

2022 UMass Crop and Animal Research Tour & Field Day

August 2, 2022 4-6:30pm

89-91 River Rd., South Deerfield, MA 01373

Stem Cells in Agriculture

Madelaine Bartlett, UMass Biology Department

Stop 1

Stem cells are an important cell type found in all plants, and are critical for plant growth and development, and for crop productivity and yield. We will discuss the basics of stem cell biology, the importance of stem cells in agriculture, and our lab's research on stem cells in corn and other related plants.

Corn and Sorghum Intercropping Reduces Greenhouse Gas Emissions and Fertilizer Loss

David Ahlberg, UMass Microbiology Department, Nüsslein Lab

Stop 2

Some plants, such as sorghum, have evolved the ability to out-compete certain microbes in the root zone for nitrogen rich nutrients and thus acquire more nitrogen fertilizer than other plants. In this experiment, we seek to leverage this trait in an intercropping system with corn, a notoriously nitrogen hungry crop, to not only increase the amount of fertilizer available to both plants but also to reduce greenhouse gas byproducts of microbial turnover of nitrogen fertilizers. In the field we take periodic soil gas emission measurements as well as measuring different forms of nitrogen in the soil to assess the effectiveness of sorghum's suppression of the root-zone bacteria. At the end of the season we measure plant yield and chlorophyll content as proxies for general plant health.

Basil downy mildew resistance

Kelly Allen, UMass Department of Plant Biology

Adrienne Shelton, Vitalis Seeds & UMass Extension Vegetable Program

Stop 3

Basil downy mildew is the most common and most devastating disease of basil in the Northeast. It first arrived in the region in 2008 and there has been a significant effort to develop cultivars with resistance to the disease. There are now many different resistant cultivars that are commercially available, with more being developed. The UMass Extension Vegetable Program is conducting this trial along with Vitalis Seeds, to evaluate the relative downy mildew susceptibility of 13 cultivars, including Dolly, Piama, Aroma 2, Nufar, Evi, the Rutgers varieties Devotion and Obsession, several forms of Prospera, and several numbered cultivars.

Bio- and OMRI-listed pesticides to control diseases of vegetable crops

Susan Scheufele, UMass Extension Vegetable Program
Stop 3

There are many biopesticides and OMRI-listed pesticides on the market today that are labeled for a wide variety of fungal and bacterial diseases on vegetable crops, but there is relatively little efficacy data from field trials on most of these materials. Three common and devastating diseases of vegetable crops are *Cercospora* leaf spot in beets and Swiss chard, and black rot and *Alternaria* leaf spot in brassica crops. These diseases are widespread and occur annually when susceptible crops are present, and there are no resistant varieties available for *Cercospora* or *Alternaria* leaf spots. We are conducting two trials to evaluate the efficacy of several biopesticides/OMRI-listed pesticides against these three diseases, as part of a regional effort of Extension professionals to generate efficacy data. The broccoli trial will also evaluate biopesticides for the IR-4 Project—a USDA program aimed at registering safe and effective pesticides for specialty crops, including vegetables.

Downy mildew resistant cucumber varieties

Genevieve Higgins, UMass Extension Vegetable Program
Stop 3

For many years, the UMass Extension Vegetable Program has evaluated new cucumber varieties with resistance to the damaging cucurbit downy mildew pathogen, with the aim of identifying resistant varieties for fall production. This year we are evaluating 10 varieties, including slicing and pickling types. The varieties being evaluated this year are: Marketmore 76 (susceptible control), SV4142CL, SVCS0025, Lovely, Citadel, EWS-CUC-054, EWS-CUC-052, CWP21ACC, Espirit, and Chaperon. Citadel, Espirit, and SV4142 are varieties that we have determined have good resistance in past trials. Other varieties we have evaluated in the past with good DM resistance include Bristol, NY264, and DMR401.

Innovative summer forages in the Northeast: upright crabgrass, sudangrass, and pearl millet

Arthur Siller and Masoud Hashemi, Stockbridge School of Agriculture
Stop 4

In the Northeast, low availability of perennial cool-season forages during June through August stresses farm budgets and can lead to overgrazing which harms the long-term productivity and health of agricultural lands. Summer forage shortfalls will likely worsen as the climate changes and becomes hotter and dryer. Fast growing summer annual grasses hold great promise to add to summer forage inventory and increase the flexibility of crop rotations at dairy, livestock, and horse farms. Experiments at the UMass research station are investigating the planting date, seeding rate, and nitrogen management of several upright crabgrass varieties as well as the direct comparison of upright crabgrass, sudangrass, and pearl millet as fresh pasture and silage. Additionally, intercropping of sudangrass and pearl millet with clovers is also being explored for improving summer forage quality. This research will be used to develop local crabgrass management recommendations and further develop sudangrass and pearl millet management strategies.

Developing a new spray additive to improve spray coverage and reduce pesticide use

Vishnu Jayaprakash, AgZen/MIT and UMass Extension Vegetable Program
Stop 5

Food as medicine? Bumble bee foraging behavior in response to disease, and consequences for 'medicinal' plants

Gordon Fitch, NSF postdoctoral fellow, UMass Biology Department
Stop 6

Disease may alter the foraging behavior of bees, including inducing 'self-medicating', where bees preferentially forage on flowers that can reduce infection. We are testing whether bumble bees infected with the parasite *Crithidia bombi* self-medicate, and what effect this might have on the reproductive success of 'medicinal' plants, using multiple chemotypes (genotypes that produce distinct chemicals in leaves, flowers, and nectar, but that look similar and freely interbreed with one another) of wild bergamot (*Monarda fistulosa*), some of which reduce *Crithidia* infection while others do not. Wild bergamot is a wildflower commonly recommended for 'pollinator-friendly' plantings, so our results may inform best practices in planning gardens that include the species.

Evaluating bumble bee preferences for medicinal and non-medicinal varieties of basil

Seanne Clemente, Plant Biology Department, Adler Lab
Research Assistants Srinath Vaidheeswaran & Willa Rudel
Stop 7

In previous research, we have found that certain varieties of basil have medicinal effects against the bumble bee parasite *Crithidia bombi*. This summer, we are evaluating whether bumble bees can "self-medicate" and visit medicinal basil varieties when they are infected with *Crithidia*. In the field, we are running choice trials to determine the preferences of infected and uninfected bumble bees for medicinal and non-medicinal basil varieties.

Evaluating the potential for disease transmission between bumble bees in pollinator habitats

Emelia Kusi, Lynn Adler, Dept of Biology
Stop 8

Bees can transmit diseases when they forage on shared plants. We are assessing the potential for such transmission on several flowering plant species common in pollinator habitat, by assessing defecation, pathogen survival, and pathogen acquisition.

Dual Use Solar on Vegetable Farms

Stephen Herbert, Stockbridge School of Agriculture
Stop 8

There is a need for sustainable renewable energy sources to meet ever increasing demands for household and industry electrical needs and for reducing environmental impacts. Solar power is an area of greatest promise for Massachusetts. However, traditional ground mounted solar installations on farmland remove arable land from potential agricultural use when the world also needs more food.

The main objective has been to demonstrate an alternative system of generating electrical energy while still maintaining the land in agriculture. Panel clusters were installed 7.5ft (2.3m) off the ground with spaces between panel clusters varying from 2 to 5ft.

The UMass Student Farm

Amanda Brown, Senior Lecturer, Director UMass Student Farm
Stop 9

The UMass Student Farm is the primary hands-on learning lab for Stockbridge Sustainable Food & Farming majors. Each season up to 15 undergraduate students take part in the cooperative planning and management for our 20-acre certified organic vegetable farm. As UMass student farmers, we commit to providing our campus community with nutritious, organically grown, local produce. We cultivate student empowerment through hands-on agricultural production and by educating our peers about the importance of creating a healthier food system.