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Producing Strawberries in North Florida Using an Outdoor Hydroponic System 97-06

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Introduction

Strawberry is a major crop produced on 6,000 acres annually. The strawberry crop is valued slightly over 100 million dollars, behind only tomato, pepper, and potato in vegetable crops during 1995-96 (anon, 1997). Essentially all strawberries in Florida are grown using plastic mulch culture in fields. Most fields are planted each year with little opportunity for crop rotation. This production system requires soil fumigation each year prior to application of new mulch primarily for control of diseases, weeds, and nematodes. The potential loss of the major fumigant, methyl bromide, after the year 2000 has created a need to search for alternative production systems. Some European strawberry production is being done with soilless bag culture outdoors on raised beds. In addition, a vertical hydroponic production system has also become available through VertiGro, a company based in Kissimmee, Florida (Carpenter, 1997). The VertiGro system uses styrofoam pots filled with a peat and perlite mix on an upright stand. Other greenhouse hydroponic and soilless production systems have also been used for strawberries over the years.

Most of the large commercial strawberry acreage for shipping is located in central Florida near Plant City and Dover. Strawberries are also produced in many other areas of Florida, but are generally grown for local direct sales. Several small farms in North Florida produce strawberries on five acres or less. Approximately 80% of the farms in North Florida are small farms and many are operated by part time farmers. An alternative strawberry production system would be of interest to several small farmers. Without mulching and fumigation equipment, many growers could not grow strawberries in the current plasticulture system.

An outdoor hydroponic system using perlite bags could be a possible alternative system. Currently the greenhouse tomato industry in Florida is using a perlite bag system of production successfully (Hochmuth and Hochmuth, 1996). Much of this system can be adopted for outdoor hydroponic strawberry production.

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Materials and Methods

A trial was conducted in the 1996-97 season at the North Florida Research and Education Center - Suwannee Valley near Live Oak, FL to evaluate outdoor strawberry production using soilless bag culture. Three soilless mediums were evaluated, perlite, a peat mix, and wood fibers. Each was placed in a layflat bag approximately three feet long and ten inches in diameter. Bags were placed end to end on a flat area of soil covered with a black polypropylene ground cover. Bags were arranged in pairs of rows with five feet between the centers of each pair to facilitate spraying with a tractor mounted sprayer.

Irrigation was supplied via half-inch polyethylene tubing laid in the center of each pair of rows. Three plants were planted in each bag and an irrigation emitter was placed at each plant (Hochmuth and Hochmuth, 1996). Emitters were Chapin's "Trickle Stik" with a .05 inch inside diameter leader. A standard hydroponic bag culture, two injectors, and nutrient stock tank system was used (Hochmuth, 1992). Two stock tanks of concentrated nutrient solution were mixed as needed according to the University of Florida recommendations for hydroponic tomato (Hochmuth, 1990). The stage one tomato formula was used throughout the season. This complete formula delivered a final irrigated solution containing 70 ppm N, 50 ppm P, 120 ppm K, 90 ppm Ca, 40 ppm Mg, and 55 ppm S. Micronutrient delivery was 2.8 ppm Fe, 0.2 ppm Cu, 0.8 ppm Mn, 0.3 ppm Zn, 0.7 ppm B, and 0.05 ppm Mo. Six irrigation events per day during daylight hours were determined by time with an irrigation controller.

Bare rooted strawberry plants of three cultivars ('Camarosa', 'Chandler', and 'Sweet Charlie') from California were planted into the bags on 23 October 1996. Each of the three cultivars were planted into bags of perlite. In addition, 'Sweet Charlie' was also planted into bags of a peat mix and bags of wood fibers. Sprinkler irrigation was supplied twice daily, at 11 am and 2 pm for one week to assist transplant establishment. After the first week all irrigation was supplied via the drip emitter system. Future systems will likely benefit by using plug plants to establish the crop in such soilless systems. Disease, insect, and mite populations were managed through integrated pest management scouting and control measures.

Protection from frost and freezing temperatures was provided by application of Agryl polypropylene floating row cover (2.0 ounces per square yard). The cover was held up and away from the plants by using wire hoops anchored in the ground. The wire hoops formed an arch over the bags of strawberry plants. The row cover protected blooms and fruit when ambient temperatures reached as low as 24^{o}F. Fruit was harvested and weighed form 1 January 1997 to 21 May 1997.

Results and Discussion

Monthly and total yield per plant is reported in Table 1. The observational yield data shows similar production of 'Sweet Charlie' in each soilless media. Approximately one pound per plant was produced in each medium. In the perlite system, 'Camarosa' produced 1.8 lbs per plant, 'Chandler' 1.6, and 'Sweet Charlie' 1.1 over the total harvest season. Early season production (January harvests), was highest for 'Camarosa' and 'Sweet Charlie' at about 0.1 lbs per plant followed by 'Chandler'.

These yields of 1.5 to 2.0 lbs per plant were approximately twice the yield of the same plants grown in a traditional field production system using common full-bed polyethylene mulch system with drip irrigation at the same location. The soilless bag culture system may provide opportunities for small or part-time growers to produce a high value crop without high equipment requirements.

Future work with this type of soilless culture is planned at the North Florida Research and Education Center - Suwannee Valley. Plans include evaluation of additional horizontal and vertical soilless systems and other soilless media. Plug plants will be compared to traditional bare rooted transplants. Strawberry cultivar evaluations will continue to determine the best cultivar choices for northern Florida. In addition, the role of slow-release fertilizers in the soilless system will be determined.

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Table 1. Observational yield data for three strawberry cultivars and three different soilless media at Live Oak, FL.

Cultivar	Media	Yield Per Plant (lbs)					
		Total Season	Jan	Feb	Mar	Apr	May
Camarosa	Perlite	1.81	.12	.24	.68	.24	.53
Chandler	Perlite	1.57	.02	.11	.64	.39	.41
Sweet Charlie	Perlite	1.09	.11	.19	.30	.15	.34
Sweet Charlie	Peat Mix	1.02	.06	.12	.39	.14	.32
Sweet Charlie	Wood Fibers	.99	.10	.22	.28	.14	.25