From Forest Nursery Notes, Summer 2009

40. Seed propagation of *Sphaeralcea* (globemallow). (ABSTRACT). Smith, A. and Kratsch, H. HortScience 44(4):1139. 2009.

the week- Monday: introduction to gardens, seeds, soils, and worms; Tuesday: plant parts and plant identification; Wednesday: plants as a commodity; Thursday: how plants capture light energy; and Friday: pollinators and their interaction with flowers and harvest. Each day is comprised of several short activities that support specific learning objectives, and student interest is maintained through integrating special speakers, discussions, experiments, field trips, crafts, and snacks that compliment different learning styles. The scientific method is emphasized through a couple of targeted experiments throughout the week as students ask questions, set up the experiments, take data, and discuss results. The greenhouse classroom serves as the home base for the class and the nearby display and trial garden, student organic farm, woods, and College of Biological Sciences Greenhouses serve as frequent field trip destinations. Students are given plants, cut flowers, and/or seeds to take home each day. On the last day of class, students are given an age-appropriate gardening book to provide them with a resource for continued learning.

Specified Source(s) of Funding: Department, College, State, and/or HATCH, University of Minnesota, and the Minnesota Agricultural Experiment Station

Undergraduate Poster Session and Competition - Session 2
Sunday, 26 July 2009 6:00–7:00 pm

***Note:** You must stay with your poster for the full session time period.*

(4) Chilling Requirement to Overcome Bud Dormancy in Chokecherry

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Chokecherry (*Prunus virginiana*) is a native North American plant that has the potential of becoming a regionally important alternative fruit crop. Fifteen open-pollinated seedling populations collected from the Intermountain West were subjected to chilling temperatures (4 °C) for 0, 2, 4, 6, 8 and 10 weeks, and then held under long day conditions (16 h) at 20 ± 2 °C for four weeks. Bud break and shoot growth were then measured on replicate plants to determine chilling requirement for breaking bud dormancy. There was no significant budbreak at less than 4 weeks of chilling, whereas plants chilled for 10 weeks showed 100% budbreak. The amount of chilling required to produce >80% budbreak differed among seedling populations, and ranged from 6 to 10 weeks. The effect of chilling time on terminal shoot elongation also differed among seedling populations. Some populations showed maximum elongation after 6 weeks of chilling, whereas shoot elongation in other populations continued to increase through 10 weeks of chilling. There did not appear to be any correlation between chilling requirement for budbreak, and the effects of chilling on terminal shoot growth. These results indicate genetic variation in chilling response. Among these Intermountain West ecotypes, 10 weeks of chilling maximized both budbreak and terminal shoot growth.

Specified Source(s) of Funding: Utah Botanical Center, Utah State University

(6) Evaluating a Columnar Population of Pink Lady and Fuji Seedlings

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This project was initiated in 1991 with an open pollination of McIntosh Wijcik by Gala to produce an initial population of compact seedling trees. The goal was to incorporate the precocity of Gala into a short-statured, spur-type tree. Precocious seedlings from the original cross that were tolerant to late-spring freezes were selected at Keedysville, MD. Field tolerance to fireblight was also evaluated following summer hailstorms. First generation trees were then hybridized with commercial cultivars such as Pink Lady, Fuji, Braeburn, Commander York, and Red Yorking that are adapted to hot, humid climates. Seedlings from the crosses were germinated and initially evaluated in the greenhouse and set in the field. In January 2008 (at the end of the 5th leaf) trees were sorted by phenotype. Approximately 90% of the wild-type trees were then removed, but all of the columnar trees were retained. The Pink Lady and Fuji populations were evaluated for bloom in April, and tree height, tree spread and fireblight in June. After a series of hailstorms in August, the number of fireblight strikes per tree was counted. Harvest and fruit analysis was conducted weekly from September 5th until October 10th. The data recorded for a representative sample of the fruit included weight, height, width, soluble solids, firmness, ground color, red color and starch. From the tree size data measurements, the compact populations of Pink Lady and Fuji trees had different tree architecture, but only a slight difference in precocity when compared with their wild-type populations. The wild-types for both Fuji and Pink Lady had a height to spread ratio of about 1.4. Compact Pink Lady trees had an average height to spread ratio of 3.38 while the compact Fuji trees had a ratio of 3.92. Fireblight strikes per tree were similar for both populations. Fruit for both compact populations were heavier, but the length-to-diameter (L/D) ratios were identical. Soluble solids were comparable, with a slight but measureable difference in fruit firmness. Fruit from wild-type trees in both cultivars was slightly smaller and firmer. Using the data and taste-test notes made while performing the fruit analysis, elite selections from these Pink Lady and the Fuji populations were identified. We expect to have clones available for commercial trials by 2010.

Specified Source(s) of Funding: Maryland Agricultural Experiment Station, Maryland State Horticultural Society and the Francis R. Gouin Fund

(7) Seed Propagation of *Sphaeralcea* (Globemallow)

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Plants of *Sphaeralcea* are flowering perennials with bright orange to red flowers that add color to landscapes. They are drought-tolerant and considered pioneer species because of their ability to establish quickly in harsh conditions. Three species are native to the Intermountain West and considered desirable for low-water landscapes: *S. grossulariifolia*, *S. parvifolia*, and *S. munroana*. While plants of *Sphaeralcea* are available in the industry, they are not widely distributed because of difficulty with seed propagation and dormancy breaking. A reasonably successful strategy for breaking physical seed dormancy in *Sphaeralcea* is seed nicking. However, this method is not cost-effective on a large scale because the seeds are small (<1 mm in diameter) and seed nicking is labor-intensive. We hypothesized that seeds of *Sphaeralcea* might

exhibit double dormancy. In February 2009, seeds in lots of 50 each were exposed to physical (seed nicking, rock tumbling for 24 hr, and hot-water scarification) and physiological (6 weeks cold-moist stratification) dormancy breaking strategies, alone and in combination to test this hypothesis (n = 5). After dormancy treatments were complete, seeds were germinated on moist filter paper in plastic Petri dishes held on a bench top at 21 °C. Germination was recorded as radicle emergence from the seed. We found no interaction between species and treatment in percent germination among the three species ($P = 0.87$). Germination of seed after nicking alone was 52%. Germination of seed after 6 weeks cold-moist stratification was only 5%. However, the combination of nicking and 6 weeks cold-moist stratification significantly enhanced seed germination over either of these dormancy breaking strategies alone (84%). Seed germination percent after rock tumbling alone was 26%, significantly greater than hot-water scarification. Cold-moist stratification did not improve germination when combined with physical dormancy breaking strategies other than nicking. Our data suggest that *Sphaeralcea* may exhibit double dormancy. Future work should focus on evaluating different rock-tumbler media and time of tumbling to find a viable alternative to nicking for breaking physical seed dormancy in these species.

Specified Source(s) of Funding: Utah State University Undergraduate Research and Creative Opportunities program

(8) Relation Between Metal Accumulation and Surface Characteristics of Leaves and Stems in Two Cultivars of Sweetpotato [*Ipomoea batatas* (L.) Lam.] 'Commensal' and 'Salyboro' Under Salt Stress

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Axillary bud cultures of two cultivars of sweetpotato *Ipomoea batatas* (L.) Lam. 'Commensal' and 'Salyboro' were subjected to salt stress under *in vitro* conditions for 8 weeks. Relative salt concentrations ranged from 0 to 150 mM. Samples were collected after 2, 4, and 6 days after exposure to salt. Another sampling was done at the end of the growing period. The present work reports the results on the early effects up to 6 days. Observations were made on stems and leaves using scanning electron microscopy. Metal analysis was carried out by ICP-Ms. SEM Analysis revealed that in both cultivars stomata distribution and the guard cells shape was affected by salt above 50 mM. Trichome distribution and shape was also affectd. Accumulation of metals, especially micronutrients like Fe, Mn, Cu, and Zn as well as levels of K have some correlation with the morphological changes. These and other results are further discussed in relation to salt tolerance mechanisms of these two cultivars of sweetpotato.

Specified Source(s) of Funding: LSAMP program, CSU

(9) Evaluation of Organic Winter Greens Production in Unheated High Tunnels

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The winter production of cold tolerant organic crops using unheated high tunnels in Colorado shows promise due to high light intensity and abundant cloud-free days; however, to date, no studies have been performed to identify appropriate crops and management techniques are best suited to Colorado's unique environment. Three treatments of floating row covers over salad were evaluated in terms of temperature ranges experienced, plant development, and nitrate accumulation. Ten suitable crops were planted in a certified organic, unheated high tunnel at Colorado State University's Horticulture Field Research Center. *Lactuca sativa* ('Winter Density,' 'Galisse,' 'Cherokee,' 'Focea,' 'Magenta'), *Valerianella locusta* 'Vit,' *Diplotaxis tenuifolia* 'Sylvette,' *Brassica rapa* 'Mei Qing,' Brassica rapa 'Early Mizuna,' and *Brassica juncea* 'Yukina,' were direct seeded on Oct. 30, 2008. The treatments consisted of 1) "1X" a single layer of floating row cover (FRC) (Agribon19 0.5oz. spun bond polyester) suspended with wire hoops, 2) "2X" two layers of FRC suspended with wire hoops, and 3) "0X" uncovered. The treatments were replicated three times over nine completely randomized beds. Three lettuce varieties, 'Galisse,' 'Cherokee,' and 'Focea,' were analyzed for nitrate accumulation at harvest on Feb. 11th, 2009. Temperature increases over external temperatures of 2.90 °C, 6.82 °C, and 7.61 °C were observed for 0X, 1X, and 2X treatments, respectively, while minimum temperatures were elevated 9.94 °C, 19.59 °C, and 21.79 °C, respectively. Lettuce varieties showed a 436% increase in mean plant mass between the 0X and 1X treatments, but only a 23% increase between the 1X and 2X treatments. Asian greens showed disparity, with 'Mei Qing' and 'Yukina' showing an increased mass between 1X and 2X treatments of 90.9% and 89.8%, but with 'Sylvette' and 'Early Mizuna' showing decreased mass of 207.0% and 64.8%. Nitrate accumulation increased with the amount of covering, but differed by variety, with mean concentrations for 'Cherokee,' 'Focea,' and 'Galisse' of 190.4, 150.4, and 157.0 mg/kg NO_3 for 0X, 415.0, 683.4, and 439.3 mg/kg NO_3 for 1X, and 727.3, 1176.3, and 577.1 mg/kg NO_3 for 2X treatment, respectively. No sample demonstrated nitrate levels above the European Commission regulated safety level of 4500 mg/kg NO_3. Results indicate that organic winter production of salad greens in unheated high tunnels with the use of floating row cover is a viable option for Colorado growers, but differential responses to the thickness of cover necessitates further study to determine best management practices for individual crops.

Specified Source(s) of Funding: CSU Specialty Crops Program, Dept.

Crop Physiology/Physiology: Postharvest 1

Monday, 27 July 2009 12:00–12:45 pm

(92) Analytical Evaluation of *Capsicum* Germplasm Resources for Genetic Improvement of Aroma and Flavor in Pepper Fruit

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Capsicum germplasm includes five domesticated species and 25 wild species. *C. annuum* is widely grown worldwide and includes the economically important sweet bell pepper. Related germplasm resources offer rich diversity for genetic improvement of *C. annuum*. Introgression