

Hydroponic Tomato and Cucumber Production in Greenhouses at Tobacco Experiment Station in Greeneville

Jim Wills, Gary Honea, Darrell Mundy, Carl Sams, Allen Straw

Interpretative Summary

Two plastic greenhouses previously used for tobacco transplant production at the Tobacco Experiment Station at Greeneville were converted to systems for tomato production in early 2001. One house was used in the fall of 2001 for a crop of hydroponic tomatoes and the second house was used for a split crop of cucumbers and bell peppers. The greenhouse used for tomatoes was 22' x 60' and the house used for the cucumbers and peppers was 32' x 48'. Both houses were covered with single layers of 6 mil polyethylene plastic and had existing heating and cooling capability. The tomato house had a gravel base and the other house had a sand base in 2001 and gravel was installed in January, 2002. Treated post and high tensile wire trellis systems were installed in both houses with four rows in the tomato house and five rows in the cucumber/pepper house. This allowed eight rows of tomatoes (four double rows) with a total of 344 plants in the house. Six rows of cucumbers and four rows of bell peppers were allocated to house two. This system permitted 103 cucumber plants and 137 pepper plants in the second house. In Spring, 2002, a crop of tomatoes and a crop of cucumbers was raised in the respective houses again while the bell pepper crop from 2001 was carried into the 2002 season. In the Fall of 2002, a tomato crop was grown in one house and the second house was not used for any crop production.

Introduction

Many greenhouses in the East Tennessee area that have been used for tobacco transplant production in the past are standing idle. Many growers are searching for alternative crops to produce in these houses. This research was an attempt to grow some potentially high value crops in these houses to evaluate the market potential and the suitability of these houses for vegetable production. Two areas of concern were the relatively small size of the houses and the single layer of polyethylene covers. Yield and quality of all three crops was a major focus of the research in both houses.

Methods and Materials

In October, 2001, a crop of 344 Celebrity variety tomatoes were planted in a 22' x 60' plastic greenhouse. A trellis system of treated posts and high tensile fencing wire was used to support the tomatoes to a height of 7.5 feet. 50% of the tomatoes were planted in 3 gallon black plastic bags and 50% were planted in 36" long by 6" wide by 4" tall white plastic sleeves filled with perlite. Each plant was watered and fertigated with a spray stake in the bag or adjacent to the plant in the long white sleeves with three

plants per sleeve. Harvesting started December 11 and continued until February 11 on the tomatoes. Cucumbers and bell peppers were planted at the same time in the second greenhouse and harvesting of cucumbers started and ended about the same dates. The cucumber crop consisted of both the long English style and the short pickling style. The bell peppers were assorted varieties of types commonly grown in the area. Cucumbers grew very quickly and once harvest started, required harvesting two or three times weekly with the average size of the long English running about 1.3 pounds per cucumber. All three crops were fertigated with the same system and same rate of nutrients which consisted of 4-18-38 soluble fertilizer, calcium nitrate and magnesium sulfate. The water pH from a city water source was 7.2 and was adjusted with nitric acid to a pH of 5.8 to 6.0.

Results and Discussion

The 2001 crop of bell peppers took about 6 months to complete the growing cycle which is costly and time consuming for greenhouse production. While the fruit was of good quality and size and yields were fair, the cost of maintaining this crop was prohibitive given yields and time to produce a mature crop. Based on our results, bell peppers are not a good candidate for greenhouse production due to overall production costs compared to marketable product. Only 731 pounds of peppers were harvested from the pepper crop. Total production cost for the crop was \$1,497.00. Propane costs were \$1,145.00 of the total. Double layers of polyethylene plastic covers would have reduced propane costs to about \$700, which still makes pepper production in greenhouses questionable with respect to potential profit. A total of 1,519 pounds of cucumbers were harvested from the first crop. Total costs to produce the cucumber crop was \$1,717.00. Of this cost, \$1,145.00 was for propane and \$257.00 was for labor. The remainder of the costs, \$316.00, was fertilizer and related supplies and pro-rated fixed costs for equipment. It is quite obvious that single layer polyethylene house covers contributed to significant propane cost for heating the house. Double layer polyethylene covers would have reduced heating cost to approximately \$700 which would make cucumbers profitable at wholesale prices of \$1.00 per pound

and quite profitable at retail prices of \$1.50- \$2.00 per pound. The tomato crop of Celebrity variety produced only 1,121 pounds of total marketable product. The difference in production comparing bags to tubes was statistically insignificant. Conclusions are that upright perlite filled bags are more desirable. Total production costs for this tomato crop were \$2,855.00. Of this total, \$1,890 was propane for heating. Total production costs were \$2.54 per pound of tomatoes. Double layer plastic covers would have reduced propane costs to about \$1,134.00. Total production costs would have been about \$1.87 per pound, still not profitable even at retail prices of \$1.80 per pound.

The Spring and Fall 2002 tomato crops of Trust variety produced 3,341 and 4,948 pounds of tomatoes respectively. Of this total production, marketable product was

2,774 and 3,898 pounds respectively. Total production costs were \$2,348.00 and \$3,880.00 respectively. With wholesale prices of \$0.90 per pound and retail prices of \$1.50 to \$1.80 per pound, tomatoes were somewhat profitable at wholesale prices and reasonably profitable at retail prices. Yields for the Spring crop were still below anticipated yields of 20 pounds per plant ($344 \times 20 = 6,880$ pounds) and above average per plant ($344 \times 12 = 4,128$ pounds) for the Fall crop. The Spring 2002 cucumber crop produced 876 pounds of English type cucumbers. Production costs were \$1,554 for this crop. A price of \$1.77 per pound would be required to break even on this crop.

Conclusions

Based on our yields and costs figures for one Fall and Spring crop of peppers, bell peppers are not a profitable crop to produce in greenhouses. Also, based on one Fall crop of field variety Celebrity tomatoes, these tomatoes do not produce suitable yields to make them profitable for greenhouse production. A Fall crop of cucumbers was profitable while a Spring crop was not profitable. Long term yields and production costs would need to be evaluated to arrive at more dependable estimates. A Spring and Fall crop of Trust variety greenhouse tomatoes were profitable at wholesale prices and even more profitable at retail prices. Double layers of polyethylene plastic on the greenhouses would have potentially reduced heating costs by 30 to 50 percent and increased profits by 20-30 percent.

Copyright © 1999 by [The University of Tennessee](#). All rights reserved.

This research represents one season's data and does not constitute recommendations. After sufficient data is collected over the appropriate number of seasons, final recommendations will be made through research and extension publications.