

INDIRECT MEASURES OF STRAWBERRY YIELD BASED ON PLANT SIZE DISTRIBUTION AND FRUIT STEM COUNTS

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In most field research trials, strawberry yields are assessed from replicate plots and then statistically compared among the different methyl bromide alternative treatments. In most of these trials, strawberry yields are evaluated from relatively small subplots, generally consisting of a 20 to 50 foot section of row where fruit are harvested and graded into marketable and cull according to industry standards. Many growers openly express mistrust of yield results derived from such small plot research trials, generally indicating that larger, field scale evaluations are necessary to establish credible plant growth and pest control performance evaluations of the alternatives.

Clearly, the time and cost which must be expended to harvest subplots which consist of larger plots or multiple plant rows (each row typically 300 to 400 ft in length) becomes very expensive, particularly when one considers the labor requirement to harvest strawberries on a 2 to 4 day picking schedule from December through March. Depending on environmental conditions, each treatment replicate plot could be expected to be picked 25 to 30 times or more per season. Even for a simple experiment of two treatments, considerable resources must be committed to provide harvesting services (picking, grading) and data collection (labor, record keeping, etc). A simpler, less costly system of evaluating strawberry yield effects on a field scale would be desirable for large scale, field demonstration trialing of the alternatives in replicated blocks. The objectives of the studies reported herein was to evaluate the combined use of end of season plant size assessments and of fruit stem (pedicel) counts per plant to provide a chronological record of total fruit picked from the plant during the season and for estimating relative differences in fruit production between fumigant treatments.

MATERIALS AND METHODS

These fields are identified as JD Farms, FSGA, and JG Farms, all of which were located in Dover, FL. At FSGA, twelve different methyl bromide alternative treatments were evaluated during the 2006-07 strawberry production season. Each of three strawberry fields exhibited significant plant growth reductions due to the sting nematode,

Belonolaimus longicaudatus. At the end of the Florida strawberry harvest season in March and April, plant size distribution were determined by walk survey, counting the number of small, medium, and large plants per unit row length of row within every row of each field. To characterize plant sizes, a long T-handled measuring stick (an 18" ruler bolted to the end of a 1 inch PVC pipe) was used to measure plant canopy diameter in both within and between row directions. Based upon canopy diameter, plants were enumerated into three plant canopy diameter categories, including small (<6 inches), medium (>6 and < 12 inches) and large (>12 inches) plant sizes.

In each field, strawberry plants were arranged in staggered double rows per bed, with plants 12 inches apart across the plant bed and spaced 15 to 16 inches apart along the row. In strawberry, plant densities of the three plant size categories were easily and conveniently expressed per irrigation sprinkler section. Sprinkler sections are the unit lengths of row between raised, overhead irrigation sprinklers, systematically spaced as a grid at 48-50 ft intervals in each of the three strawberry fields. Each sprinkler section, depending upon grid distance, consists of a maximum of 78 to 82 plants per sprinkler section. The number of large plants per sprinkler section was not counted but determined by subtracting numbers of small and medium plants from the maximum number of plants possible per sprinkler section within each of the fields. Plant stand density was also counted and expressed per sprinkler section (unit row length) to account for any dead or missing plants within each chemically treated area or replicate plot. At the FSGA site, differences in plant numbers within each plant size category were then compared between alternative treatments using a complete randomized block design ($P=0.05$) with three replications. Although actual strawberry yields were not measured at each field demonstration site, meaningful differences in plant size distribution were expected to infer seasonal differences in strawberry fruit production due to treatments or as nematode induced crop losses on a field scale.

In addition to field level enumeration of plant sizes, three separate studies were conducted to relate plant size (canopy diameter) to plant weight and other indirect measures of strawberry yield. Immediately after final harvest, 60 individual strawberry plants were harvested from the each of three fields. At each field location, plant canopy diameters were measured both along the row and across the bed before the plants were cut along the mulch / soil interface. This was done to insure equal representation of plants within small, medium, and large size categories. After harvesting, plants were bagged, tagged, and returned to the laboratory where total plant weight was determined, and then foliage weight, both harvestable and developing fruit numbers and weight, flowers, and number of picked

fruit stems (pedicels) counted and recorded.

GENERAL SUMMARY:

- § Both end of season plant size assessment and of fruit stem (pedicel) counts per plant provide a chronological record of total fruit picked from the plant during the season and for estimating relative differences in fruit yield between different fumigant treatments.

- § The relationship between relative numbers of strawberry fruit stems (Pedicels) per plant and average plant canopy diameter were all well described by quadratic, polynomial functions for each of the three farm locations. In general, 70 to 75% of the variability in fruit stem counts per plant was explained by changes in canopy diameter.

- § However, even when the same strawberry variety was used, a very different functional relationship between canopy diameter and counts of fruit stems was observed between farm locations. This would suggest that in addition to cultivar differences, differences in cultural practices (irrigation, plant nutrition, etc.) also significantly influence crop productivity and potential response to the sting nematode and or fumigant treatment.

- § Overall, field scale changes in strawberry crop productivity due to sting nematode and or different soil fumigant treatment can be meaningfully determined, on a farm by farm basis, from post harvest assessments of plant sizes and counts of fruit stems per plant in the differentially treated areas.

Figure 1. The relationship between relative numbers of strawberry fruit stems (Pedicels) per plant and average plant canopy diameter measured at the end of the strawberry production season in each of three commercial fields in Dover, FL. March, 2007.

