

Yield Increase with Early Spring Microclimate Manipulations

Lori Bushway and Marvin Pritts, Department of Horticulture, Cornell University

Many different cultural practices have been recommended to eastern strawberry growers over the years, but none has proven to be consistently beneficial to all growers. The exception to that may be the use of row covers. We have been experimenting with early spring cultural practices and microclimate manipulation and have found row covers and elevated CO₂ under row covers positively impacts plant development, carbohydrate reserves, and productivity in strawberry fields.

We found with traditional straw mulching practices of the northeastern and midwestern United States, starch content of overwintering leaves, crowns, and roots in the field declined by 51%, 78% and 69%, respectively, during late March and early April. There was also a net loss in root biomass and no new leaf growth before mid-April. This suggests to us that carbohydrate reserves in early spring may be insufficient for optimum vegetative growth and subsequent fruiting. If the plants' microclimate was more favorable for photosynthetic activity in late March and April, plant reserves and productivity might be significantly improved.

Synthetic row covers have been used as an alternative to straw mulch in early spring to enhance plant microclimate (light and temperature) while maintaining plant protection from seasonally low temperatures. When temperature and light availability are increased under row covers, CO₂ may become the next essential factor limiting photosynthetic rates and plant productivity. Addition of CO₂ may improve assimilation rates, which could further accelerate new leaf development and reduce competition among reproductive sinks.

In the field, early spring removal of straw and application of spunbonded row cover accelerated plant development, increased starch accumulation in the leaves, and increased photosynthetic rates of overwintering and spring leaves. Elevating the CO₂ levels under row cover further increased photosynthetic rates and advanced plant development and starch accumulation, but not significantly above row cover alone. Carbohydrate losses later in the season during flower development were reduced when row cover was applied in early spring.

Total fruit yield was as much as 48% higher for plants under row cover in early spring than those that had no cover and an additional 9% higher when CO₂ was elevated. Yield improvements were attributed mostly to an increase in the number of marketable secondary and tertiary fruits than to an increase in mean fruit size.

The economics of rowcover use is favorable if the material is reused. The added expense of CO₂ gas and the resulting marginal gains would not make field CO₂ enrichment an economically viable practice for strawberry growers using the method we employed.*

Our recommendation for row cover use is to use straw mulch for winter protection, place the straw in the aisles as soon as the snow melts in early spring, then cover the planting immediately with floating row cover. The material should be removed when flowering commences to allow for pollination. Store row your covers and use them again for several more springs.

The major disadvantage with row covers is that additional episodes of frost protection may be required in the spring as flowering is accelerated. Water can be applied directly over the row cover for frost protection.

Sheets of row cover can be purchased from NYSBGA. Contact:
James Altemus (585) 657 5328 Fax: 657 4642 goodberries@frontiernet.net

*Full details of these studies can be found in the following article:
Lori J. Bushway and Marvin P. Pritts. 2002. Enhancing Early Spring Microclimate to Increase Carbon Resources and Productivity in June-bearing Strawberry. Journal of the American Society for Horticultural Science 127(3): 415-422.
Contact Lori for a copy.

Submitted by:
Lori Bushway (LJB7@cornell.edu or (607) 539-7075)
Senior Extension Associate - Berry Crop Production