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Sharpshooter Populations in Declinio-Affected Citrus Orchards in Brazil

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ABSTRACT. A survey of sharpshooter species (Homoptera) was carried out in declinio-affected citrus groves in the following locations of Sao Paulo State, Brazil: north—Barretos; center—Conchal; south—Tatui. Yellow sticky traps were used to monitor sharpshooter species and determine the frequency of occurrence. The trapped sharpshooters were separated into three groups: 1) occurring frequently in each of the three regions; 2) occurring only sporadically in the three regions; 3) occurring in only one or two regions. In group 1, *Scaphytopius* sp. and *Bahita fratercula* (Linnavuori) were the most prevalent species, followed by *Crepluvia pygmeae* (Linnavuori) and *Diplobopteris costalimai* (Young). In group 2, *Curtaria insularis* (Caldwell) was more prevalent in the northern and central regions, whereas in the south, *Oncometopia fascialis* (Sionovet) was the most prevailing species. Other sharpshooters of this group were *Aerogonia terminalis* (Young) and *Gypona fissura* (DeLong & Freytag). In group 3, the undetermined species occurred which do not seem to be related with incidence of declinio. The orchards of the northern region, Barretos, were the most severely affected by declinio and the total number of sharpshooters was much higher than in the other two regions. In the central area, Conchal, the orchards were irrigated and a larger number of species was found in a uniform distribution throughout the whole year.
Index words. blight, vectors, Homoptera.

Some sharpshooter species (Homoptera) are known vectors of some xylem-limited bacterial diseases (XLB) (11). The behaviour and distribution of these insect vectors have been studied in relation to Pierce's disease of grapevine (1, 2) and phony peach (3, 9, 16). Only limited information on species and populations of sharpshooters in citrus orchards is available (2, 14, 15). Recently surveys have been made of the entomofauna in Sao Paulo citrus orchards by using an aspirator (6, 13).

Citrus declinio, a vascular disease of unknown etiology in Brazil, is similar to blight in Florida (4) and does not affect trees until they are at least 5 yr old. In declinio-affected citrus trees, two types of xylem blockage structures have been described: amorphous and filamentous plugs (4, 5, 7). The amorphous plugs block water conductivity, are of specific composition, and are unique to blight and declinio affected trees. The filamentous plugs are commonly present in citrus with various disorders and are probably a response of the plants to injury (5). Xylem-limited bacteria carried by sharpshooters, have been investigated as a possible cause of blight in Florida (8).

The purpose of this study was to determine the occurrence and distribution of sharpshooter species in declinio-affected orchards in Sao Paulo State, Brazil.

MATERIALS AND METHODS

Regional surveys. These surveys were carried out in declinio-affected 12-15-yr-old citrus groves located in three regions of the Sao Paulo State, as follows: north—Barretos, center—Conchal and south—Tatui. All orchards were Valencia (sweet orange) on Rangpur lime rootstock. The orchard from Conchal was irrigated. The surveys covered areas of about 120,000 m^2 planted with citrus in each region. The percentages of declinio-affected trees were estimated as follows: Barretos—33.58%, Conchal—27.22%, Tatui—7.48%.

Trap placement. Insect traps were prepared coating 16-cm diameter yellow plastic no. 603 can lids (Tri Plas Inc., La Palma, Calif.) with Tack-Trap (Animal Repellants Inc., Griffin, Ga.). Yellow was chosen because it is known to be the most effective color for attracting sharpshooters as well as other insects (11, 15).

In each orchard the prepared traps were attached by wires to 20 trees. The distance between the trees with traps was 10 trees and 10 rows. In each tree two traps, were fixed to the branches, on the outer part of the canopy on opposite sides at 1.20 m and 1.90 m from the ground. For one year from September 1985 to August 1986, the traps were replaced monthly.

Insect identification and enumeration. The traps were removed every month and taken to the laboratory. The insects were then carefully recovered from the traps and kept in glass bottles containing 70% ethanol for later identification. The bottles were sent to USDA entomologists for identification of the collected sharpshooters.

The genera and species of trapped sharpshooters were then separated in three groups according to their frequency as follows: 1) occurring frequently in each of the three regions, that is found every month in all orchards; 2) occurring only sporadically in the three regions, that is found only in some months in all orchards; 3) occurring only in one or two regions.

RESULTS AND DISCUSSION

There was no difference as to the number or species of captured sharpshooters caught in the traps located at two heights from the ground so this experimental variable was not considered for analysis. Results were expressed as total number and species of sharpshooters captured each month in each orchard.

Group 1. In the central Conchal region sharpshooters of the genus *Bahita* were found in high number prevailing mainly in September, January and February (table 1). In the southern Tatui region, the genus *Scaphytopius* was found in high numbers in January and February, followed by the genus *Crepluvia* in March and April. In the northern Barretos region the genus *Scaphytopius* also was found in high numbers mostly in September, October and November.

The periods of highest population incidence, considering all genera, found in Conchal, Tatui and Barretos, were January and September, January and April, and September-October, respectively. The number of sharpshooters of group 1 was higher in Tatui than in Conchal. During this survey the population was highest in Barretos. Sharpshooters of the genus *Diplobopteris* occur in small quantities in all regions. An unidentified sharpshooter (no. 14) was more frequent in Conchal and Tatui than in Barretos.

Group 2. In Conchal, the sharpshooters of group 2 occurring with the highest frequency belonged to the genus *Curtaria* (table 2). Populations occurred mainly in September. In Tatui, the genus *Oncometopia* occurred very frequently, mostly in September, followed by the genus *Curtaria*, in June. In Barretos, *Curtaria* was the most frequent, occurring mainly in June.

The highest population incidence of the genera of this group occur in September in Conchal and Tatui and in June for Barretos. The population of group 2 was higher in Conchal than in Tatui.

Group 3. Several other Homopteran insects were found occasionally in one or more regions. The species in this group do not seem to be associated with declinio because of their low frequency and sporadic occurrence. For this reason, they were not identified.

In Florida, the genus *Oncometopia* was the most frequently found in orchards affected by blight (10, 15). Sharpshooters of the genera *Oncometopia*, *Scaphytopius*, and *Gypona* are known to transmit xylem-limited bacteria and mycoplasma (11).

Scaphytopius nitridus is well known as a vector of *Spiroplasma citri*, the causal agent of stubborn dis-

TABLE 1
DISTRIBUTION OF GROUP 1 SHARPSHOOTERS FOUND FREQUENTLY DURING ONE YEAR, IN THREE DECLINIO-AFFECTED CITRUS ORCHARDS IN SAO PAULO STATE, BRAZIL[z]

		1985				1986								
Region	Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
N	*Scaphytopius* sp.	433	549	385	52	225	196	70	73	93	92	43	41	2252
	Bahita fratercula	403	136	91	34	172	111	23	54	58	59	19	7	1167
	Diplobopteris costalimai	—	—	—	6	7	29	14	—	21	15	1	4	97
	Crepluvia pygmeae	3	5	1	27	37	33	16	13	24	11	1	8	179
	No. 14[y]	—	—	—	22	44	82	13	—	—	—	3	21	181
	Total	839	689	477	141	485	451	136	140	197	177	67	81	3880
C	*Scaphytopius* sp.	54	50	66	88	98	52	66	15	7	—	2	6	504
	Bahita fratercula	186	83	47	23	178	122	53	28	52	6	8	10	796
	Diplobopteris costalimai	4	1	1	6	2	4	—	35	12	8	7	—	80
	Crepluvia pygmeae	4	41	31	66	113	41	40	148	104	30	13	4	635
	No. 14	112	47	37	64	146	38	31	59	51	1	1	9	596
	Total	360	222	182	247	537	257	190	285	226	45	31	29	2611
S	*Scaphytopius* sp.	97	32	36	84	381	279	120	77	12	8	7	7	1090
	Bahita fratercuila	244	43	10	23	107	76	38	97	41	12	10	50	751
	Diplobopteris costalimai	8	4	10	8	—	15	4	9	20	17	10	50	116
	Crepluvia pygmeae	11	7	2	62	203	57	243	373	39	19	9	10	1035
	No. 14	126	79	2	64	105	44	30	104	28	12	16	39	649
	Total	436	165	60	241	796	471	435	660	140	68	52	117	3641

[z]Total number of sharpshooters trapped at two heights (1.20 m and 1.90 m) of 20 trees.
[y]Unidentified species.

TABLE 2
DISTRIBUTION OF GROUP 2 SHARPSHOOTERS FOUND SPORADICALLY DURING ONE YEAR, IN THREE DECLINIO-AFFECTED CITRUS ORCHARDS IN SAO PAULO STATE, BRAZIL[z]

Region	Species	1985				1986								
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
N	*Curtaria insularis*	34	7	--	—	25	—	—	42	31	133	11	19	302
	No. 6[y]	—	—	—	—	—	—	4	3	—	2	—	2	11
	Aerogonia terminalis	—	—	—	—	5	6	4	7	2	5	5	1	35
	Diedrocephala variegata	1	5	2	—	—	1	3	1	14	1	1	4	34
	Oncometopia facialis	—	—	—	6	3	3	—	4	4	4	1	1	26
	Gypona fissura	1	—	2	—	1	4	13	3	—	5	1	2	32
	Macugonalia cavifrons	—	1	1	—	1	2	—	—	—	3	6	2	16
	Total	36	13	5	8	35	15	22	62	38	166	25	31	456
C	*Curtaria insularis*	121	—	—	—	—	—	—	6	8	13	18	6	172
	No. 6	8	2	5	3	6	8	11	13	5	2	—	2	172
	Aerogonia terminalis	1	—	—	—	—	2	—	21	4	4	5	1	38
	Diedrocephala variegata	5	—	—	—	—	—	1	—	1	12	17	1	37
	Oncometopia facialis	2	—	—	—	11	—	—	1	2	5	1	3	25
	Gypona fissura	2	20	7	3	3	5	13	1	—	—	—	—	54
	Macugonalia cavifrons	1	—	—	—	—	3	1	1	—	3	3	—	12
	Total	140	22	12	6	20	18	26	43	20	39	44	13	403
S	*Curtaria insularis*	19	6	2	—	—	2	1	7	13	22	4	15	91
	No. 6	17	4	—	1	6	1	1	5	1	4	1	2	43
	Aerogonia terminals	—	—	1	—	—	1	1	3	1	4	1	2	14
	Oncometopia facialis	47	4	2	—	7	7	2	1	16	7	4	43	140
	Gypona fissura	—	3	—	—	—	3	2	—	1	—	—	—	9
	Macugonalia cavifrons	1	—	—	—	2	2	1	—	2	—	6	1	15
	Total	119	19	5	3	20	21	8	23	36	40	19	63	376

[z]Total number of sharpshooters trapped at two heights (1.20 m and 1.90 m) of 20 trees.
[y]Unidentified species.

ease of citrus which is a limiting problem in California and in Mediterranean countries. Silveira *et al.* (13) found the occurrence of *Scaphytopius lineatus* in their survey carried out in 1982, and another species of the same genus was detected in high number by the authors, in 1985-1986, as described in this paper. Such species might also be vectors of stubborn or other diseases. Since stubborn does not occur in Brazil, attention has been recently called to the severe danger of illegally introducing citrus propagative material from countries where the disease is prevalent (12).

The sharpshooters of groups 1 and 2 occurring in high quantities in Sao Paulo orchards will be studied in the future to determine their possible association with declinio.

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