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POPULATION DENSITIES OF THE ANT FAUNA INCLUDING Solenopsis
invicta IN PASTURES IN BRAZIL

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ABSTRACT

A 2-year study of the population densities of the ant fauna was conducted on 3 farms in Brazil. Also, mound densities of the fire ant, Solenopsis invicta, on the farms were compared to densities on improved pastures in the U.S. There were 116 ant species identified. Nests counts of S. invicta varied depending on the farm with the lowest counts averaging 20 nests/hectare (8/acre) while the highest averaged 100 nests/hectare (41/acre). S. invicta populations on these farms were not unlike those seen on farms in many locations in the southeastern U.S. The mean S. invicta nests/hectare on the Brazil farm with the highest fire ant populations was not significantly different from the mean S. invicta nests/hectare in the U.S. The most recently developed farm, 4 years old at the beginning of the study, had the greatest number of S. invicta nests. The farm with the lowest number of S. invicta nests/hectare had the highest number of total ant species while the farm with the highest number of S. invicta nests/hectare had the lowest number of ant species. Pheidole diligens had the highest mean frequency of occurrence of all ant species. In pitfall traps, the percent P. diligens was lower than the percent S. invicta at the newest farm and higher than the percent S. invicta at the oldest farm. As in the U.S., large populations of S. invicta in Brazil were associated with disturbed habitats. Rainfall and temperature had no noticeable effect on populations of S. invicta.

INTRODUCTION

Some investigators have implied that populations of the fire ant Solenopsis invicta never reach densities in its homeland in the state of Mato Grosso, Brazil that it does in the southern United States (Buren et al 1978; Buren 1980, Whitcomb 1980, Porter personal communication). Contrary, Banks et al. 1985 and Wojcik 1983, 1986, Trager (personal communication), indicated that fire ant populations in certain habitats were as abundant as those in the U.S.

It is well known that fire ants are an insect that thrives in disturbed habitats (Buren et al. 1978 and Tschinkel 1987). Therefore, we undertook a 2-year study of the ant fauna in improved pastures, which are disturbed habitats that do not differ very much between the United States and Brazil. The primary objectives of the study were to : (1) compare the mean number of ant species on the three farms, (2) determine the population levels of S. invicta during the study period, (3) compare mound densities of S. invicta on the 3 farms with those in improved pastures in the U.S., and finally, (4) determine if temperature or precipitation had an effect on the S. invicta populations.

MATERIALS AND METHODS

The three farms were all located near the town of Caceres in the state of Mato Grosso in the southwestern corner of Brazil. The following is a description of each farm:

I--Piraputanga farm: 1) ca. 10 years old

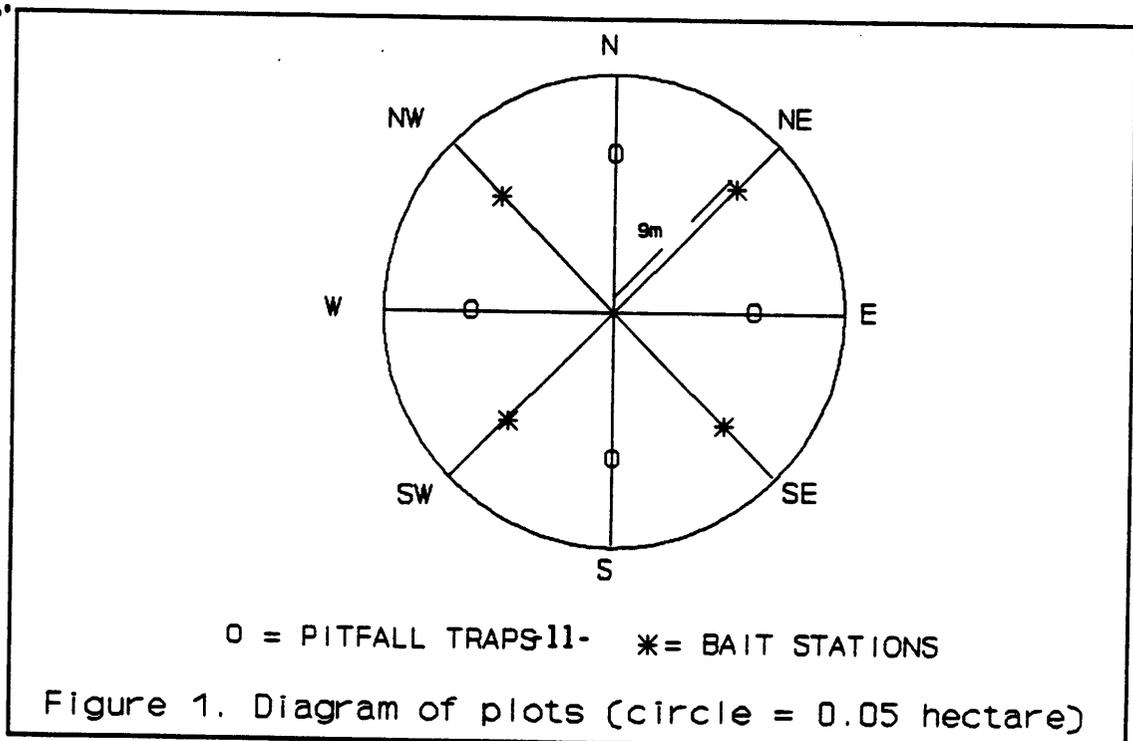
- 2) ca. 193 hectares in size
- 3) ca. 10-15 cattle
- 4) Grass height was 5-26 cm.

II--Facao farm :

- 1) ca. 100 years old
- 2) ca. 11037 hectares in size
- 3) ca. 1000 cattle
- 4) Grass height was 6-36 cm.

III--Assis farm :

- 1) ca. 4 years old
- 2) ca. 124 hectares in size
- 3) ca. 50 cattle
- 4) Grass height was 5-29 cm.



Three circular plots, 0.05 hectares each (Figure 1), were established on each farm and populations of ants were sampled on a monthly basis for the 1st year and bimonthly for the 2nd year. The 3 methods of sampling used were:

- a) pitfall traps (4/plot operated 1 week per month)
- b) mound densities in each plot (Solenopsis invicta only). Mounds were rated by modifying the population index method described by Harlan et al. (Table 1).

Table 1. Population index method.

ABNORMAL NESTS (WITHOUT BROOD)		NORMAL NESTS (WITH BROOD)	
INDEX	NO. OF WORKERS	INDEX	NO. OF WORKERS
1	<10,000	5	<10,000
2	10 - 50,000	10	10 - 50,000
3	>50,000	15	>50,000

- c) bait stations (4 stations/plot, 3 baits/station).

NOTE: The bait station samples have not been sorted and therefore, this report does not include this data.

Mound densities in the U.S were obtained from control plots of monogyne Solenopsis invicta populations used in previous surveys for field test sites. Since these sites were used for field tests, they were always moderate-heavily infested with IFA, and therefore, this data was biased towards higher densities in the U.S.

RESULTS AND DISCUSSION

During the 2 years, 624 pitfall samples were collected. There were 116 ant species identified from the pitfall samples. Nests counts varied depending on the farm with the Piraputanga farm the lowest, averaging 20 nests per hectare (range 0-54/ha) while Assis farm was the highest averaging 100 per hectare (range 60-133/ha). Facao farm was in the middle with an average of 62 nest per hectare (range 20-120/ha).

The nest counts of S. invicta on these farms were similar to those we have made in many locations in the southeastern U.S. Assis, which had the highest densities of S. invicta was the most recently developed farm, about 4 years prior to our study. As the habitat at this farm stabilizes, the populations of S. invicta will probably stabilize and may actually decline to a lower level depending on how much disturbance or competition from other ants occurs in the future. In fact, at Assis farm, the populations of S. invicta appear to be declining while the populations of Pheidole diligens, a very abundant ant found at all 3 farms, are increasing. We hope to conduct additional monitoring of this occurrence on future trips to Brazil. A farm comparison of the mean number of S. invicta nests/hectare and the mean number of ant species on each farm is shown in Table 2. Piraputanga farm had a mean of 21.9 (SE 3.5) S. invicta nests/hectare or ca. 8 per acre with a mean of 9.6 (SE 0.4) ant species. Facao farm had a mean of 60 (SE 5.9) S. invicta nests/hectare or ca. 25 per acre with a mean of 8 (SE 0.3) ant species. Assis farm had a mean of 97.4 (SE 5.1) S. invicta nests/hectare or ca. 41 per acre with a mean of 6.5 (SE 0.3) ant

species. The population index which is representative of the total numbers of S. invicta per hectare was greatest at Assis.

The farm with the lowest mean number of S. invicta nests per hectare had the highest average number of species of other ants. The most recently developed farm (newest) had the greatest number of S. invicta nests. The large populations of S. invicta were associated with disturbed habitats. Pheidole diligens had the highest mean frequency of occurrence of all ant species at each farm. Rainfall and temperature had no consistent effect on populations of S. invicta.

Table 2. Farm comparison of S. invicta mounds and number of ant species.

FARM	MEAN <u>S. invicta</u> MOUNDS/HA *	MEAN NUMBER OF SPECIES *
PIRAPUTANGA	21.9(3.5)c	9.6(0.4)a
FACAO	60.0(5.9)b	8.0(0.3)b
ASSIS	97.4(5.1)a	6.5(0.3)c

*Means (SE) followed by the same letter are not significantly different using Tukey's studentized range test ($P < 0.05$)

Although there is still discussion on whether the densities of fire ant populations in the U. S. are different than in Brazil, these studies indicate that densities can be equal in similar habitats and under similar conditions. As always, there is the

problem of comparing habitats between two countries such as Brazil and the U.S. which can be difficult at best, especially because of the differences between the land use (the U.S. is more developed in the fire ant infested area) and the general ecology (Wojcik 1986). However, this is true for any such comparisons and based on the strong similarities between improved pastures on farms in the two countries, the results shown here indicate, at least in these types of disturbed habitats, population densities of the monogyne form of S. invicta are similar in the U.S. and Brazil.

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