

## Alternative Frost/Freeze Protection Systems for Strawberry Production

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### Objectives:

- 1) To evaluate the use of off-center rotary-action sprinklers (the Wobbler<sup>7</sup>) as an alternative to impact sprinklers.
- 2) To evaluate the temperature limitations and extremes when using row-covers of various weights for frost/freeze protection, as well as growth enhancement.
- 3) To evaluate the effectiveness of the combination of over-head water and row covers for frost/freeze protection.
- 4) To evaluate the economics of the use of these alternative frost/freeze protection systems.
- 5) To develop an Extension publication that outlines the design and operational procedures for providing frost/freeze protection to strawberries and other small fruits grown in the Southeast.

### Justification:

Over the past several years there have been significant changes in the production of strawberries. The most significant change is that many producers are discontinuing the matted-row method of production and are adapting the raised-bed plasticulture method. The use of the annual plasticulture production system will promote earlier blooming and ultimately earlier fruit ripening. Annual plasticulture strawberry production requires a significant higher financial investment from producers. Many producers have \$5,000 to \$6,000/A invested in the crop in the fall and as much as \$12,000/A invested by the time the crop is harvested and sold. Therefore, the switch to the annual plasticulture production system demands that producers invest in some method of frost/freeze protection.

Extremely cold temperatures and strong winds limit the use of impact sprinklers. Preliminary trials and grower observations in Tennessee have shown that the Wobbler<sup>7</sup>, an off-center rotary-action sprinkler, will resist freezing to temperatures of less than 10EF, while impact sprinklers tend to freeze at about 18EF. The off-center rotary-action sprinkler has also been observed to be less subject to freezing under extremely windy conditions than the impact sprinklers. Therefore, it is important that a more thorough evaluation of the Wobbler<sup>7</sup> sprinkler be conducted in order to recommend the proper spacing and configuration to producers.

Under extremely windy conditions it is very difficult to keep the heat provided by over-head watering in the field. To thoroughly investigate the extent of protection provided by floating row covers, further evaluations need to be conducted.

While these covers can provide several degrees (EF) of protection, extremely cold and windy nights may require more protection than covers or over-head watering used alone can provide. A combination of these two technologies, combining heat and insulation, appears to offer promise. Further evaluations of the combination of different weight row covers and the Wobbler<sup>7</sup> off-center rotary-action sprinklers are needed.

**Description:**

A series of research plots were developed at The University of Tennessee's Plateau Experiment Station. 'Chandler', 'Camarosa', and 'Sweet Charlie' strawberries were produced utilizing the annual plasticulture method of production. The strawberry plants were grown from tips, and transplanted to the field as plug plants. Wobbler<sup>7</sup> sprinklers were arranged on a 30' x 30' square grid. Row covers of 0.5, 1, 1.2, 1.5, and 2 oz; along with two layers of 1 oz cover, another brand of 0.5 oz cover, and no cover treatments were evaluated. Covers were applied on January 9, 2003 and removed on March 28, 2003. Data were collected concerning air and bud temperatures, ratings of frost/freeze damage, date of first harvest, yield, berry size, and quality evaluations.

**Results:**

The off-center rotary-action sprinklers (the Wobbler<sup>8</sup>) proved to be very effective as an alternative to traditional impact sprinklers. They are less prone to freezing during windy conditions. As the name suggests, Wobblers wobble as they rotate. This movement is transferred to the riser post. After several hours of water application, the risers will loosen within the saturated soil. If the post moves out of the vertical position, wobblers will become locked in one direction and freeze. The authors suggest using re-bar risers that are driven a minimum of 24 inches into the soil.

For the 2002-2003 growing season, there were only three nights of frost/freeze protection. The differences among treatments were not a result of freeze protection treatments, but rather the differences were inversely correlated to cover weight. The 'No-cover' treatment produced the highest yield. The difference was significant ( $p=0.05$ ) for the 'Sweet Charlie', but not significantly different for the 'Chandler' and 'Camarosa'. There were no significant differences among the two brands of 0.5 oz cover; the 1, 1.2, 1.5, and 2 oz covers; or the two layers of 1 oz cover treatments for either of the strawberry varieties. It is speculated that the cover-treatments significantly reduced light transmission during crown development.

**Conclusions:**

Row covers have three basic functions. During the fall and winter, row covers can promote plant development - especially if transplanting was late. During the winter and spring, row covers can be used to promote bud and bloom development. And also during winter and spring, row covers provide some protection from cold temperatures, wind, and frost. Like all weather-related production management tools, the benefit of row covers depends on the weather conditions.

**Impact Statement:**

For frost/freeze protection, the following are recommendations that have been derived from the research results: for frost conditions at or near 32° F, either row covers or overhead irrigation; for temperatures that range from the 25 to 30° F, either row covers or overhead irrigation; for temperatures in from 18 to 24° F, use both row covers and overhead water; for colder temperatures, use both row covers and the off-center rotary-action sprinklers.