

ECONOMIC IMPORTANCE OF THE RED IMPORTED FIRE ANT,  
*SOLENOPSIS INVICTA* BUREN<sup>1, 2</sup>. I. PRELIMINARY  
INVESTIGATIONS OF IMPACT ON SOYBEAN HARVEST

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ABSTRACT

Comparisons were made of the yield of soybeans from two fields, one infested with the red imported fire ant, *Solenopsis invicta* Buren, at the rate of 44 mature mounds per acre and the other noninfested. Though differences were small (ca. 0.25 bushel/acre), they were statistically significant. On the basis of soybean prices in 1974, the loss for farmers in the state of Georgia could range from \$178,537 to over \$1,000,000 if 10 to 75% of the acreage was infested. A discussion of damage to combines resulting from the presence of fire ant mounds is presented.

Key Words: *Solenopsis invicta*, red imported fire ant, soybean, economic impact, economic assessment

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Lofgren *et al.* (1975) point out that little data concerning the economic importance of the red imported fire ant, *Solenopsis invicta* Buren, are available for review. Assessments that are presented are too often based on hearsay and personal emotions rather than scientific fact. As a result, considerable controversy has developed over the economic importance of the imported fire ant, ranging from nuisance to a serious agricultural and major medical pest. On one occasion predation by this ant is claimed to have played an important part in the reduction of populations of the sugar cane borer (*Diatraea saccharalis* (F.)), resulting in increased crop production (Reagan *et al.*, 1972). The ants are however, nondiscriminatory in their feeding habits, and attack beneficial as well as harmful insects (Wilson and Oliver, 1969).

Wilson and Eads (1949) studied crop damage by direct observation in the field, and by a systematic poll of 174 farmers in two infested counties in Alabama. Depradations of the seedlings of corn, peanuts, and beans, and the roots, stems, and leaves of corn, beans, irish potatoes, and cabbage were reported. According to these farmers, the crops damaged most included corn,

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<sup>1</sup>Hymenoptera: Formicidae.

<sup>2</sup>This paper reflects the results of research only. Mention of a pesticide or a commercial or proprietary product in this paper does not constitute a recommendation or an endorsement of this product by the USDA.

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irish potatoes, soybeans, sweet potatoes, and cabbage. Wilson and Eads confirmed these reports by personal observations, and estimated that these ants caused a total crop damage in Mobile County of \$177,610 and in Baldwin County of \$357,612.

At least two independent unpublished surveys have been made of imported fire ant damage to farm crops and animals, however, none of the farmers were required to document their losses. Because of this lack of documentation, we have begun a series of studies to obtain data on the economic impact of the red imported fire ant on crops, animals, and man. The present paper presents information on the impact of *S. invicta* on the harvest of soybeans.

The study was performed in Lowndes County, Georgia, and resulted in part from comments made by the Extension Chairman of Lowndes County at a meeting of extension personnel held in Tifton, Georgia, in October 1973. The pertinent statement leading to this study was that custom combine operators habitually raised the header bar of their combine to avoid fire ant mounds. It was speculated that this might represent a substantial loss in crop and money to the farmers. Thus, we initiated this study to measure the difference in beans left unharvested in fire ant infested vs. uninfested fields.

#### SURVEY AND PLOT SELECTION

Initial surveys for imported fire ants involved several thousand acres of soybeans in the southwestern portion of Lowndes County which had been treated with 4X Mirex Fire Ant Bait® in early May 1974. The northeastern quadrant of the county did not receive a treatment of bait in 1974. No infestations of the imported fire ant were located in the southwestern portion of the county during the initial survey in late June, though several heavy infestations of young colonies were apparent in unharvested crops at the time of the last survey in November. The northeastern portion of the county however, presented a somewhat different picture. In the area to the east of Staten Road, and north of U. S. Highway 84, excluding the city limits of Valdosta, populations of *S. invicta* were abundant, particularly on right-of-ways, in pastures, and in the peripheral areas of croplands. Infestations were heaviest near the community of Barretts, and in that portion of the county bordering Berrien and Lanier counties. A survey of this portion of the county in June 1974 revealed one soybean field supporting a heavy fire ant infestation. This field measured 7.69 acres (416 X 806 ft), and was located on State Road 125, approximately 11 miles northeast of the city of Valdosta. Initial investigations indicated a heavy peripheral infestation of *S. invicta*, with a moderately heavy infestation within the field itself. The extent of the infestation within the field was not apparent at the time of the initial survey because of the density of the soybean foliage. Subsequent counts of six ½-acre circular areas taken after harvest revealed an average infestation rate of 44 mature mounds per acre. This field was selected as an example of a moderately infested field and served as our experimental plot. Mounds within

the infested field varied in size from 8 to 20 inches in diameter and from 4-10 in. high.

A second field of approximately 30 acres was located in the vicinity with a moderate peripheral infestation but with no apparent mounds within the field itself. A portion of this field, randomly selected and measuring exactly 7.69 acres (416 X 806 ft), served as the noninfested field. A postharvest survey revealed only one mature mound in six ½-acre circular sample plots. There is no plausible explanation as to why one field was heavily infested, while the other showed no infestation, though they were separated by less than one mile. Bragg variety soybeans were planted in both fields, and both received the same basic treatment during the growing season. Both fields were planted on 38-inch rows, thus giving the same theoretical plant density per field.

### SAMPLING AND HARVESTING PROCEDURES

Each field was mapped, and 16 subsample plots measuring 0.01 acre each (6.3 X 69.1 ft) were selected for postharvest survey. Each individual plot included two adjacent rows measuring 69.1 ft in length. After combining, each subsample plot was hand gleaned of all bean pods remaining on the stubble. Samples were returned to the laboratory, hand-shelled, cleaned, and weighed. Results were tabulated and compared both individually and collectively.

Combining of both fields was accomplished by the same combine operator and from our observations, following the same basic combining techniques. In each instance the operator raised the header bar of the combine as he approached a fire ant mound. This technique is apparently common among custom combine operators of this area to protect the header bar from the abrasive action of the tumulus of the fire ant mound.

### RESULTS

Individual and collective comparisons of the samples revealed variations greater than two-fold in seven of the 16 paired samples between the infested and noninfested plots; one paired set had a variation greater than six-fold. The "t" test was used to compare two sets of 16 subplots. The calculated value of 2.89 was greater than the value of  $t(.05)$  for 15 df (2.13). Thus, there was a significant difference between the amount of beans collected from the infested and the noninfested fields.

A comparison of the collective subsamples of the two fields revealed slightly more than a two-fold variation. Soybean samples gleaned from the stubble of the noninfested field averaged 0.25 bushel, or 15.00 pounds per acre compared to an average of 0.52 bushel, or 31.20 pounds per acre from the fire ant infested field, a difference of 0.27 bushel, or 16.20 pounds per acre. The actual yield of soybeans as harvested by the combine for the infested and noninfested fields was 42.3 and 44.2 bushels per acre, respectively (Table 1).

Table 1. — Data on yield and loss of soybeans during harvest in fields infested or noninfested with the red imported fire ant.

Plot	Soybeans harvested with combine		Soybeans remaining in field after combining		Loss (\$) due to fire ants
	Bu/acre	Value (\$)	Bu/acre	Value (\$)	
Infested	42.3	380.70	0.52	4.68	2.43
Noninfested	44.2	397.80	0.25	2.25	0

The only obvious variable between the two fields was the presence of the fire ant mounds. The proximity of the two fields would negate any possibility of weather variation in crop production and as indicated, cultivation techniques were identical throughout the growing season. Soil types were identical, being a light sandy loam, typical of most coastal plain soils.

### DISCUSSION

Techniques of combining appear to vary greatly with each individual operator and depend entirely upon their respect for their machinery. The custom operator appeared to have a greater respect for his equipment than the individual farmer since this represented his primary source of income. Others operating in the area, however, primarily farmers owning their own equipment, showed little or no concern for their machinery and probably experienced higher maintenance costs than the custom operator because of ingestion of the tumulus of the fire ant mounds. We observed one breakdown of equipment that resulted from the inability of an operator to see a stump that was covered by a fire ant mound.

It is obvious from our discussions with farmers and combine operators that the loss of soybeans in fire ant infested fields represents only a portion of the true economic loss involved in their harvest. Damage to their equipment also plays a significant role.

To date, all investigations involving soybeans have been in light sandy loam soil. Losses here may be much less than in heavy clay soils where the mounds of fire ant colonies form a rigid brick-like protrusion, and are usually mixed with pebbly ferrous materials. Investigations in areas of heavy clay soils are anticipated in future studies.

Table 2. — Potential loss of soybeans in Georgia resulting from infestations of the red imported fire ant, assuming losses indicated in Table 1.

Year	Acres planted	Price/bu (\$)	Dollar loss at indicated degree infestation			
			10%	25%	50%	75%
1973	670,000	7.50	135,675	339,178	678,375	1,017,562
1974	750,000	9.00	182,250	455,625	911,250	1,366,875

While the actual loss of soybeans in our study areas was small, it represented a considerable monetary loss based on the price of soybeans at the time of harvest, i.e., \$9.00/bushel. At this price, 0.27 bushel represents a monetary loss of \$2.43/acre (Table 1). We have extrapolated the data to soybean production for the state of Georgia for the year 1973 and 1974 assuming that various percentages of the area devoted to soybeans was infested (Table 2). The figures show that depending upon the prevailing price of soybeans, the monetary loss to the farmers of Georgia could range as high as \$1,000,000 if the majority (75%) of the acreage was infested.

### CONCLUSIONS

Our investigation, while limited, shows that indirect loss of soybeans can be expected in the harvest of fields infested with the red imported fire ant. These losses relate directly to the combine operator and his efforts to protect his machinery. All operators, however, do not follow the same harvesting techniques thus allowing for a high degree of variability in the economic assessment of harvesting. This study relates to one soil type only — light, sandy loam. It is strongly suspected that a greater respect for combining equipment is exhibited in areas of heavy clay soil or rocky soil. If this is the case, a greater loss of soybeans can be expected.

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