



PSPP - Plant Science Says

October 2018

Thank you Dave and Jeff! By Mike Giroux

On behalf of all the PSPP faculty, staff, and students that conduct research at the Post Farm, I would like to thank Dave Gettel and Jeff Todd for all of their expert help this season. Dave and Jeff enable all of us to conduct our research efficiently and properly, from soil testing before planting to emergency combine repairs during harvest. They are always cheerful and positive and looking for ways to work in a more efficient and safe manner even while working long days and many extra hours during the growing season.



Dave Gettel and Jeff Todd with their invention, the chaff collection system. Photo courtesy of Perry Miller (LRES).

Dunkel Receives Edible Insect Award

The Gene DeFoliart Excellence in Entomophagy Research and Leadership Award was presented to Florence Dunkel on August 15, 2018, by the North American Coalition for Insect Agriculture (NACIA). A standing ovation by the attendees showed their appreciation for Dunkel's ongoing efforts.



NACIA is a continent-wide organization of and for educators, researchers and entrepreneurs in the growing "BugAg," movement.

Gene DeFoliart was one of Dunkel's Ph.D. committee members and department chair of Entomology at the University of Wisconsin; however, at the time (1968) neither of them had any idea what was in store for them in helping launch a young industry now in an exponential growth phase worldwide. During the "Dark Ages of Edible Insects," each served as editor of *the Food Insects Newsletter* (1988-2002, 1000 subscribers in 67 countries). The newsletters then became two separate websites:

www.foodinsectsnewsletter.org and <http://labs.russell.wisc.edu/insectsasfood/the-human-use-of-insects-as-a-food->

resource/ and a book (2009), *Chronicle of a Changing Culture*.

Congratulations Florence!

The McPhee Lab By Kevin McPhee

The Montana Pulse Crop Breeding Project is an applied genetics and cultivar development program housed in the Plant Sciences and Plant Pathology Department. The cultivar development program is a cooperative effort between Montana Agricultural Experiment Station and the pulse crop producers of Montana to develop improved cultivars of pea, lentil and chickpea adapted to Montana's climate and cropping systems. The core breeding team includes Kevin McPhee and Derek Lewis. The breeding program is new to MSU, only two years old, and is being built from the ground up. Currently the project includes Jake Tracy, a M.S. graduate student studying salt tolerance in peas, and three undergraduate students, Claire Good, Meggie Tomczyk, and Madison Cherry. The research program is primarily field based but includes greenhouse and laboratory efforts to advance cultivar development.

The breeding program is somewhat unique in that it works with three crops each with multiple market classes. Spring-sown dry pea market classes include, 1) green cotyledon, 2) yellow cotyledon, 3) marrowfat and 4) maple peas. Green and yellow cotyledon market classes are targeted for human consumption in soup mixes as well as fractionated for use as ingredients. Worldwide yellow peas are largely used in animal rations. Marrowfat peas are used in snack foods, often roasted and seasoned with salt or wasabi. Maple peas have a pigmented and mottled seed coat and are used in bird feed or decorticated and used as split yellow peas. Lentil market classes include, red and yellow cotyledon types with specific variations in size of the seed. Red cotyledon lentil types, often referred to as Turkish red lentils, are relatively small and marketed as decorticated whole or split



Desi chickpea blooming in field trials at the Post Farm.



Field pea yield trials at the Post Farm near Bozeman, MT - 2017.

seed. Yellow cotyledon types have a green seed coat or testa and are marketed as either small, medium or large whole lentils. Some markets will can the seed, but most use the mature dry seed whole in soup preparations. Chickpea market classes include the small desi and the larger Kabuli types. Desi chickpeas are often variously pigmented and the seed is angular. The more common market class in the United States is the Kabuli which has a light brown to very white seed coat. Kabuli seeds are large and have more rounded features and are described as having an owls head or rams head appearance. Desi chickpeas are often decorticated and used in soup preparations while Kabuli types are canned

and served in soups or salads. Kabuli chickpeas are also the main ingredient in hummus, a popular spread served with crackers.

Cultural requirements are very similar for all three crops making it possible to manage them in the same program. Pea, lentil and chickpea are primarily grown as a spring crop and are ideally sown in April aiming to avoid the summer heat during flowering and they tend to mature in early (pea and lentil) or late August (chickpeas). The program is further diversified by having pea and lentil types that can be fall-sown and have a winter annual growth habit similar to winter wheat. The primary difference is that the winter legumes can be sown in the spring, flower and produce seed; therefore, they do not require true vernalization as other winter annual crops do. The program established its first fall-sown trials in September 2018 at Bozeman, Conrad and Havre. The fall-sown pea types have similar market classes and end uses as the spring types.

Primary breeding objectives include increased yield potential, disease resistance, harvest ease, end-use quality and winter hardiness for the fall-sown types. Each crop is challenged with its own suite of pathogens but share many similarities. Root rots, virus and foliar pathogens are among the top considerations for breeding and selection. Collaborations with pathologists across Montana and use of greenhouse facilities will be crucial to successfully overcoming these pathogens. Biotic stress is also an important consideration in breeding. Heat, drought and soil conditions are important for all three crops while tolerance to cold winter conditions is additionally important for fall-sown pea and lentil.

Selection and testing efforts are currently focused at Bozeman with small yield trials conducted at Havre, Moccasin and Richland, MT. As the project grows and matures, additional sites for selection in the more concentrated production areas are planned. The current focus is to increase the

availability of specific seed lots, develop genetic populations and evaluate available germplasm accessions for desired traits. A modified bulk-pedigree breeding system is used to advance populations and lines toward homozygosity and individual plants expressing desired phenotypes are typically selected beginning in the F₄. End-use quality evaluations are currently based on visual inspection of size, shape and color of the seed, however, more detailed evaluation of seed composition, especially protein, will be performed in the future to meet the needs of the ingredient industry.

The Montana pulse producers and the Montana Agricultural Experiment Station have been instrumental in supporting the new program and getting it off the ground. Support from the state agricultural experiment stations has been and will continue to be a crucial component of the breeding program and its success in the future.

Collecting Alpine Mushrooms in Alaska By Cathy Cripps

In late August, through a small MSU grant, I was able to extend my research on alpine mushrooms north to Alaska. My former graduate student Kate Mohatt, Ecologist for the Chugach National Forest east of Anchorage, arranged a series of field trips for myself and colleagues Henry Beker, a mycologist from Belgium and Noah Siegl, photographer and mycologist from Massachusetts. Over the course of six days, we collected in a low elevation 'bog' within a Hemlock-Sitka spruce forest, a high elevation bald covered with shrubby birch, an aspen forest filled with *Inocybes* (my specialty), and gravel flats and forests near Turnagain Pass.

The highlight of the week was an exceptional alpine area above treeline, on Crow Pass. Typically, it is a six hour round trip hike to this alpine area, which leaves little time for collecting and processing mushrooms. Instead, we rented a small helicopter (a Robinson R-44) to access this remote site. Since the helicopter was small and had a



Collecting alpine mushrooms via helicopter.



View from the helicopter.



Cathy Cripps, Kate Mohatt, and Storey

serious weight limit, both Kate and Noah had to leave their packs behind, except for the bear spray. The weather was not particularly conducive to flying with intermittent rain and lots of low, quickly moving clouds obscuring the view, but the pilot was able to maneuver around them and set us down in the perfect spot. And the

alpine mushrooms were there! We found them everywhere on moss, in gravel, and with willows and *Dryas*! In all, we collected around 60 species; well worth the trip! Many of these fungi are also found in the Arctic, Scandinavia, Svalbard, Greenland, Iceland (all places I have visited), and alpine areas of our own Rocky Mountains, such as the Beartooth Plateau and the high passes and cirques of the southern Rockies in Colorado. These mushrooms are *only* found in these cold-dominated but disjunct habitats.

We also managed to sample the local beer and seafood, and to visit a wildlife preserve to view bears, caribou, and muskoxen (reintroduced) close up. A full Alaskan adventure!

Landscape design students participate in Park(ing) Day 2018

By Rebekah VanWieren

Landscape design students designed, constructed and installed one pop-up park on College Street as part of an international event, Park(ing) Day (parkinday.org) on Friday, September 21. We could not have asked for a more beautiful fall day. Their project was the only one installed in Montana! For one day, the tiny park successfully challenged people's every-day perceptions of public space. The objectives for this class project, which was part of the



assess material sourcing and disposal strategies, learn construction techniques, develop communication and media relation strategies, and analyze user engagement with the space. We collaborated with the Division of Agricultural Education, which amped up the student learning, design options, and construction quality. A huge thank you to Dr. Dustin Perry and his graduate student, Jondie Rianda, who helped make this project a reality! Also, thank you to David Baumbauer, John Van Delinder - City of Bozeman's Street, Sign, and Signal Superintendent, Greenspace, Gallatin Valley Sod Farm, and all who stopped by.



*Top to bottom:
Installed pop-up park on College St.; planter benches with re-used pallets, hay bales from the BART farm, and flowers from HORT farm; constructing the arbor at the BART farm with help from the Division of Agriculture Education.*

Montana Ag Live October Schedule October 7

Anton Bekkerman, Director of the Montana AG Experiment Stations, "The economic value of public research, including benefits to our agricultural industry".

October 14

Emily Meccage, Forage Specialist in the Department of Animal and Range Science, "Forage production, the backbone of Montana's livestock industry".

October 21

President Cruzado, MSU President, "The Land Grant Mission is alive and well 125 years later!"

October 28

Barry Jacobsen, PSPP Emeritus Professor, Larry Krum, Montana Dept. of Agriculture, Steve Cottom, Seed Potato Grower from Dillon, and President of the Montana Potato Improvement Association, and Laci High, Seed Potato Grower from Twin Bridges, "Everything you always wanted to know about potatoes but were afraid to ask!"



Invited Talks

The International Congress on Plant Pathology (ICPP) was held in Boston from July 29-August 4. David Sands was one of four invited speakers in a concurrent session on Innovative Pest Control Technologies for Smallholder Farmers: Cases from the Field. The session was organized by Amer Fayad, of the Feed the Future Innovation Lab at Virginia Tech (<https://vtechworks.lib.vt.edu/handle/10919/80008>) and Cindy Morris from INRA in Avignon, France, an affiliate professor in our department. Dr. Sands gave an inspiring presentation on "Biological control of *Striga* witch weed in Kenya: from a toothpick to home-grown biocontrol inoculum" that generated lively debate and discussion afterwards.

Grants

Jason Cook, DuPont, "Pioneer Symposium-Genetic Evaluation of Yield using Functional Genomics".

Kevin McPhee, USDA, "Increasing Nitrogen Fixation Potential in Pulses for Environmental and Economic Sustainability".

Ryan Thum, US Army Research Office, "Genetic Characterization of Introduced Floating Hearts to Support Biological Control Development".

Ryan Thum, Aquatic Plant Management Society Inc (AQUPLA), "Identifying Eurasian and hybrid watermilfoil gene expression differences in response to frequently used herbicides for improved adaptive management".

Kevin Wanner, USDA, "Protecting Alfalfa Yield from Weevil Damage in the Intermountain West Region".

Publications

Wei-fang Xu, Hui-shuang Ren, Ting Ou, Ting Lei, Jun-hong Wei, Chuan-shu Huang, Tian Li, Gary Strobel, Ze-yang Zhou, and Jie Xie. Genomic and Functional Characterization of the Endophytic *Bacillus subtilis* 7PJ-16 Strain,

a Potential Biocontrol Agent of Mulberry Fruit Sclerotinose. *Microbial Ecology*. doi.org/10.1007/s00248-018-1247-4.

Strobel, G. (2018). Special Issue: Fungal Endophytes in Plants. Ed. Strobel. *J. Fungi* 2018, 4(3), 104.

Spooky plants

By Toby Day, Extension Horticulture Specialist

A note regarding last month's article: "To my entomological friends in Plant Sciences and Plant Pathology: I apologize that I called the bald-face hornet a "bold-faced" hornet in the September issue of Plant Science Says. I knew the correct spelling, but my fingers decided otherwise. I didn't catch it in editing the article. Thanks for the heads-up."

No plant signifies Halloween more than the pumpkin. We scoop out its guts, carve it into some whimsical or scary face and bring it to life with fire. So much fun! I love Halloween and all it has to offer. But it got me wondering what other plants are synonymous with Halloween? That is when I stumbled across an internet article called "Top Ten Spooky Plants" from Earth Rangers, an online resource to help kids "save animals and protect the earth." I'm not sure what spooky plants have to do with their mission, but I rolled with it. The ten plants include deadly nightshade (*Atropa belladonna*) which is considered "the devil's favorite plant." Also mentioned is Devil's Claw (*Proboscidea louisianica*). The pods of devil's claw, when dried, look like hooks or horns. And of course, there is wolfsbane (*Aconitum*), which the name alone implies something to do with werewolves.

The article also mentions purple devil (*Solanum atropurpureum*) which looks like spikes of death, Chinese lanterns (*Physalis alkekengi*) which looks like a pumpkin covered in lace, cockscomb (*Celosia cristata*) that looks like a brain, dolls' eyes (*Actaea pachypoda*) that – you guessed it – looks like scary little doll eyes looking back at you.



Dracula orchid (Earth Rangers)



Chinese lantern (From Pinterest)



Purple Devil (Earth Rangers)

Also mentioned is witch hazel (*Hamamelis*) that just looks creepy, and ghost plant (*Monotropa uniflora*), which is a parasitic plant that lives in the dark and resembles ghostly figures.

Rounding out the ten are the dracula orchids that are supposed to remind us of bats or dragons. I don't see a bat nor a dragon, but rather a deformed shark. Still scary, if you think about it?

If you want to learn more about these spooky plants, the full article is at <https://www.earthrangers.com/wildwire/top-10/top-ten-spooky-plants/>

Have fun this Halloween and please, send me pictures of your carved pumpkins.

Recipe of the Month

Sour Cream Pumpkin Coffee Cake

Streusel

- 1 cup packed brown sugar
- 1/4 cup all-purpose flour
- 2 teaspoons pumpkin pie spice
- 1/3 cup cold butter
- 1 cup chopped pecans



Batter

- 1/2 cup butter, softened
- 3/4 cup sugar
- 3 large Eggs
- 1 teaspoon vanilla extract
- 2 cups all-purpose flour
- 1 teaspoon baking powder
- 1 teaspoon baking soda
- 1 cup (8 ounces) sour cream

Filling

- 1 can (15 ounces) solid-pack pumpkin
- 1 large egg, lightly beaten
- 1/3 cup sugar
- 1 teaspoon pumpkin pie spice

Preheat oven to 325°. For streusel, in a small bowl, combine brown sugar, flour and pumpkin pie spice. Cut in butter until crumbly. Stir in pecans; set aside.

In a large bowl, cream butter and sugar until light and fluffy. Beat in eggs, one at a time, and vanilla. Combine flour, baking powder and baking soda; add to creamed mixture alternately with sour cream.

Spread half of batter into a greased 13x9-in. baking dish. Sprinkle with half of the streusel. Combine pumpkin, egg, sugar and pumpkin pie spice; drop by tablespoonful's over streusel and spread evenly. Top with remaining batter and streusel.

Bake 45-50 minutes or until a toothpick inserted in center comes out clean. Cool on a wire rack.

October Birthdays

Autumn Weis	1
Hannah Turner	6
Derek Lewis	9
Florence Dunkel	10
Bob Sharrock	11
Joseph Fenoglio	11
Monica Brelsford	13
Jamie Sherman	20
Fernando Guillen-Portal	22



Congratulations to Uta and Kevin!



Uta Stuhr and Kevin McKelvy were married on September 2, 2018, at the Springhill Pavilion. Uta and Kevin met in Halle/Saale, Germany in 2012 and they moved to Bozeman in 2015. Kevin works as Client Relations Manager at Wildfire Defense Systems at Four Corners. Uta is pursuing a PhD in Plant Pathology in Dr. Mary Burrows' lab.