

Study of the Chilling Requirements of Four Floracane Raspberry Varieties for Greenhouse Raspberry Production

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By
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Introduction:

Following preliminary research by Dr. Marvin Pritts, Cornell University Department of Horticulture on greenhouse raspberry production, Happy Valley Berry Farm started greenhouse raspberry production in 1998 in Southern New Jersey (Cumberland County). After three years of attempts to chill the canes as early in the fall/winter as possible, using weather data from my own records and comparing them with weather data from the nearby Rutgers Agricultural Research and Extension Center (RAREC) data, I found that no chilling started to accumulate until the end of October. Chilling in raspberries occurs when temperatures fall below 45° F. The most efficient chilling occurs between 40 and 45°F. Often any chilling occurring during the night is reversed by days in which the temperature rises above 45° F.

Specific chilling requirements for each variety are unknown but are generally thought to be in the range of 800 to 1000 hours. Raspberry plants in pots can be chilled in cold storage. Prices for cold storage space in commercial operations are in the \$25 per pallet size area per month (2004 prices). This is a costly operation. On farm chilling can be done in a "common storage" where cold night air is drawn into a well insulated structure. In the morning before the temperature rises above 45°F, the fan is shut off and the structure closed up for the day. This works unless there are several days when the temperature is well above 45°F.

We found that we could not safely assume that sufficient chilling had occurred (1000 hours) on our raspberry canes until the end of January. Moving canes into the greenhouse at this time meant that fruit production began about the first of May. There was a relatively short production period before outdoor raspberries started coming into the market and the price fell. With the high cost of greenhouse production and the normally high temperatures in Southern NJ in late May, this made greenhouse production an untenable proposition. If chilling could be completed so that the raspberries could be moved into the greenhouse by the first of December, then greenhouse raspberry production was a much more viable option.

Goals:

1. Determine the chilling requirements of four varieties of raspberry:
Tulameen, the preferred greenhouse variety
Malahat, a variety from the Pacific Northwest
Chiliwack, a variety from the Pacific Northwest
Titan, a large fruited variety from NY
2. Using the knowledge of the specific chilling requirements of these varieties, produce greenhouse raspberries two months earlier than currently possible.

Farm Profile:

Happy Valley Berry Farm is a six acre farm specializing in the production of high quality raspberries. Two greenhouses (5184 ft²) and six high tunnels (10,916 ft²) are currently used for the production of raspberries. Tulameen is the principal variety used for greenhouse raspberry production. Heritage is the principal variety of raspberry grown for high tunnel raspberry production with some Autumn Britten, Caroline and Josephine. As fuel costs have risen greenhouse production has decreased while high tunnel production has increased. In Southern New Jersey raspberries can be harvested from May through

November using high tunnels with a much lower cost of production than can be obtained in greenhouse production. We harvest two crops of raspberries per year - a summer crop that is harvested from the second week in May to the end of July and a fall crop that begins in mid-August and runs through November. Pruning is used to delay fruiting in some high tunnels. Removal of fruiting clusters after harvest promotes further fruiting on the same canes in the fall of the year. A period of cold temperatures below 25°F for several hours usually causes the cessation of harvest in the high tunnels in late November or early December.

Happy Valley Berry Farm also produces black raspberries, blackberries, blueberries, strawberries and hanging strawberry baskets, and a variety of vegetables. Most fruit is sold wholesale, but a portion of the farm's production is sold at farmers' markets.

Participants:

For this project I relied upon Dr. Marvin Pritts, Department of Horticulture, Cornell University, Ithaca, NY, for technical assistance, RAREC, Bridgeton, NJ, for chilling facilities the first year of the project, and Graiff Farms, Vineland, NJ for chilling facilities the second and third years of the project.

Project Activities:

Raspberry plants used for the study were grown in five gallon pots using standard peat-lite mix, pruned to four or five canes per pot. Ten pots of each variety (Tulameen, Chiliwack, Malahat, and Titan) were subjected to treatments of 30, 35, 40 and 45 days, respectively, in refrigerated storage at 40°F. These treatments represented 720, 840, 960, and 1080 hours of chilling, respectively. The 30 day treatment was placed in cold storage on September 14, 2002, the 35 day treatment on September 9, 2002, the 40 day treatment on September 4, 2002, and the 45 day treatment on August 30, 2002. All treatments were removed from cold storage on the same day and placed in the greenhouse.

In 2003, the decision was made to chill the plants earlier in the growing season. Plants were moved into cold storage beginning in July, 2003, using the same staggered introduction (five day intervals) as the previous year. Dr. Pritts thought the fruiting buds on the study plants were too immature to be able to receive the signal from the chilling treatment and thus remained in the vegetative state when placed in the greenhouse for the production period. Raspberry plants not in the study were grown for production purposes until September, then treated to six weeks of temperatures of 40°F and placed in the greenhouse. These plants did produce fruit, although the study plants did not.

The study was once again repeated in 2004, placing the 45 day treatment plants in cold storage beginning the first of September; 40 day treatment went in on September 6; 35 day treatment September 11; and the 30 day treatment went in on September 16, 2004. After chilling for the specified time, plants were placed in the greenhouse and grown for production.



40 day treatment plants in 5 gallon pots after chilling and placement in greenhouse

Results:

2002: The cooler holding the 30 and 35 day treatments broke down over a weekend in October, 2002, heating the plants rather than chilling the plants. This confounded the results. Neither the 30 nor the 35 day treatment plants produced fruit in the 2002-2003 production period, but we did not know whether this was due to a reversal of chilling during the weekend or a true result of insufficient chilling over a 35 day period. Both the 40 and the 45 day treatments produced fruit with no observable difference in the results between the two treatments

2003: The result of the 2003 study was that no plants in this study produced fruit. All plants entered dormancy as the result of the cold treatment (lost foliage) and began regrowth when placed in the greenhouse. However no flowers were produced regardless of the length of the chilling period.

2004: only the 40 and the 45 day treatments produced any quantity of fruit. Some fruit clusters were produced on the 35 day treatment (mostly associated with smaller diameter canes), but not the quantity found on the 40 day treatment. Dr. Pritts indicated that cane diameter is another variable besides variety that determines length of chilling requirement required.



40 day chilled Tulameen raspberries in greenhouse

Economics:

Chilling the plants in cold storage resulted in earlier production of fruit so that all fruit was sold for \$3 per half pint. However between the cost of cold storage and the cost of fuel for heating the greenhouse, early greenhouse production of raspberries in Southern New Jersey is much less profitable than it was when the study began.

Assessment:

The results of this study show that a 40 day cold treatment is consistently sufficient to produce fruiting in the varieties of raspberry studied. Tulameen is by far the best variety of the four studied to produce greenhouse raspberries. We found that Titan berries while large (spectacular for eye appeal) are quite flavorless when produced in the greenhouse. We also learned that there is a limit to how early chilling can be accomplished (in the growing season) as in the 2003 year study where the canes remained vegetative due to immaturity of the fruiting buds.

Adoption:

Unfortunately, the cost of fuel has made greenhouse production of raspberries a poor economic choice. For this reason Happy Valley Berry Farm has changed its focus from greenhouse production to high tunnel production which produces a very high quality berry with a long shelf life (7 to 10 days). We use no pesticides to control fungal diseases and in fact, have little or no problem with gray mold which we attribute to the fact that neither the flowers nor the berries are exposed to rain or dew eliminating one of the factors favoring disease development.



Overview of Happy Valley Berry Farm high tunnels and greenhouse

Report Summary:

The original objective of this study, ie. to produce greenhouse raspberries earlier in the year to take advantage of a higher price has been overshadowed by high energy costs that make greenhouse raspberry production less attractive than it once was. The study was successful in determining that a 40 day chilling period is consistently adequate for obtaining fruit production once canes are sufficiently developed to have mature fruit buds.

Wednesday, January 11, 2006

Information You Can Use from Our Exhibitors & Pesticide Recertification Credits offered for each session

Activ

STRAWBERRIES

Insuring Your Income

Mr. David Lee, Salem Cnty Ag Agent, RCRE

2005 NJ Strawberry Variety Trial

Mr. Peter Probasco, Salem Cnty Ag Agent, RCRE

Fungicide Rotation For Disease Control & Resistance Management

Dr. Andy Wyenandt, Specialist in Vegetable Pathology, RCRE

Fall Strawberry Production on Plastic Mulch and

Winter Row Cover Studies On Annual Strawberries

Mr. Mike Newell, Wye Research & Education Center, Univ. of Maryland Maryland

The Trials and Tribulations Of Growing & Marketing Strawberries

Mr. Greg Donaldson, Co-Owner Donaldson Farms

Morning Sessions

9:30am-11:45am

GREENHOUSES & HIGH TUNNELS

High Tunnel Tomato Production

Mr. Judson Reid, Cornell Cooperative Extension of Yates Cnty

High Tunnel Cut Flower Production

Mr. Ted Blomgren, Cornell Cooperative Extension, Capitol District

High Tunnel Small Fruit Production and Marketing

Mrs. Shirley Kline, Happy Valley Berry Farm

Rutgers High Tunnel Research Update

Dr. A.J. Both, Specialist in Bioresource Engineering, RCRE

SWEET CORN

2006 Sweet Corn Marketing Outlook for New Jersey

Representative of National Agricultural Statistics Service, NJ

When and How to Use Callisto in Your Sweet Corn Weed Control Program

Dr. Brad Majek, Specialist in Weed Control, RCRE

Farmers & Their Ecological Sweet Corn Practices—

A video produced by Dr. Vern Grubinger, Univ of VT

Shown by Ray Samulis

Controlling Sweet Corn Insects in 2006

Dr. Joann Whalen, Specialist in Vegetable Entomology, UDel

Producing Early Sweet Corn Using Transplants

Ms. Sandy Menasha, Cornell Cooperative Extension

Seed Priming—Its Effect on Sweet Corn

Germination & Yield

2006 White Sweet Corn Variety Trial Results

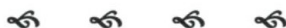
Mr. Ray Samulis, Burlington Cnty Ag Agent, RCRE

Insuring Your Income

Mr. David Lee, Salem Cnty Ag Agent, RCRE



Visit the Trade Show



8am to 5pm

WIC CERTIFIED VENDOR TRAINING

Mr. Ronald Good & Mr. Damon Williams, NJDA

Ms. Janet Prestor, Dept Health—Senior Services

12:30pm-1:30pm

HOW TO BEAT THE ODDS— WOMEN IN AGRICULTURE

Analyzing the Farm Business

Mr. Mike Marandola, Salem Cnty Program Asst, RCRE

Utilizing Government Programs

Ms. Kristin Smolenski, Salem Cnty Program Asst, RCRE

Insuring Your Income

Mr. Gene Gantz, Risk Management Specialist, RMA

Environmental Regulations Update

Mr. Jasen Berkowitz, Salem Cnty Program Asst, RCRE

What You Need For a

Nutrient Management Plan

Mr. Rodger Jany, Salem Cnty Program Assistant, RCRE

Marketing Trends: Organic

Ms. Karen Anderson, Executive Director of NOFA-NJ

FSA's Conservation Programs

Mr. Paul Hlubik, Director & Ms. Coleen McGarrity, NJ FSA

Marketing Trends: Value-Added

Mr. David Lee, Salem Cnty Ag Agent, RCRE

Afternoon Sessions

1:45pm-4:30pm



GENERAL SESSION

Repositioning New Jersey Agriculture

Charles Kuperus—NJ Secretary of Agriculture

New Directions for the NJ Agricultural

Experiment Station, Rutgers

Cooperative Research & Extension

Dr. Robert Goodman—Executive Director,

NJ Agricultural Expt Stn & Dean of Cook College

Two strikes BUT You're Not Out!!

Mr. John Cancelarich—CEO of Regent Associates

Challenges and Opportunities for NJ's

Vegetable & Fruit Growers

Mr. Tom Stenzel, President and CEO of the United

Fresh Fruit & Vegetable Association