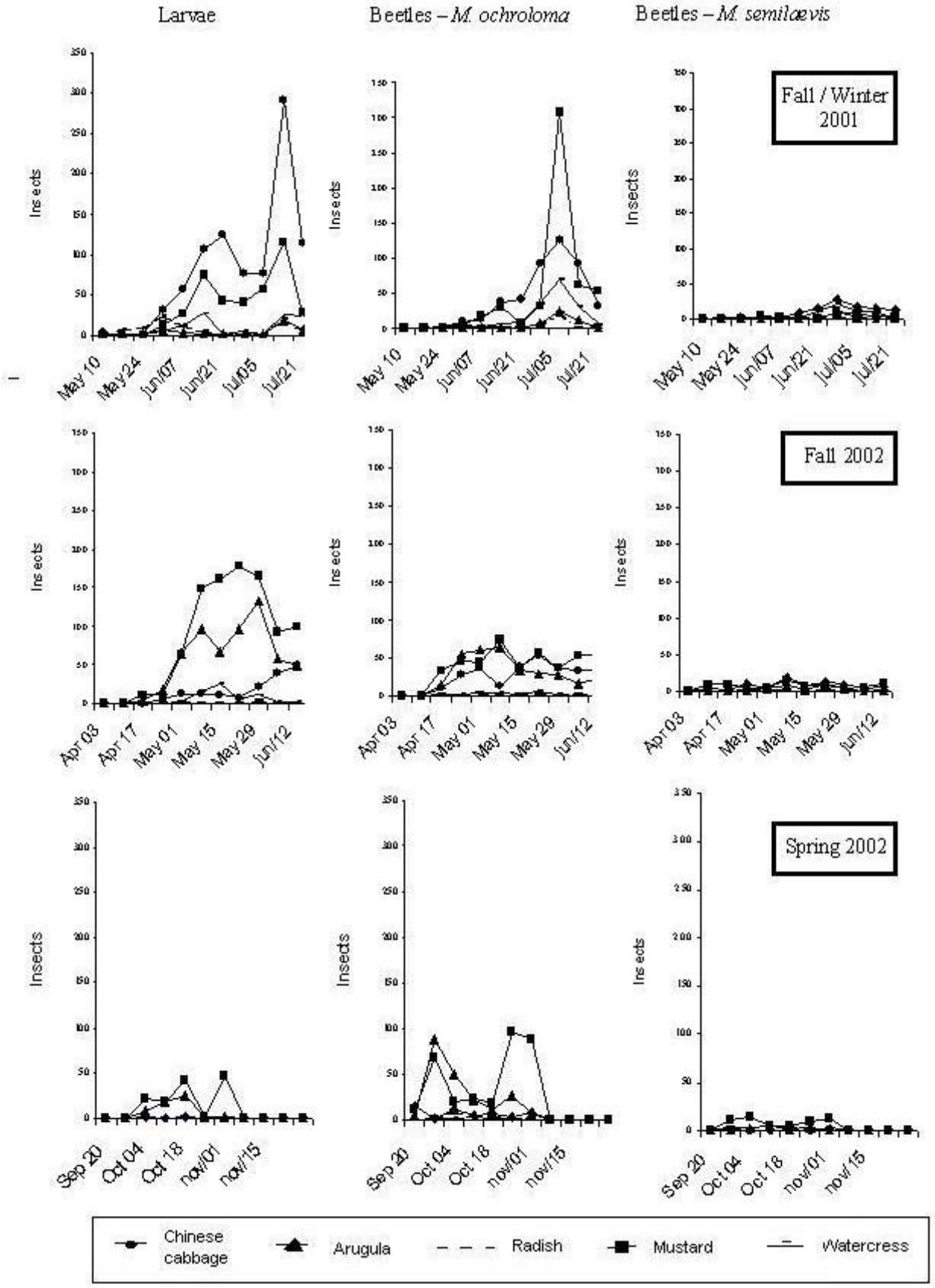

Fig. 1 - Occurrences of larvae and adults of *M. punctigera* and *M. semilaevis* in plots of five hosts in the field in three periods.

Table 1 - Mean number of occurrences of larvae of *M. punctigera* and *M. semialevis* per plot (six plants) in three periods.

	Fall/winter 2001										
Treatment	May 10	May 18	May 24	May 31	Jun 07	Jun 13	Jun 21	Jun 28	Jul 05	Jul 13	Jul 21
Chinese cabbage	1.00 a	0.00 b	0.25 b	8.00 a	14.25 a	26.50 a	31.25 a	19.25 a	19.25 a	72.70 a	28.25 a
Mustard	0.00 b	0.25 b	0.00 b	3.25 abc	6.50 b	18.50 a	10.75 b	10.25 b	14.00 a	28.75 b	7.00 b
Arugula	0.25 ab	0.00 b	0.25 b	1.75 bc	0.75 c	0.251 c	0.25 c	0.00 c	0.25 b	4.50 c	1.75 c
Watercress	0.25 ab	0.00 b	0.50 ab	1.25 c	3.00 bc	6.75 b	0.50 c	1.50 c	0.25 b	6.00 c	5.75 c
Radish	0.00 b	1.75 a	2.25 a	5.75 ab	3.25 bc	1.50 c	0.00 c	0.75 c	0.00 b	4.75 c	1.75 c
	Fall 2002										
	Apr 03	Apr 10	Apr 17	Apr 24	May 01	May 08	May 15	May 22	May 29	Jun 05	Jun 12
Chinese cabbage	0 a	0 a	0.00 b	1.25 ab	3.00 b	3.25 c	2.75 c	2.00 c	5.50 b	9.75 b	12.25 b
Mustard	0 a	0 a	2.75 a	2.75 a	15.75 a	37.00 a	40.25 a	44.25 a	41.25 a	23.25 a	25.00 a
Arugula	0 a	0 a	0.75 ab	4.50 a	16.50 a	24.00 b	17.00 b	24.25 b	33.25 a	14.50 b	12.25 b
Watercress	0 a	0 a	0.00 b	0.00 b	0.50 bc	4.00 c	6.25 c	1.25 c	2.50 bc	0.25 c	0.25 c
Radish	0 a	0 a	0.00 b	0.00 b	0.25 c	0.00 d	0.00 d	0.00 c	0.75 c	0.00 c	0.00 c
	Spring 2002										
	Sep 20	Sep 27	Oct 04	Oct 11	Oct 18	Oct 25	Nov 018	Nov 08	Nov 15		
Chinese cabbage	0 a	0 a	0.25 bc	0.00 b	0.50 c	0.00 a	0.00 b	0.00 a	0.00 a		
Mustard	0 a	0 a	5.50 a	4.75 a	10.75 a	0.50 a	48.00 a	0.00 a	0.00 a		
Arugula	0 a	0 a	2.00 ab	4.75 a	6.25 b	0.50 a	0.50 b	0.00 a	0.00 a		
Watercress	0 a	0 a	0.00 c	0.00 b	0.00 c	0.00 a	0.00 b	0.00 a	0.00 a		
Radish	0 a	0 a	0.00 c	0.00 b	0.25 c	0.00 a	0.00 b	0.00 a	0.00 a		

[1]Means with a common letter do not differ using Goodman (5%).

Table 2 - Mean number of occurrences of *M. punctigera* adults per plot (six plants) in three periods.

	Fall/winter 2001										
Treatment	May 10	May 18	May 24	May 31	Jun 07	Jun 13	Jun 21	Jun 28	Jul 05	Jul 13	Jul 21
Chinese cabbage	0.00 a	0.00 a	0.75 a	2.50 a	3.50 ab	9.75 a	10.75 a	23.25 a	32.50 b	23.00 a	8.00 a
Mustard	0.00 a	0.25 a	0.75 a	1.00 b	4.75 a	7.50 a	2.00 bc	8.25 b	77.25 a	15.50 a	13.75 a
Arugula	0.00 a	0.00 a	0.75 a	0.50 ab	0.75 bc	0.50 b	0.00 c	2.25 c	6.25 d	3.00 b	0,00 b
Watercress	0.00 a	0.00 a	0.75 a	1.25 ab	0.50 c	1.75 b	2.50 b	9.25 b	17.50 c	7.75 b	1.50 b
Radish	0.00 a	0.25 a	0.00 a	0.25 b	0.50 c	0.25 b	0.75 bc	0.75 c	5.75 d	0,00 c	1.00 b
						Fall 2002					
	Apr 03	Apr 10	Apr 17	Apr 24	May 01	May 08	May 15	May 22	May 29	Jun 05	Jun 12
Chinese cabbage	0,00 a	0,00 a	2.75 b	7.00 b	9.00 a	3.00 b	9.50 a	13.50 a	9.00 a	8.5 ab	8.50 ab
Mustard	0,00 a	0,00 a	8.25 a	11.50 ab	11.00 a	18.25 a	9.00 a	14.25 a	9.25 a	13.25 a	13.5 a
Arugula	0,00 a	0,00 a	3.60 ab	14.00 a	15.00 a	16.25 a	8.50 a	7.50 a	6.75 a	4.25 b	6.00 b
Watercress	0,00 a	0,00 a	0.25 b	0.50 c	1.00 b	1.00 bc	0.50 b	1.50 b	0.25 b	0.00 c	0.00 c
Radish	0,00 a	0,00 a	0.25 b	0.00 c	1.00 b	0.00 c	0.50 b	0.25 b	0.25 b	0.25 c	0.25 c
						Spring 2002					
	Sep 20	Sep 27	Oct 04	Oct 11	Oct 18	Oct 25	Nov 01	Nov 11	Nov 15		
Chinese cabbage	3.50 a	0.25 b	3.00 b	1.25 c	1.75 abc	0.75 c	2.25 b	0.00 a	0.00 a		
Mustard	3.00 a	17.25 a	5.00 b	5.75 a	4.50 a	24.25 a	22.25 a	0.00 a	0.00 a		
Arugula	1.25 ab	22.00 a	12.50 a	5.25 b	3.00 ab	6.75 b	1.50 bc	0.00 a	0.00 a		
Watercress	0.00 b	0.25 b	0.25 c	0.00 c	0.25 c	0.25 c	0.00 bc	0.00 a	0.00 a		
Radish	0.00 b	1.00 b	2.25 bc	1.00 c	1.00 bc	0.25 c	0.50 c	0.00 a	0.00 a		

[1]Means with a common letter do not differ using Goodman (5%).

Table 3 - Mean number of occurrences of *M. semialevis* adults per plot (six plants) in three periods.

	Fall/winter 2001										
Treatment	May 10	May 18	May 24	May 31	Jun 07	Jun 13	Jun 21	Jun 28	Jul 05	Jul 13	Jul 21
Chinese cabbage	0.00 a	0.00 b	0.75 a	0.75 a	0.75 a	2.00 a	3.00 a	7.00 a	4.50 a	3.75 a	3.25 a
Mustard	0.00 a	0.00 b	0.00 a	1.00 a	0.50 a	0.50 ab	0.25 c	3.00 ab	1.50 ab	1.00 ab	0.50 b
Arugula	0.00 a	0.00 b	0.75 a	0.25 a	0.00 a	0.25 ab	0.00 c	3.00 ab	0.75 b	0.25 b	0.00 b
Watercress	0.00 a	0.50 a	0.75 a	0.05 a	0.50 a	0.50 ab	2.75 b	5.50 a	2.75 ab	2.50 ab	0.00 b
Radish	0.00 a	0.00 b	0.25 a	0.25 a	0.25 a	0.00 b	0.50 bc	0.50 b	1.25 ab	0.25 b	0.25 b
						Fall 2002					
Treatment	Apr 03	Apr 10	Apr 17	Apr 24	May 01	May 08	May 15	May 22	May 29	Jun 05	Jun 12
Chinese cabbage	0.00 a	0.75 ab	0.25 b	3.00 a	0.75 ab	4.75 a	1.75 a	3.50 a	2.25 a	0.75 ab	1.25 ab
Mustard	0.00 a	2.25 a	2.25 a	1.00 ab	1.50 a	3.75 a	2.00 a	2.00 ab	0.75 ab	1.25 a	2.75 a
Arugula	0.00 a	0.00 b	0.00 b	0.50 b	0.75 ab	1.75 ab	0.25 ab	0.25 ab	1.00 ab	0.00 b	0.25 b
Watercress	0.25 a	0.00 b	0.00 b	0.00 b	0.75 ab	0.02 0b	0.00 b	0.00 bc	0.00 b	0.00 b	0.00 b
	Sep 20	Sep 27	Oct 04	Oct 11	Oct 18	Oct 25	Nov 01	Nov 08	Nov 15		
Chinese cabbage	0.50 a	0.50 b	0.00 b	0.00 b	0.00 b	0.00 b	0.75 b	0.00 a	0 a		0 a
Mustard	0.25 a	3.00 a	3.50 a	1.25 a	1.50 a	2.50 a	3.25 a	0.00 a	0 a		0 a
Arugula	0.00 a	0.25 b	0.75 b	1.00 ab	0.50 ab	0.75 ab	0.00 b	0.00 a	0 a		0 a
Watercress	0.00 a	0.00 b	0.00 b	0.00 b	0.00 b	0.00 b	0.00 b	0.00 a	0 a		0 a
Radish	0.00 a	1.00 ab	0.00 b	0.00 b	0.75 ab	0.25 b	0.00 b	0.00 a	0 a		0 a

[1]Means with a common letter do not differ using Goodman (5%).

The standard of preference was not repeated in the three trials (Fig. 1), (Table 1). Larvae of *M. punctigera* + *M. semialevis* predominated mostly on Chinese and mustard in 2001 Fall/Winter, while in the 2002 Fall and 2002 Spring preference was predominated for mustard and arugula. Hence, the preference may have been influenced by the period of assessment.

In previous laboratory preference assays, Chinese cabbage and mustard were preferred foods for both larvae and adults and arugula was preferred by adults (Menezes Junior *et al.*, 2005). In the present study larvae were also found in high numbers in arugula plants.

A series of factors may have affected insect behavior and determined variations in preferences. Gregarious behavior is reported as affecting insect feeding preference (Ventura et al., 2000) which was also demonstrated for *M. punctigera* in multiple-choice assays in laboratory (Menezes Junior *et al.*, 2005). Feeding and consequent production of excrements affects food quality throughout the season. According to Bowers (2003), at higher population levels, *M. ochroloma* move *en masse* in response to their own herbivory. The author also found that *M. ochlroloma* small populations do not congregate in patch restricted searching.

Population in the field is a consequence of the feeding preference and also of other biotic and abiotic factors. Plant architecture may have great importance in choosing a host plant. Chinese cabbage and mustard have leaves that grow in a "closed head". In general, beetles and larvae were sown sheltered in the interior of the head. Ameen; Story (1997a) hypothesized that the texture of host plant leaves may influence feeding; the beetles avoid plants with tough or waxy surfaces.

CONCLUSIONS

Occurrence of larvae of *M. punctigera* + *M. semialevis* was affected by the season.

M. punctigera was the predominant species and beetles were found mostly on Chinese cabbage and mustard.

M. semialevis beetles occurred mostly on Chinese cabbage and mustard.

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