

## **Final Project Report to the NYSIPM Program, Agricultural IPM 2002-2003**

**Title:** Redefining IPM for Strawberry Production under the Emerging Threat of Anthracnose and Strawberry Sap Beetle

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**Type of Grant:** Monitoring, forecasting, and economic thresholds

**Project Location:** All of NY.

### **Abstract**

A sampling survey of strawberry acreage in New York was conducted to determine the distribution of two pests of increasing concern to strawberry growers in New York: strawberry sap beetle, *Stelidota geminata* (Say), and anthracnose, *Colletotrichum acutatum*. The 2002 sampling for both pests was conducted in a total of 37 strawberry fields at 14 farms, with farms distributed throughout four agricultural regions of New York. The average number of strawberry sap beetle (SSB) captured per whole wheat bread dough trap in fields ranged from 0.4 to 53.6. Trap catches of SSB were lower at farms sampled after berries began ripening, suggesting that the beetles are more attracted to ripe strawberries than the bread dough traps. No specific cultural practices or crops surrounding the strawberry fields were clearly linked to the number of SSB captured in the field. SSB was perceived to be a pest in some locations and not in others, despite its presence at all farms. Further work to understand when beetles are moving into fields in New York, what other crops are important food sources for the beetle, and how far the beetles can disperse will be needed to develop strategies for controlling SSB. Although, severe anthracnose epidemics were observed in some fields in western NY this year, the disease was found in only one of the 37 fields included in the survey this season. The reason for its conspicuous absence, in what appeared to be a season conducive for a widespread epidemic, is under investigation. Most likely, weather conditions in other regions of the state just prior to or during harvest were not as conducive for disease development as it was in western NY or, because many fields were sampled 1 to 2 weeks prior to harvest, fields were surveyed before significant disease development occurred. It has been hypothesized that SSB may help spread anthracnose throughout strawberry fields, although it was impossible to determine during this survey because the disease was only found in one field.

### **Background and justification**

The strawberry sap beetle, *Stelidota geminata* (Say) [Coleoptera: Nitidulidae] and strawberry anthracnose, *Colletotrichum acutatum*, are both pests of strawberry in New York. Strawberry sap beetle (SSB) feeds on overripe strawberries, melons, and rotting fruit underneath other fruit crops including apples, cherries, and blueberries. Beetles likely move between crops during a season as various crops ripen. The beetles are known to overwinter in wooded areas, but the extent to which they overwinter in strawberry fields is unclear. While SSB is present in many fruit crops, it is only a pest in strawberry fields where the adults and larvae feed on berries. Adult feeding damage at first appears as tunnel drilled into the strawberry. Larvae then develop in the strawberry and are noticeable as consumer's process strawberries for making jam or jelly. Adults could potentially vector anthracnose, facilitating the dispersal of anthracnose

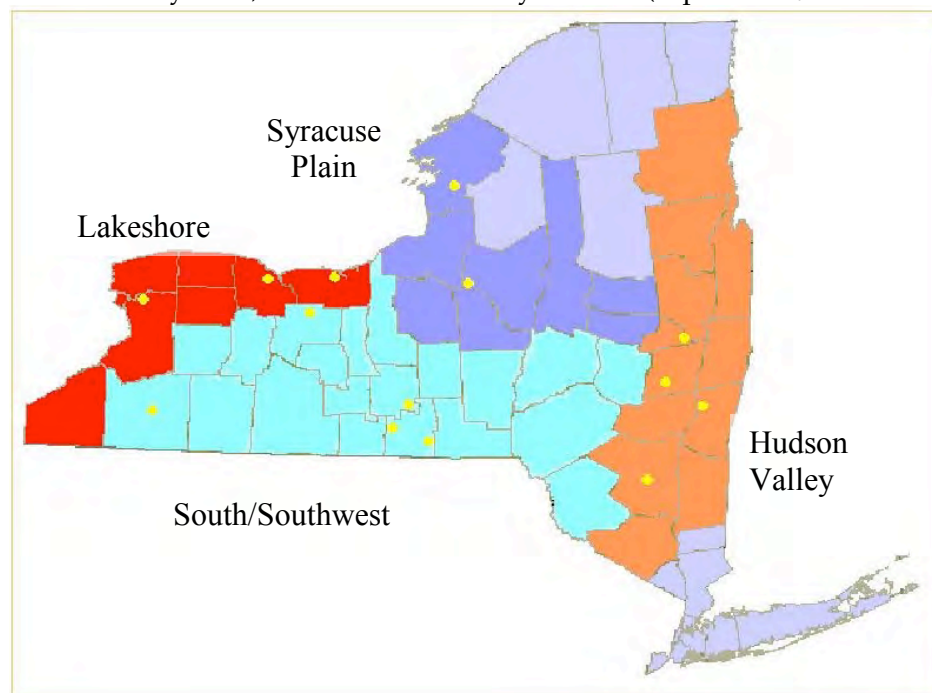
within and perhaps between fields. A survey of strawberry acreage in New York was conducted to determine the distribution of SSB and anthracnose and if the presence of the SSB and anthracnose are correlated. Information was also collected on habitat surrounding strawberry fields as well as strawberry production practices.

## Objectives

- 1) Survey strawberry fields to determine environmental, horticultural, and management factors influencing the distribution of strawberry anthracnose and (SSB) in New York.
- 2) Evaluate the potential for insects, particularly SSB, to serve as a vector of anthracnose.

## Procedures

Membership lists were obtained from the New York and North American Strawberry Growers Associations to create a database of strawberry in New York. Farms were then classified as being located in one of four agricultural regions of New York: Hudson Valley, Syracuse plain area, Lakeshore, and South/Southwest (Figure 1). Approximately 11% of farms from each of the four regions were randomly selected. Growers from selected farms were contacted and asked to participate in the 2001 SSB and anthracnose sampling. Either two or three distinct strawberry fields were identified at each farm, depending on farm layout and number of existing plantings. A total of 37 fields at 14 farms were surveyed. A distinct field was defined as a contiguous plot of strawberries separated by other fields, a road, a fallow field, a crop other than strawberries, or another type of strawberry production system. A minimum of 10 rows of strawberry plants were required but no limit was placed on the maximum size of fields. Fields planted in strawberries in 2001 were excluded as the plants were not fruiting at the time of the sampling. No attempt was made to separate fields based on cultivar, except for exclusion of day neutral strawberries that ripen later in the season. Cultural practices were recorded including strawberry cultivars grown within each field, age of plantings, crops and habitats surrounding each strawberry field, and method of berry harvest (u-pick and/or commercial).



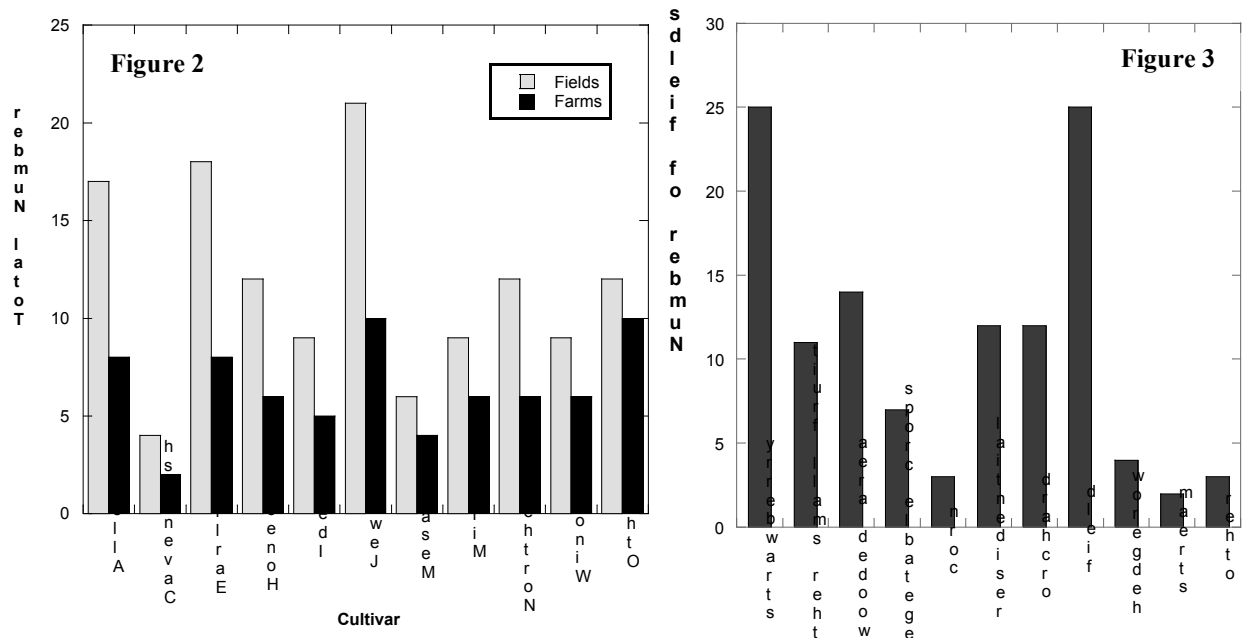
**Figure 1.** Agricultural region classifications of New York used to group strawberry farms. Points indicated with a dot are approximate locations of farms included in the sampling.

Sampling was conducted with baited traps for SSB and visual evaluations in the field for anthracnose. Nitidulid inventory technique traps used were a modification of those used by Williams et al. 1994. A 0.95L polypropylene deli container was baited with approximately 30g of whole wheat bread dough wrapped in nylon fusible knit interfacing material (HTC-Handler Textile Corp., Secaucus, NJ) and secured with a rubber band. Bread dough was mixed following Williams et al. 1994, using 450g whole-wheat flour, 12.5g sugar, 7g package of dry active yeast, and approximately 300mL of distilled water. The opening of the container was screened (7 holes/cm) to exclude larger species of arthropods. A golf course cup cutter was used to create a hole in which the top of the trap was placed at soil level (Williams et al. 1994). A 30.5 x 30.5 cm piece of roofing shingle served as a rain shield and was placed over the trap and secured with either rocks or soil. Two transects of traps were placed approximately 11m apart running perpendicular to the rows of plants. A trap was placed in an edge row and in every other row thereafter, for a total of 5 traps per transect and 10 traps per field. One additional trap without the mesh screening was placed at least 11m away from the other traps along the edge of the field to collect picnic beetles. Strawberry sap beetles and picnic beetles in the traps were counted after one week. Collection of traps from the 14 farms was spread over 20 days beginning on June 13, 2001 and ending on July 2, 2001.

Sampling for anthracnose was conducted at the time SSB traps were collected. Six rows were randomly selected from the rows available in each field and 8 samples per row were evaluated, each approximately 3m apart. For each data point, three of the ripest berries within easy reach were examined in the field for symptoms of anthracnose and the number of affected berries was recorded.

## Results and Discussion

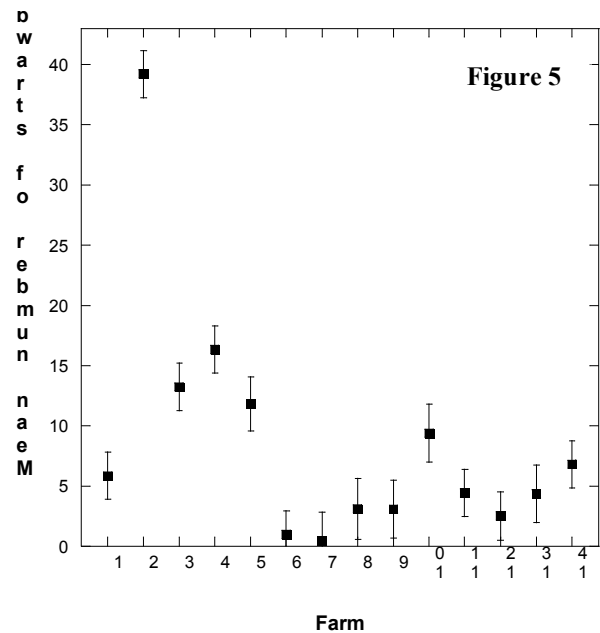
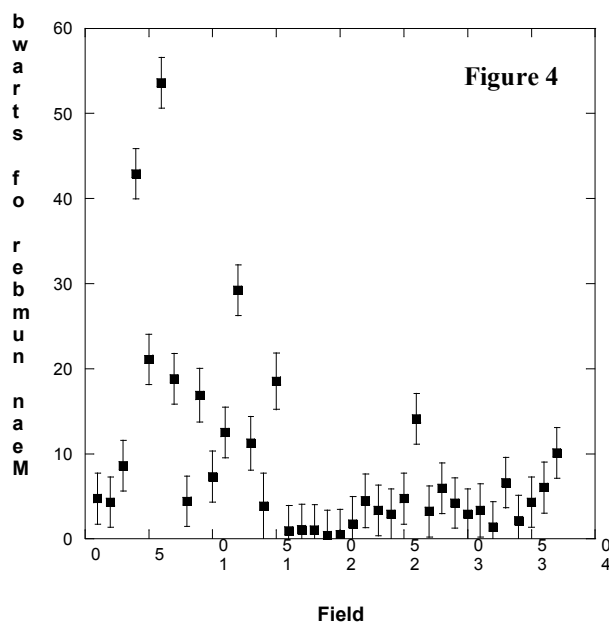
Thirty-seven strawberry fields located at 14 farms were included in the survey. Production systems were primarily matted row (35 fields) although one field had raised beds and another had raised beds covered in black plastic. Overhead irrigation was available for use in 25 fields and trickle tubing in 16 fields (some fields had both). Few growers had applied any irrigation due to the amount of rain in the weeks preceding the sampling. The age of fields ranged from 1 to 5 years of picking, with a mean age of  $2.1 \pm 0.18$  years ( $n=32$  fields with known age). Harvest method was u-pick, commercial pickers, or a combination of both methods in 19, 4, and 14 fields, respectively.



Strawberry cultivars grown are summarized for farms and fields in Figure 2. Cultivars included in the “Other” category were grown in two or less of the fields surveyed and include Annapolis, Cabot, Del Mara, Evangeline, Kent, Lateglow, Latestar, Marabella, Mohawk, Primetime, Red Chief, Rosecot, Seneca, Sparkle, as well as any unidentified cultivars. No attempt was made to determine acreage of each cultivar.

Crops and other significant features of the landscape immediately surrounding strawberry fields in the survey are detailed in Figure 3. Each type of habitat was counted only once for each field regardless of the proportion of the field surrounded by a particular habitat.

The number of strawberry sap beetles by field and by farm are shown in Figures 4 and 5, respectively. More sap beetles were captured in fields visited at the beginning of the sampling period. Berries were green or beginning to ripen in the first fields visited, while berries were ripe or overripe in fields visited later in the sampling period. Although some of the fields visited later in the sampling period had obvious strawberry sap beetle populations, relatively few SSB were captured in the traps.



Anthraxnose was found on berries in only one of 37 fields, with 20% of the berries examined being infected. The field with infected berries had raised beds covered in plastic.

Because sample collection occurred over a three week period, strawberry fields were in varying stages of ripeness when sampled. Variation in berry ripeness also was present within fields of mixed cultivars. In the presence of ripe and overripe berries, it is probable that SSB would be attracted to the ripe fruit instead of the bread dough bait. Future studies of SSB should incorporate some measure of damage to fruit in the evaluation method. Although time of sampling affected the quantity of SSB captured, strawberry sap beetles were found in all of the 37 fields sampled indicating that the beetle is distributed widely across New York. SSB was perceived to be a pest in some locations and not in others, despite its presence at all farms. Further work to understand when beetles are moving into fields in New York, what other crops

are important food sources for the beetle, and how far the beetles can disperse will be needed to develop strategies for controlling SSB.

Anthrachnose was later found on at least one other farm after the sampling was concluded. Disease development is dependent on weather conditions and may have resulted in symptoms not being evident at the time farms were visited for sampling. Sampling of strawberry fields to correlate the presence of SSB and anthracnose in the field is unlikely to determine if SSB is a competent vector of anthracnose. A more controlled study will be necessary to establish the role of SSB in anthracnose dispersal.

## **Literature Cited**

Williams, R.N., M.S.Ellis, and G. Keeney. 1994. A bait attractant study of the Nitidulidae (Coleoptera) at Shawnee state forest in southern Ohio. *The Great Lakes Entomologist* 27:229-234.