NCERA-101 Station Report July-2015
University of Alaska Fairbanks
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New Facilities and Equipment

A replacement greenhouse facility was constructed in 2011 for research and instruction on the University of Alaska Fairbanks campus. The 4,500 square-feet greenhouse is built in two levels adjacent to the south side of an existing building (Arctic Health Research Building) The new greenhouse replaces a 40-year old greenhouse to allow the construction of the Margaret Murie Building for housing the Department of Biology and Wildlife. The first floor with 2,250 square feet of growing space in four sections was completed in December of 2011. These greenhouse sections were occupied in early 2012. The ground level was completed in 2014 with three sections of 750 square feet. A local construction company (Ghemm Company Inc.) built the greenhouse in consultation with the Nexus Greenhouse Systems (Northglenn, Colorado). The facility also includes 1,000 square feet dedicated to growth chambers and a headhouse/teaching lab of 1,700 square feet.

Accomplishment Summary

Grafting vegetable seedlings for field production is expected to decrease days to crop maturity while increasing yields, improving perform during unfavorable climatic conditions, and enhancing resistance to soil-borne diseases and nematodes. Grafting may be a technique to increase earliness and yields of fruited vegetables in northern regions of short growing seasons and cold soils. The cultivar Beaverlodge Slicer was grafted on the rootstocks 'Maxifort', 'DRO138TX' or SuperNatural®. 'Beaverlodge Slicer' was selected because it is adapted to produce mature tomatoes in short field seasons. Only limited advantages of grafting tomatoes were observed for earliness and productivity under field conditions. Although these results did not show significant yield improvements, studies are needed to evaluate additional cultivars, crop management procedures, field locations and seasonal conditions to fully understand the effects of grafting on tomato field production at high latitudes.

Greenhouse tomato growers in northern climates often start seedling propagation during winter months to take advantage of increasing natural light for production. Since natural winter light integrals are low and supplemental lighting is needed, the impact of light quality on grafted seedlings needs to be known for healing success, plant growth, morphology and timing of flower development. Grafted seedlings of 'Komeett' and 'Amsterdam' on the rootstock 'Maxifort' were grown in light qualities of red LEDs (peak emission at 630 and 665 nm), blue LEDs (peak at 455 nm), red/blue LEDs (80:20, peak at 665 and 455 nm), or white LEDs (3700 K). In addition, T5 fluorescent tubes (4100 K) and natural greenhouse light supplemented with high-pressure sodium (HPS) irradiance were included. Flowering was on average 62 days from seeding with no differences among treatments or cultivars. The tallest seedlings after 30 days were those under red LEDs at 27.8 cm (Komeett) and 33.6 cm (Amsterdam). The shortest heights were recorded under red/blue LEDs (15.2 cm for Komeett, 16.8 cm for Amsterdam). The smallest stem diameters were recorded for red LED grown Amsterdam seedlings at 5.0 mm for the scion and 4.6 mm for the rootstock. Although all growing environments supported development of quality transplants, the more compact plants under red/blue LEDs are expected to be preferred for greenhouse crop applications.

Impact Statement

Research activities address the need for information and training to expand production and ensure a continuous supply of high quality local food. Energy efficient lighting technologies for instance, have large impacts on greenhouse operations in far north locations. Training opportunities related to various production systems such as greenhouses, high tunnels and field conditions are regularly offered. Examples of events used for information transfer are the Alaska sustainable agriculture conference with 150 participants and the energy fair at Chena Hot Springs Resort (CHSR) with an estimated 1,000 attendants. These types of gatherings attract people of variable and diverse educational, financial and demographic backgrounds who may not be reached through conventional extension and outreach activities. Daily educational programs on greenhouse operation, management and research are conducted year round at CHSR. A minimum of 15 participants from local and state populations, and visitors from all over the world, attend each tour to receive the information.

Published Written Works

Cook, E. and M. Karlsson. 2015. Light quality impacts on growth, morphology, and flowering of grafted tomato seedlings (in press).

Karlsson, M. 2014. Grafted vegetable transplants for earliness and productivity during northern field seasons. HortScience 49(9):S287.

Karlsson, M. 2014. Controlling the greenhouse environment. University of Alaska Fairbanks, School of Natural Resources and Extension, Cooperative Extension Service HGA-00336.

Karlsson, M. and J. Dawe. 2014. What are the implications of your research? Starting the Broader Impacts conversation in Alaska. Agroborealis 44:46-47.

Outreach

Cook, E. and M. Karlsson. 2015. Hydroponics for vegetable production. Alaska Sustainable Agriculture Conference, March 3-5.

Karlsson, M. 2014. Grafted vegetable transplants. Renewable Energy Fair, Chena Hot Springs Resort. August 17.

Other Relevant Accomplishments and Activities.

In 2014, we hosted the NCERA-101 annual meeting from April 12 to 15. The meeting was held at Chena Hot Springs Resort, 60 miles north-east of Fairbanks, and attracted 75 participants. The last day of the meeting, the participants toured greenhouses and other facilities on the University of Alaska Fairbanks campus.

We have ongoing partnerships with Chena Hot Springs Resort and Pike's Waterfront Lodge. These associations offer opportunities for effective information dissemination to the public, national and international visitors, and commercial producers. These establishments and greenhouse operations also offer training and summer job opportunities for high school and college level students.