



University of New Hampshire

NH Agricultural Experiment Station

Macfarlane Research Greenhouses Research Field Day

March 31 ♦ 9:30 to 11:30 a.m.

Plant Improvement in the Three Major Economically Important Species of Squash and Pumpkin

Greenhouse 2B

Dr. Brent Loy, professor emeritus of plant biology and genetics

Cucurbit breeding research at the Macfarlane Research Greenhouse encompasses melon breeding with graduate student Janel Martin, and plant improvement in the three major economically important species of squash and pumpkin. In all of the species we are breeding for resistance to powdery mildew and overall adaptability to New England growing conditions. In *Cucurbita pepo*, the specific objectives are to improve eating quality and nutritional content in acorn squash. Three commercial varieties have been introduced from this research: Honey Bear, Sugar Bush and Sugar Dumpling. In ornamental pumpkin we have developed more than 20 varieties with the classic orange color, and are now concentrating on developing pumpkins with more diverse rind colors and stripping patterns. This has resulted in the introduction of two white pumpkins, Moonshine and Snowball, and a yellow pumpkin variety, Sunlight. In *C. maxima* the goal has been to introduce kabocha/buttercup varieties with more restricted growth habit. Five varieties are currently available in seed catalogs from this breeding effort: Autumn Cup, Thunder, Eclipse, Space Station and Bagheera. In *C. moschata*, researchers are developing butternut varieties with a more compact growth habit, a high carotenoid content for better nutritional value, improved eating quality, and with powdery mildew resistance. Researchers also are working with processing squash and developing round-fruited cultigens similar in size and appearance to kabocha/buttercup squash, but with better disease and insect resistance.

Breeding Ornamental Strawberries

Greenhouse 2C

Dr. Lise Mahoney, postdoctoral research associate

Researchers working with Dr. Tom Davis are working to improve the fruit quality and increase the duration of flowering in advanced generations. Breeding cycles with parent selections, crosses, generation of progeny and selections are ongoing, and genetic markers are being developed and evaluated for day neutrality and fruit quality traits for use in Marker Assisted Breeding.

Controlled Environment Agriculture Systems

Greenhouse 3A

Dr. Todd Guerdat, assistant professor of agricultural engineering

Guerdat will discuss a sustainable agriculture and food systems course that focuses on the elements of agriculture systems operated in controlled environments (e.g. greenhouses, high tunnels, warehouses, row covers, etc.). This laboratory, hands-on course discusses systems theory and provides hands-on examples of opportunities for designing, controlling, monitoring, and analyzing controlled agricultural environments.

Kiwiberry Development for New England

Greenhouse 3C

William Hastings, graduate research assistant

Greenhouse-based investigations primarily concern best propagation practices for kiwiberry vines. Other projects include obtaining and maintaining documented germplasm of the hardy kiwifruit for the USDA National Plant Germplasm System. Hastings, who works with Dr. Iago Hale, is investigating methods for soft and hardwood propagation of vines and the categorization of germplasm acquisitions. Scientists expect to develop best propagation practices for nurseries and growers. Samples from the collection will be submitted to the ARS National Clonal Repository in Davis, California, and made available nationally.

Investigating Genetic Mechanism(s) of Resistance to Wheat Stem Rust in Barberry

Greenhouse 3C

Radhika Bartaula, doctoral student in genetics

Common European barberry (*Berberis vulgaris*) function as an alternate (sexual) host to globally important rust pathogen of wheat crops but Japanese barberry (*B. thunbergii*) is nonhost. Working with Dr. Iago Hale, Bartaula is conducting controlled inoculations and implementing association studies to investigate the mechanism(s) of rust resistance in these alternate hosts. This work may lead to identification of new sources of durable resistance to wheat stem rust disease.

Applying Engineering Principles to the Design of Recirculating Aquaponic Systems

Greenhouse 5A

Dr. Todd Guerdat, assistant professor of agricultural engineering

Guerdat is leading a fundamental study focusing on the engineering and biological principles for integrating recirculating aquaculture and hydroponic production systems for improved nutrient utilization efficiency. The focus is on developing an environmentally and economically sustainable integrated farming model for food improved intensive production.

Project OASIS: Optimizing Aquaponic Systems for Improved Sustainability

Greenhouse 5A

Dr. Todd Guerdat, assistant professor of agricultural engineering

Guerdat will talk about a student international service project led by a group of undergraduate students from the environmental engineering, mechanical engineering, sustainable agriculture and food systems, Paul College, and biological sciences programs. Having raised more than

\$30,000 in grants, the students' goals are to design an aquaponic system here at UNH and then travel to Costa Rica to install the system for a community in need in Uvita, Costa Rica.

Screening Echinacea Varieties for Lower Leaf Purpling Disorder

Greenhouse 6A

Dr. Ryan Dickson, extension assistant professor of greenhouse management and technologies
Certain popular varieties of Echinacea are prone to developing a disorder where leaves and stems suddenly turn purple to black, negatively affecting the visual appearance and market value of the crop. Researchers are screening Echinacea varieties from two breeding lines under different environmental and cultural practices in an effort to test if the disorder is triggered under certain conditions. Project goals include identifying cultural strategies that growers can use to help prevent leaf purpling and developing screening protocols to help plant breeders evaluate new varieties for susceptibility to leaf purpling.

Pesky Weeds and Patchy Resources: Root Foraging and Competition

Greenhouse 6A

Dr. Carolyn Lowry, postdoctoral research associate
"Root foraging" encompasses the plastic responses utilized by roots to find and exploit soil resources. Researchers working with Dr. Richard Smith are comparing root foraging strategies among maize and common agricultural weeds to evaluate how within and between species differences in root foraging can influence the outcome of maize-weed competition. Results from this work will improve the understanding of how root plasticity and foraging traits enhance crop competitiveness against weeds, thereby increasing our capacity to develop crop genotypes adapted to low-input environments.

Evaluating Wood Fiber and Coconut Coir Effects on pH Buffering Capacity and Nitrogen Drawdown in Container Media

Greenhouse 6B

Dr. Ryan Dickson, extension assistant professor of greenhouse management and technologies
More greenhouse growers are using new wood fiber and coconut coir (husk) materials as growing media components, primarily because these materials are often more sustainable and are low-cost compared to conventional peat moss. Replacing peat with wood fiber and coir influences the pH buffering and nutrient availability in the media, and can potentially increase the risk of nutritional problems developing in the crop. In laboratory and greenhouse experiments, researchers are quantifying the effects of different growing media blends (varying in peat, coir, and two wood fiber materials), limestone type, and the ammonium:nitrate nitrogen ratio in the applied fertilizer on plant quality, lime rate, pH buffering capacity, nitrogen drawdown in the substrate, and nitrogen uptake by roots.

Using Data Logging Scales to Monitor and Control Irrigation in Container Crops

Greenhouse 6B

Dr. Ryan Dickson, extension assistant professor of greenhouse management and technologies
As the old saying goes, "The person who holds the watering hose, also holds the purse strings for your greenhouse business." Good watering practices are critical to growing high quality

crops, and over or under-watering can easily lead to nutritional problems, disease, and plant loss. Scientists are evaluating the potential for new data logging scales linked to a greenhouse environmental control to monitor container water content over time and trigger irrigation events. Project goals include using the scales to help growers improve irrigation practices and monitoring irrigation practices to use as a training tool for new irrigators.

Breeding Strawberry for Organic Agriculture

Greenhouse 6C

Dr. Lise Mahoney, postdoctoral research associate

Cultivars have not been developed for organic agriculture. Researchers working with Dr. Tom Davis have selected parents and made crosses and obtained Organic Certification for three fields at the Woodman Farm where selections are being made. Researchers are working to develop cultivars for eventual commercial release for organic agriculture.

Will Melon Grafted to Interspecific Hybrid Squash Rootstock Have an Increased Tolerance to Cold Soil Temperature and Soil Borne Pathogens?

Greenhouse 6D

Janel Martin, graduate student

Researchers have found that grafting melons onto the rootstocks of hybrid squash substantially increases the production of melons, a potential source of increased revenue for New England farmers. Melons do not grow well in cooler temperatures, and melon vines may be affected by Sudden Wilt that makes them unharvestable. In 2016 field study, melons grafted to interspecific rootstock, some of which were developed by Dr. Brent Loy, were planted three weeks earlier than the standard planting date. Martin found the grafted melons had an increase of 90 percent yield in comparison to nongrafted melon plants.