Environmental effects of cold-climate strawberry farming

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Strawberries are America's fifth-favorite fruit, according to consumption rates. California and Florida grow more than 95% of the nation's strawberries; an additional 12,000 acres are planted in other states. Strawberries are increasingly grown on small-scale farms in direct-to-consumer markets, which are gaining popularity as part of the emerging "local food movement". But how do growing methods designed to ensure successful strawberry production in colder climates affect the environment?

Matthew D. Stevens, currently with North Carolina State University, and a team of USDA-Agricultural Research Services (ARS) researchers developed an experiment to shed light on that question. Stevens conducted the research while working as a graduate student at the USDA-ARS. Three methods of growing strawberries were compared for the study published in *HortScience*.

The conventional matted row system (CMR) has been the primary method in colder areas. Recently, use of a second method, cold-climate plasticulture (CCP), has increased. Both rely on fumigation and pesticides to protect plants, but use of these elements is being restricted because of environmental concerns. This has led to the development of alternative pest-control measures, including advanced matted row (AMR), the third method tested in the study.

Growing practices were evaluated on sustainability, soil and water conservation, and reduction of movement of soil, nutrients, and

pesticides from fields to nearby water sources. Pesticides, nutrients, and soil particles moved from fields to water systems, even through naturally occurring runoff, have significant negative effects for aquatic ecosystems.

In the AMR beds, a cover crop was planted and later mowed down to create a protective vegetative layer, which reduces weed growth. Both CMR and CCP methods use plastic sheeting to limit weeds. As few insects were observed, no insecticides were used. Automated runoff samplers kept track of the water and soil movement. Runoff samples were analyzed for nitrate, ammonium, and pesticide concentrations. Plants were also analyzed for carbon and nitrogen.

Annual mean soil loss was significantly greater in the CMR compared to the AMR, but neither the CMR nor the AMR annual mean soil loss was significantly different from the annual mean soil loss of the CCP in 2002. Though the annual mean soil losses for CMR and AMR were significantly greater than for CCP, the difference between CMR and AMR was not significant in 2003. Annual mean soil losses in 2004 were not significantly different across the planting methods.

The results indicate that the intensity, duration, and timing of precipitation affected the soil and pesticide losses and runoff volume more than the type of planting system.

Timing of fertilization is very important in CMR production because fertilizer is sprayed onto the plants. This method produced low nutrient uptake and high nutrient runoff. AMR and CCP plants were fertilized underground and resulted in higher nutrient uptake and lower nutrient runoff compared with CMR. Furthermore, CMR plots had the greatest pesticide losses. This makes the CMR system the least effective in controlling soil and pesticide losses. The AMR system was best for erosion control in the first year, but the CCP was better the following

year. AMR runoff also had the lowest pesticide levels.

"These observations suggest that the AMR and CCP systems have less negative effects on our natural resources than the CMR system," Stevens remarked. And, because it does not use non-biodegradable plastic mulch that must be disposed of in a landfill, AMR is more environmentally sustainable for cold-climate strawberry production.

More information: The complete study and abstract are available on the ASHS Hortscience electronic journal web site: hortsci.ashspublications.org/c … nt/abstract/44/2/298

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