Proceedings V World Avocado Congress (Actas V Congreso Mundial del Aguacate) 2003. pp. 495-501.

DYNAMICS AND SAMPLING OF MIRIDS (HEMIPTERA: MIRIDAE) IN AVOCADO IN FLORIDA

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SUMMARY

Flower feeders, such as mirids *Dagbertus fasciatus* (Reuter), *Rhinacloa* sp. and *D. olivaceous* (Reuter) contribute to excessive flower drop and reduction of fruit set in Florida. Several studies on the dynamics and sampling of these pests were conducted in South Dade County by collecting mirids from thirteen avocado varieties. The effectiveness of a beating sampling technique was compared to the use of sticky traps as monitoring tools. Relationship between avocado flower variety and avocado phenology was determined.

Key Words: mirids, flower pests, avocado, *Dagbertus, Rhinacloa*

INTRODUCTION

Mirids are injurious and widespread insect pests of avocado and cause diverse damage in some producer areas. For instance, in Africa, the avocado bug, *Taylorilygus* sp., appears to feed on avocado flowers, young fruit and presumably also young fruits (Wysoki et al., 2002). Damage to avocado fruit is caused within the first few weeks after fruit set. This leads to the development of protrusions on larger fruit which are only visible about a month after feeding. The lesions that occur on avocado fruit are in the form of 'pimply' elevations on the fruit surface (Du Toit et al., 1993). If surveys indicate that large populations of the avocado bug are present shortly after fruit set, chemical control should be applied immediately (Van den Berg et al., 1999). In the Philippines, the mirid bugs *Helopeltis bakeri* Pop., and *H. collaris* Donovan attack the shoots and fruit of avocados, causing significant damage (Cendaña et al., 1984).

During the late 70s in Florida, USA, populations of mirids began to appear annually on avocado blossoms in numbers great enough to cause concern. Preliminary surveys conducted by the two junior authors showed the following mirids to be associated at least occasionally, with avocado

blossoms: *Polymerus cruentatus, Taylorilygus apiacalis, Lygus lineolaris, Neurocolpus flavescens, Rhinacloa* sp., *Dagbertus fasciatus* and *D. olivaceous.* Later, Baranowski and Glenn (unpubl.) observed that the only species feeding and breeding on avocado were *Dagbertus fasciatus* Reuter and *D. olivaceous* (Reuter). *Dagbertus* adults were also collected from mango, longan, lychee, black olive, *Schinus terenbinthifolius*, *Parthenium* sp. and sabal palmetto (Baranowski and Glenn, unpublished). Attacks to avocado seem to especially affect flowers and recently set fruit, causing them to drop. These insects are green-brown, comparatively small at 1 cm in length. *Dagbertus* eggs held at 23°C hatch in 6-8 d, nymphs go through 5 stages before reaching the adult stage. Thus, *Dagbertus* can complete a single generation in as short a time as 14 d (Glenn and Baranowski, unpubl.).

The objectives of the present study were to determine the relationship between *Daghbertus fasciatus, D. olivaceous, Rhinacloa* sp. and avocado varieties and to determine the seasonal abundance of these species.

MATERIALS AND METHODS

Three trees representing each of thirteen avocado cultivars , 'Choquete', 'Black Prince', 'Nadir', 'Booth 8', 'Booth 7', 'Nesbitt', 'Hardee', 'KL', 'Streamliner', 'Pollock', 'Fuchs', and 'Waldin' were selected from the germplasm collection at the Tropical Research and Education Center, Homestead, Florida. Floral buds of each cultivar were sampled by shaking floral clusters in a modified sweep net method at different times of the day. The modified sweep net method consisted in beating 1 panicle 4-5 times into a 36 x 26 cm plastic tray. Adults and nymphs were recorded. Adults were identified to the species level by the second and third authors. Sampling was conducted from January, 24, 1985 through April 25, 1985. Sampling was also conducted during 1987 on 13 cultivars, 'Pollock', 'Brookslate', 'Nadir', 'Monroe', 'Simmonds', 'Booth 7', 'Nesbitt', 'Waldin', 'Tower', 'Tonnage', 'Choquette', 'Black Prince', and 'Taylor'. Developmental stages of avocado inflorescence were determined by following the descriptions of Davenport (1982). Mirids were also trapped by placing 21.3 cm in diam. white circular sticky traps at 1 and 2 m high on the external tree canopy. The effectiveness of this type of trapping was determined and compared with the modified sweep net method.

Pimply elevations were evaluated by visually inspecting 10 randomly collected fruits per tree. 'Pimpling' was expressed as percent of fruit with more than 1 'pimple' per fruit.

RESULTS AND DISCUSSION

Relationships between avocado varieties and mirids. During our first sampling period, *Daghbertus olivaceous* were more abundant (P> 0.05) on cultivars 'Booth 8 and 'Booth 7' compared with other cultivars (Table 1). Adults of *D. fasciatus* were more commonly found on 'Booth 8', 'Booth 7, and 'Waldin'. The cultivars with the highest *D. fasciatus, D. olivaceous* densities, and with nymphs of both species, were 'Booth 8 and 'Booth 7' followed by 'Fuchs', 'Black Prince', 'KL' and 'Waldin'. The lowest mirid densities were found in 'Pollock', 'Streamliner' and 'Nesbitt' (Table 1). During our second sampling period, mirids were more abundant on 'Pollock' and 'Brooks late' compared to 'Nadir', 'Taylor', 'Monroe', 'Booth 7', 'Choquette', 'Waldin', 'Simonds', 'Black Prince' and 'Tonnage' (Table 2). Therefore, it is uncertain that *D. olivaceous* and *D. fasciatus* showed constant preference for the cultivars evaluated during this study. A relationship between the average number of mirids and percentage of fruit 'pimpling' was not observed ($F = 0.01$; $Pr > 0.94$; $df = 38$) (Table 3).

Relationship between mirid density and flower phenology. During the first study, more mirids were found (F = 5.12; df = 532; P<0.0001) (Table 4) on flower buds with a maximum floral opening (grade 9) than on any other developmental stage. During the second study, more mirids (F = 5.18; df = 531; P <0.01) were found on those flowers with a flower development higher that 7.5.There was not a significant difference between the number of mirids found on male or female avocado flowers (F = 0.07; df = 552; P < 0.78).

Mirid densities and weather. There was a statistical difference between the total number of mirids captured and the weather conditions (sunny, cloudy or overcast). More mirids were collected from flowers surveyed under cloudy conditions than during sunny or overcast conditions (F = 3.30; df = 551; P < 0.04) (Table 5). No statistical differences were detected between sampling time and number of mirids captured on the flowers. However, the lowest percentage of mirids was collected between 10 and 1230 hours and a higher percentage between the 9 h or at 1330 hr (Fig 1).

Mirid Seasonality. Depending on the variety [early flowering, vs. late flowering], mirids were captured as early as January. Numbers peaked between the end of March and through mid April. The total number of mirids decreased afterwards (Fig 2).

The cultivars 'KL' and 'Streamliner' showed earlier mirid populations in January, followed by 'Nadir', 'Nesbitt', 'Black Prince' (mid March) and the late cultivars ('Booth 8, 'Booth 1', 'Hardee', 'Fuchs', and 'Booth 7) showed mirid population build up by late March. Mirid densities were observed as late as April on the cultivars 'Waldin' and 'Choquette'.

Trapping. Sticky traps detected 56% of the mirid population as compared to the swep-net method. Therefore, the sweep method trapped 4 times more mirids than the sticky traps. The use of sticky traps, however, has the advantage to provide an estimation of mirid density using less man-hours than the sweep net method. More mirids were detected in traps when the flower development was higher than 7. During the second study no significant relationship was found between the number of mirids found per panicle and number of mirids collected in traps (Fig 3).

CONCLUSIONS

The species, *Dagbertus fasciatus* Reuter and *D. olivaceous* (Reuter) were collected infesting avocado panicles during this study. A definitive varietal preference by the mirids was not observed. Flowers with a grade development between 7.5 and 9 which correspond to open flowers, held the highest number of *Dagbertus* sp. Therefore, a population build up in avocado accompanies and probably directly depends on flower development from January to April. Moreover, *Dagbertus* mirids are highly poliphagous infesting besides avocado, flowers of *Mangifera indica, Parthenium* sp., *Schinus terebinthifolius*, and other species. A correlation between 'pimpling' on fruits and average mirid density was not observed. Previously, Peña and Denmark (1996) suggested that feeding of *Tegolophus perseaflorae* (Acari: Eriophyidae) may cause fruit deformation and decoloration. Further research is needed to elucidate this problem as other pests, i.e., *Frankliniella* sp. can also feed on avocado flowers.

Monitoring in orchards allows a better timing of sprays and an estimation of the population densities of pests involved. Sticky traps may be useful for detecting the presence of mirids in avocado and for monitoring incoming adults from other plant species moving into the avocado orchard.

Table 1. Abundance of *Daghbertus olivaceous* and *D. fasciatus* adults and nymphs of both species, on 13 avocado cultivars, 1985

Cultivar	Average No.			
	D. olivaceous	D. fasciatus	Nymphs	Total
'Choquette'	0.14b	0.08c	0.04c	0.26b
'Black Prince'	0.28b	0.10c	0.58bc	0.96b
'Nadir'	0.14b	0.00c	0.10c	0.25b
'Booth 8'	0.65a	0.48a	1.70a	2.83a
'Booth 7'	0.65a	0.42ab	1.18ab	2.25a
'Booth 1'	0.11b	0.06c	0.46bc	0.64b
'Nesbitt'	0.10b	0.03c	0.10c	0.23b
'Hardee'	0.15b	0.07c	0.03c	0.27b
'KL'	0.06b	0.00c	0.73bc	0.80b
'Streamliner'	0.14b	0.02c	0.05c	0.22b
'Pollock'	0.06b	0.10c	0.02c	0.19b
'Fuchs'	0.06b	0.10c	0.82bc	0.96b
'Waldin'	0.19b	0.20bc	0.33bc	0.72b

Numbers followed by different letters were significantly different by Duncan's multiple range test ($P<0.05$)

Table 2. Abundance of *Daghbertus olivaceous* and *D. fasciatus* adults and nymphs of both species, on 13 avocado cultivars, 1987

Cultivar	Average No.		Total
	Adults	Nymphs	
'Pollock'	0.86a	0.21bc	1.07ab
'Brooks late'	0.57ab	1.15a	1.72a
'Nadir'	0.39b	0.41bc	0.79bc
'Monroe'	0.31b	0.33bc	0.64bc
'Simmonds'	0.29b	0.14bc	0.43bc
'Booth 7'	0.26b	0.42bc	0.68bc
'Nesbitt'	0.20b	0.08c	0.28bc
'Waldin'	0.17b	0.64b	0.81bc
'Tower'	0.15b	0.23bc	0.38bc
'Tonnage'	0.15b	0.49bc	0.64bc
'Choquette'	0.13b	0.15bc	0.28bc
'Black Prince'	0.10b	0.10c	0.20c
'Taylor'	0.08b	0.08c	0.16c

Numbers within a column followed by a different letter were significantly different by Duncan's multiple range test ($P<0.05$).

Table 3. Relationship between average number of mirids and percent avocado fruits with 'pimpling' on an avocado grove, May 1985, Homestead, FL

Cultivar	Percent Fruit		Average No.
	Undamaged	Damaged	Mirids
Choquette	56	43	0.26
Black Prince	31	77	0.96
Nadir	4	96	0.26
Booth 8	20	79	2.83
Booth 7	25	75	2.25
Booth 1	41	59	0.64
Nesbitt	17	83	0.23
Hardee	19	81	0.27
KL	8	92	0.80
Streamliner	14	86	0.22
Pollock	17	83	0.19
Fuchs	17	83	0.96
Waldin	3	96	0.72

Table 4. Abundance of *D. olivaceous* and *D. fasciatus* on different phenological states of avocado flowers.

Bud Development	Average No.			Total
	D. olivaceous	D. fasciatus	Nymphs	
0-7	0.01	0.01	0.22b	0.25b
0.5-5	0.00	0.00	0.00b	0.00b
5.5	0.08	0.04	0.04b	0.17b
6.0	0.00	0.00	0.00	0.00
6.5	0.00	0.00	0.00	0.00
7	0.15	0.05	0.73b	0.94b
7.5	0.10	0.00	0.10b	0.21b
8	0.21	0.14	0.17b	0.53b
8.5	0.41	0.08	0.08b	0.58b
9	0.65	0.34	0.81b	1.81b
9.5	0.80	0.68	3.37a	4.85a
10	0.29	0.27	0.73b	1.30b

Numbers within a column followed by a different letter were significantly different by Duncan's multiple range test ($P<0.05$).

Table 5. Average number of mirids collected during sunny, over cast and cloudy conditions.

Weather Condition	Average Mirids per flower
Sunny	0.67 b
Overcast	1.33 a
Cloudy	0.00 b

Numbers within a column followed by a different letter were significantly different by Duncan's multiple range test ($P<0.05$).

Figure Captions

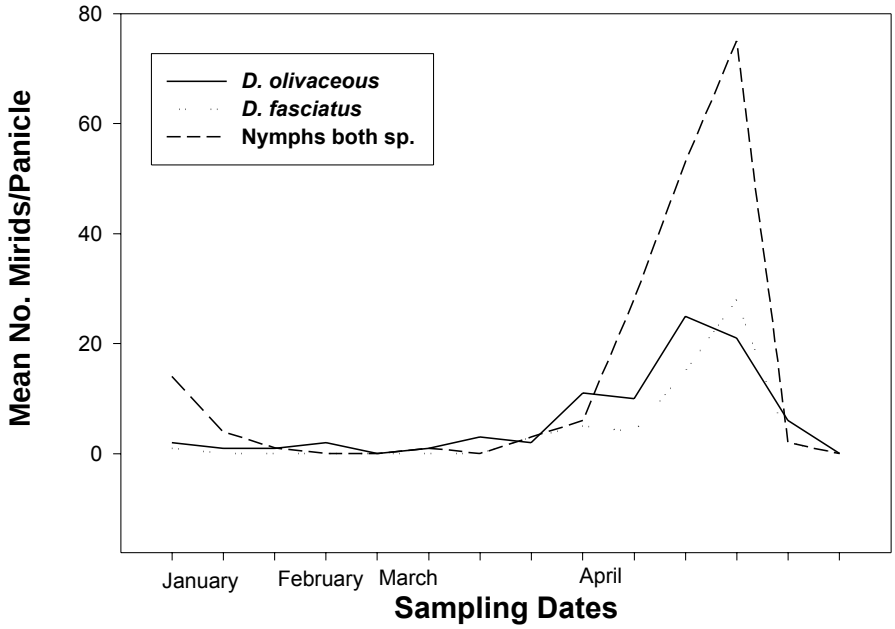

Fig 1. Percentage of flowers with more than 1 avocado mirid, collected from panicles between 8 am and 4 pm in Homestead, Florida, USA.

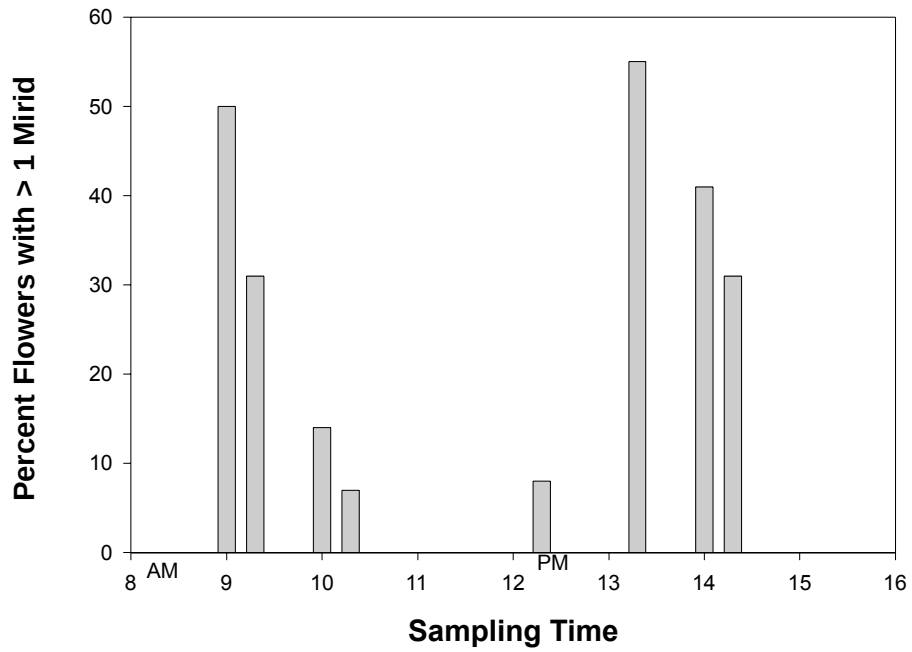

Fig 2. Mean number of *Dagebrtus* sp., and nymphs collected from January through April, in avocado, Homestead, Florida, USA.

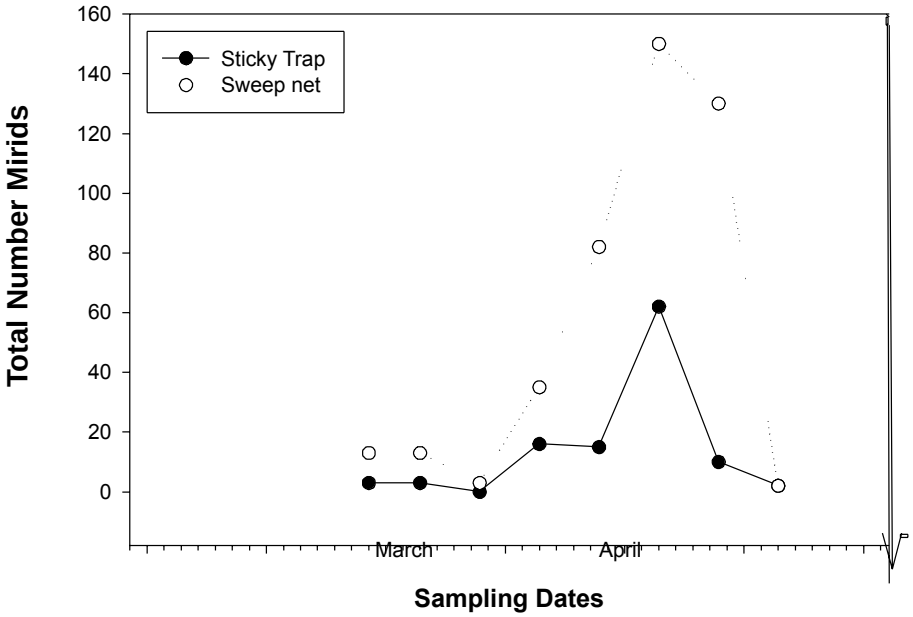

Fig 3. Total number of mirids trapped and/or collected from avocado floral panicles in Homestead, Florida, USA.

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