

## Abstracts of Some Papers Presented at the 2008 Annual Meeting of the Kentucky Academy of Science

Edited by Robert J. Barney

### AGRICULTURAL SCIENCES

Yield and Quality of Vegetables Grown in Sewage Sludge Amended Soil. REGINA R. HILL\*, ERIC TURLEY and GEORGE F. ANTONIOUS, Land Grant Program, Department of Plant and Soil Science, Kentucky State University, Frankfort, KY 40601.

Sewage sludge as a soil amendment is a simple and inexpensive way to improve soil fertility and physical properties of agricultural soils. The nutrients in biosolids can replace commercial fertilizer, while the biosolids organic matter can improve crop yield and quality. The objective of this study was to compare yield and quality of squash, eggplant, bell pepper, and tomato grown under three soil management practices. The soil management practices were: 1) municipal sewage sludge, 2) municipal sewage sludge mixed with yard waste compost, and 3) rototilled bare soil used for comparison purposes.

Six replicates of each soil treatment were established in 18 plots of 22 × 3.7 m each at Kentucky State University Research Farm, Franklin County, KY. The use of sludge in land farming must increase profits in order for it to become an accepted practice among vegetable growers. Mature fruits were harvested from each plot, weighed and graded according to USDA standards. Yields of squash (3,302 lb/acre), eggplant fruits (5,559 lb/acre), and bell pepper fruits (2,008 lb/acre) obtained from sludge mixed with yard waste compost at 15 tons/acre were superior compared to other treatments. Tomato marketable yield from sludge-yard waste and sludge treatments were not significantly different. However, tomatoes grown under both sludge treatments had significantly higher yields than those grown in no mulch treatments.

A Simplified Procedure for Glucosinolates Quantification. GEORGE ANTONIOUS\* and MICHAEL BOMFORD, Community Research Service, Department of Plant and Soil Science, Kentucky State University, Frankfort, KY 40601 and PAUL VINCELLI, Department of Plant Pathology, University of Kentucky, Lexington KY 40546.

Glucosinolates (GSLs), secondary metabolites of *Brassica* plants, are precursors of many natural pesticides, including volatile biofumigants. Consistent and reliable soil-borne pest management with *Brassica* GSLs requires simple, accurate, and fast methods of GSL separation and quantification. The objectives of this investigation were: 1) to develop a simplified procedure for quantification of

GSL in *Brassica* accessions and 2) to determine variation in total GSL and phenol concentrations between plants grown under greenhouse, high tunnels and field conditions. A survey of *Brassica* accessions from the national germplasm repository was conducted to identify potential cover crops that could be soil-incorporated for use as biofumigants. Separation of GSLs from the selected *Brassica* accessions was achieved using ion-exchange sephadex in disposable pipette tips. Quantification of total GSLs was based on liberation of the glucose moiety from the GSL molecule by addition of standardized thioglucosidase (myrosinase) and colorimetry. GSL concentration of greenhouse, high tunnel, and field-grown shoots (leaves and stems) averaged 23, 40 and 76  $\mu\text{moles/g}$  fresh weight, respectively. A comparison of accessions revealed that Ames 8887 of *B. juncea* contained the greatest GSL concentration, but had the lowest biomass yield and ascorbic acid concentration, in part because phytochemical concentration tended to be negatively correlated with biomass yield. More promising was *B. juncea* accession 'Pacific gold' which coupled high biomass yield with above-average GSL production, but had low phenol and ascorbic acid concentration. We conclude that environmental stress on growing plants can increase the concentration of GSLs and total phenols in *Brassica* plants, but does not increase yields of active phytochemicals per unit area.

Ascorbic Acid and Phenol Contents of Hot Pepper Fruits from Eight Countries of Origin. LAUREN LOBEL\* and GEORGE F. ANTONIOUS, Land Grant Program, Department of Plant and Soil Science and TEJINDER S. KOCHHAR, Department of Biology, Kentucky State University, Frankfort, KY 40601.

*Capsicum chinense* has been referred to as the most cultivated pepper in South America. The USDA pepper (*Capsicum* spp.) germplasm collection contains several thousand members or accessions. Many of these species and cultivars have not been analyzed for their concentrations of antioxidant compounds. The main objective of this investigation was to select candidate accessions of hot pepper having high concentrations of ascorbic acid and phenolic content among countries of hot pepper origin for use as parents in breeding for these compounds. Seeds of 63 hot pepper accessions of *C. chinense* were collected from Belize, Brazil, Colombia, Ecuador, Mexico, Peru, Puerto Rico, and United States. Seeds were field grown in a silty-loam soil and their mature fruits were analyzed for ascorbic acid and phenol content. Fruits of *C. chinense* PI-152452 (Brazil) and PI-360726 (Ecuador) contained

\* indicates presenter



the greatest concentrations of ascorbic acid (1.2 and 1.1 mg/g fresh fruit, respectively), while PI-438648 (Mexico) contained the greatest concentration of total phenol content (349 µg/g fresh fruit) among the 63 accessions tested. These accessions were identified as potential candidates for mass production of major antioxidants that have health-promoting properties.

**Absorption and Accumulation of Heavy Metals in Vegetables Grown in Soil-Mixed with Sewage Sludge.** MALEKA EMBRY\* and GEORGE ANTONIOUS, Land Grant Program, Department of Plant and Soil Science, and TEJINDER KOCHHAR, Department of Biology, Kentucky State University, Frankfort, KY 40601.

The use of municipal sewage sludge (MSS) as a source of nutrients in crop production is increasing in the U.S. and worldwide. Recycling this material as a soil amendment would reduce the need for landfill disposal and/or incineration and the impact of disposal on environmental quality. Field studies were conducted at the Kentucky State University Research Farm to determine the concentration of seven heavy metals (Cd, Cr, Ni, Pb, Zn, Cu, and Mo) in sewage sludge and yard waste compost, and monitor heavy metal concentration in edible portions of plants at harvest. In consecutive years the soil was incorporated with MSS and planted with potato, sweet pepper, broccoli, squash, and eggplant. Quantitative analyses of extractable metals using inductively coupled plasma (ICP) showed that Cd, Cr, Ni, and Pb in potato tubers, sweet peppers, and broccoli grown in sludge-amended soil were not significantly different from control plants. Concentrations of Zn, Cu, and Mo were significantly greater in potato tubers and sweet peppers grown in sludge compared to their respective controls. Zinc and Mo in broccoli heads were higher than their control plants. Soil analysis during the five years of the study revealed that Zn and Cu have increased significantly in soil as a result of sludge addition. Plant uptake is one of the main pathways through which metals enter a food chain. The impact of potentially toxic trace metals in sludge applied to cropland can be reduced by growing crops that do not accumulate these metals in their edible portions.

**Heavy Metal Concentrations in the Fruits of *Capsicum chinense*.** GEORGE F. ANTONIOUS, Land Grant Program, Department of Plant and Soil Science, Kentucky State University, Frankfort, KY 40601.

Presently, one of the pollutants of most concern around the world is heavy metals. Elevated concentrations of heavy metals in edible plants could expose consumers to excessive levels of potentially hazardous chemicals. Plant uptake is one of the main pathways through which metals enter the food chain. The main objectives of this investigation were: 1) to select candidate accessions of hot pepper having high concentrations of capsaicin and dihydrocapsaicin for use as parents in breeding for these two compounds, 2) to determine the concentrations of seven heavy metals (Cd, Cr, Ni, Pb, Zn, Cu, and Mo) in

soil and their accumulation in hot pepper fruits, and 3) to determine if the heavy metal content of hot pepper fruit that have elevated levels of capsaicin and dihydrocapsaicin are lower than the permitted heavy metal limits. Twenty-three genotypes of hot pepper seeds from the USDA germplasm collection were grown in the field to identify accessions having increased concentrations of heavy metals in mature fruits. Concentrations and relative proportions of capsaicin, dihydrocapsaicin, and seven heavy metals varied between and within pepper species. Plant Introduction 547069 (*C. annuum*) contained the greatest concentrations of the two pungent compounds. Fruits of PI-439381 and PI-267729 (*C. baccatum*) accumulated the greatest concentrations of Pb, while PI-246331 (*C. annuum*) accumulated the greatest concentration of Cd among accessions tested.

**Conifer Decline and Potential Causes at Baker Arboretum.** RICK HEAVRIN\* and MARTIN STONE, Western Kentucky University, Department of Agriculture, Bowling Green, KY 42101.

The Baker Arboretum is a fifteen-acre private garden established over fifteen years ago near Bowling Green and serves as a horticultural teaching and research facility for students and faculty at Western Kentucky University. The horticultural collections specialize in dwarf conifers, Asian maples, and American and Asian dogwoods, and their hybrids. Over the past few years, an apparently non-pathogenic decline has been seen in the growth of some conifers. By noting the position of the terminal bud scar, textural, and morphological changes in the stem, the growth of thirty-three specimens from four genera has been tracked over the past four years. Growth of thirteen taxa was significantly reduced for the years 2006 and 2007, compared to the previous years' growth (2004 and 2005). Growth of all taxa combined revealed that in 2008 plants grew more than in 2007. Taxa showing improved growth included cultivars of *Cedrus atlantica* and *Chamaecyparis obtusa*. Taxa not growing significantly more than the previous season's low were species and/or cultivars of *Chamaecyparis pisifera*, *Chamaecyparis gracilis*, *Picea orientalis*, *Picea pungens*, and *Pinus nigra*. There were no taxa showing negative growth compared with the previous year. Tests revealed soil pH between 7.0 and 7.6, which was elevated for these acid-loving plants. Base saturation for soil calcium was excessive compared to magnesium. Irrigation water did not contain excessive calcium but was low in magnesium, which may be a contributing factor.

**Investigation of Yield and Quality of Grafted, Heirloom, and Hybrid Tomatoes.** STEPHEN FLOMO\*, DIANA EDLIN, MARTIN STONE and ELMER GRAY, Department of Agriculture, Western Kentucky University, Bowling Green, KY 42101 and NATHAN HOWELL, University of Kentucky Extension, Munfordville, KY 42765.

Tomatoes (*Lycopersicon esculentum* Mill.) are one of the most popular vegetable crops grown for fresh market



and processing in the U.S. Grafting has potential in the U.S. for managing soil-borne diseases, especially for organic heirloom tomato production. The objectives of this study were to examine the effects of grafting heirloom and hybrid cultivars reciprocally and also to determine the impact of self grafting on tomato fruit size, weight, number, and quality. Our cultivars included the heirlooms 'Cherokee Purple' and 'Mister Stripey', and the commercial standards, 'Crista' and 'Maxifort'. The trial was conducted at the WKU Farm in Bowling Green, KY. Transplants were set out on raised beds utilizing drip irrigation to the amount of one acre-inch water each week. The largest fruits were produced by 'Cherokee Purple' due its genetic potential. Fruit size was greatest when 'Cherokee Purple' scion was grafted onto 'Maxifort' rootstock. 'Crista', the hybrid, produced the highest quality fruits regardless of the rootstock. 'Mister Stripey' was more prolific in fruit number but their quality was lower. There was no advantage to self-grafting. One-way analysis of variance using ANOVA with  $P < 0.05$  was used to determine differences among treatments. Means were separated using the Duncan's multiple range test.

**Heirloom and Hybrid Tomato Yield in Organic and Conventional Production Systems.** DIANA EDLIN\*, MARTIN STONE, STEPHEN FLOMO and ELMER GRAY, Western Kentucky University, Department of Agriculture, Bowling Green, KY 42101 and NATHAN HOWELL, University of Kentucky Extension, Munfordville, KY 42765.

Tomatoes are one of the most valuable vegetable crops grown in the U.S. In 2007, 120,000 acres of tomatoes were grown for fresh market production at a value of 1.3 billion dollars. Of this amount, 578 acres were grown in Kentucky. There is much potential in Kentucky for further expanding production, especially in the niche markets such as heirlooms and organic production. We compared yield of two heirloom cultivars, 'Mr. Stripey' (MS) and 'Cherokee Purple' (CP), to a commercial standard, 'Crista' (CR), under two production systems, organic and conventional. Plants were grown on plastic mulch, in raised beds, with drip irrigation beneath plastic, and received one acre-inch of water per week. This was part of a larger study investigating the influence of grafting heirlooms onto commercial rootstocks and their reciprocal grafts. Planting occurred in late May while harvest began August 1st and continued two and three times a week through the end of the season. Organically grown CP yielded significantly heavier and larger fruits compared to those grown conventionally. CR yielded heavier and larger fruits when grown conventionally. MS also yielded the largest fruits when grown conventionally compared to organic. There were no significant differences between cultivars for number of fruit per plant. All cultivars produced higher fruit quality when grown conventionally. For the organically produced heirloom market, CP is the preferred cultivar.

**Impact of Red and Black Plastic Mulch on Yield of Field Grown, Staked Tomatoes.** BRANDON BURCHETT\*, STEPHEN FLOMO, DIANA EDLIN, ELMER GRAY and MARTIN STONE, Western Kentucky University, Bowling Green, KY 42101 and NATHAN HOWELL, University of Kentucky Cooperative Extension, Munfordville, KY 42765.

Staked, field-grown fresh tomatoes hold much opportunity for Kentucky's agricultural entrepreneurs. The opportunity is especially great for the niche fresh market heirloom cultivars. Colored plastic mulch has been shown to impact crop yields but its effect on Kentucky's tomatoes was unknown. We compared the heirloom cultivars, 'Mister Stripey' and 'Cherokee Purple' to the commercial standard, 'Crista'. This was part of a larger study in which the aforementioned cultivars and the commercial rootstock 'Maxifort' were reciprocally grafted and all were grown conventionally or organically. Tomatoes were planted in the field in late May at the Western Kentucky University farm in Bowling Green, KY. Plants were grown on raised beds with drip irrigation under the plastic under red or black plastic mulch. Beginning in early August, harvests were conducted two or three times per week. Fruits grown on red mulch were significantly ( $P < 0.05$ ) heavier and of better quality than those grown on black plastic. However, plants grown on black plastic mulch yielded more but smaller fruits.

**Evaluation of Baby Corn as a Niche Crop for Kentucky.** TARA HOLADAY\* and CRYSTAL WALKER, Transylvania University, Lexington, KY, 40508 and MARTIN STONE, ELMER GRAY and TODD WILLIAN, Western Kentucky University, Department of Agriculture, Bowling Green, KY 42101.

Baby corn is the edible, young, unfertilized ears of corn and is usually consumed fresh or canned. A field trial was conducted during the 2008 growing season at the Western Kentucky University research farm. Three cultivars of field corn were investigated, each with varying degrees of genetic flex. Plots were planted on 30 inch rows, four rows wide, thirty feet long, and data was taken on all rows except the outermost. Three plant population densities of each flex cultivar were planted at 36,000, 46,000, and 57,000 plants per acre. Baby corn was hand harvested on two to three day intervals beginning at 52 DAP (days after planting) and continued for eight harvests through 69 DAP. The highest planting density produced the greatest weight and number of ears and also improved the marketability of ears. The high flex trait produced the greatest weight and number of ears and also increased their marketability. We conclude that producers should plant high flex corn varieties at high densities for optimum baby corn production with the least amount of unmarketable ears.

**Populations of Lady Beetles and Lacewings in Organically Grown Sweet Corn Using PredaLure® Insect Attractant.** JOHN D. SEDLACEK\*, KAREN L. FRI-



LEY, LESLYE S. BRENT and MICHAEL K. BOMFORD, Community Research Service, Kentucky State University, Frankfort, KY 40601.

Sweet corn, *Zea mays* 'Garrison', was grown in 260 m<sup>2</sup> replicated plots using organic production practices. Plots were treated with PredaLure® or were left as untreated controls. One lure was fastened to a tobacco stick placed in the center of the plot and in the center of each plot quadrant. Beneficial insects were sampled weekly during silking using 232 cm<sup>2</sup> yellow sticky traps stapled to each tobacco stick 2.5 cm below each lure. Pink lady beetles, *Coleomegilla maculata*; Asian lady beetles, *Harmonia axyridis*; spotless lady beetle, *Cycloneda munda*; seven-spotted lady beetle, *Coccinella septempunctata*; parenthesis lady beetle, *Hippodamia parenthesis*; convergent lady beetle, *Hippodamia convergens*; big eyed bug, *Geocoris punctipes*, and green lacewing, *Chrysoperla carnea*, were the predatory insects collected on the traps. Pink lady beetle was the most abundant predator caught followed by the big eyed bug. All other predators were not abundant. There was a tendency toward higher numbers of multicolored Asian lady beetles, spotless lady beetles and green lacewings in plots where PredaLure lures had been deployed. However, there were no significant differences in abundance of any of the predatory insects found between PredaLure baited and non baited plots in organically grown sweet corn. This could be due to baited and non baited plots being too close to one another and methyl salicylate plumes saturating both. Other possible explanations may involve the rate of emission of the methyl salicylate from the dispenser or suboptimal placement of the lures in the crop.

Impact of Ripe Pawpaw Fruit Extract on Mortality and Feeding Deterrence of Striped Cucumber Beetles on Squash. KAREN L. FRILEY\*, JOHN D. SEDLACEK, JEREMIAH D. LOWE and KIRK W. POMPER, Community Research Service, Land Grant Program, Kentucky State University, Frankfort, KY 40601.

Laboratory experiments were performed to study the effects of pawpaw (*Asimina triloba*) fruit extract on mortality and feeding deterrence of striped cucumber beetle (*Acalymma vittatum*). Acetogenins were extracted from ripe pawpaw fruit pulp using ethyl alcohol. Concentrations of 0, 10, 100, 1,000, 10,000 and 50,000 ppm were used. Buttercup squash leaf disks 3.5 cm in diameter were treated individually with each concentration and placed on water moistened filter paper in 9 cm plastic Petri dishes. Five striped cucumber beetles were placed on each treated or control leaf disk. Feeding activity was recorded in each Petri dish one and four hours after beetle introduction. All Petri dishes were then placed in an environmental growth chamber set at 27°C and a 16:8 hr light:dark photoperiod. After 24 hr the cucumber beetles were removed. Amount of leaf tissue eaten was calculated by tracing the damaged leaf disks using graph paper and a light table. Beetles did not feed on treated squash leaves at either one or four hours of

exposure. At 24 h striped cucumber beetle mortality was 35%, feeding was lowest and feeding damage least (<1%) on 50,000 ppm pawpaw treated leaf disks. Additional experiments need to be conducted to determine the optimal concentration of ripe pawpaw fruit extract for striped cucumber beetle feeding deterrence. The duration of treatment effectiveness and susceptibility of other pest and beneficial insect pest species to the extracts also need to be determined.

Populations of Lady Beetles and Green Lacewings in Organic, Conventional and Genetically Engineered (Bt) Sweet Corn. LESLYE S. BRENT\*, KAREN L. FRILEY and JOHN D. SEDLACEK, Community Research Service, Kentucky State University, Frankfort, KY 40601.

Lady beetles (Coleoptera: Coccinellidae) and green lacewings (Neuroptera: Chrysopidae) are predators of many small and soft bodied insect pests in agroecosystems. Economically important insects that they prey upon in sweet corn fields include eggs and small larvae of corn earworm, *Helicoverpa zea*; European corn borer, *Ostrinia nubilalis* (Hübner); southwestern corn borer, *Diatraea grandiosella*; and fall armyworm, *Spodoptera frugiperda*. Sweet corn was grown using organic, conventional, and genetically engineered (Bt) production practices. Concerns regarding negative impacts on biodiversity and non target beneficial insects in genetically engineered crops and those which have been treated with broad spectrum insecticides have been voiced. Therefore, the objective of this research was to determine lady beetle species composition and abundance and green lacewing abundance in the three cropping methods of sweet corn. Yellow sticky traps 232 cm<sup>2</sup> in area were used to capture flying insects at tassel and silk height during anthesis in 2006 and 2007. Eight sticky traps were placed equidistant from edges and from each other within the middle row of the center corn subplot in each plot. Sticky traps were serviced weekly for 3 weeks. Pink or 12 spotted lady beetle, *Coleomegilla maculata*, was the most abundant lady beetle caught. Asian multicolored lady beetles, *Harmonia axyridis*, along with six other species of lady beetles, and green lacewings, *Chrysoperla carnea*, were captured but were not abundant. Warrior® insecticide was very toxic to lady beetles whereas Entrust®, an organic insecticide, was not. Results will be discussed in the context of these cropping methods and treatments.

#### ANTHROPOLOGY AND SOCIOLOGY

One-Child Family Policy, What Do We Obtain? ZHENG WANG\* and ELMER GRAY, Department of Agriculture, Western Kentucky University, Bowling Green, KY 42101.

In 1979, the Chinese Government issued the One-Child Family Policy which placed restrictions to control the population size in order to slow down the population growth. Almost three decades have passed since the policy application. During the period, how did the policy impact on the family control and sex ratio become the hottest



topic for many scholars both inside and outside China? The present study, done in the summer of 2008 in Shenyang, China, was conducted to review the past situation, discuss the effect of the policy today, and especially, look into the possible changes and trends in family sizes and sex ratios. The study included 976 university students with equal number of males and females who were surveyed on the number of children in parental, present and projected generations. Average numbers of children were 4.50, 1.64, and 1.73, and secondary sex ratios were 101.22, 108.27, and 107.12 for the parental, present and projected generations, respectively. In the present generation, approximate percentages of families stopping with 1, 2, and 3 children were 54, 34, and 9%, respectively. For desired families in the projected generation, the approximate percentages wanting 0, 1, 2, and 3 children were 9, 19, 66 and 4%; respectively. Comprehensively viewing the history and combining our study results, as well as China's response to the policy, the conclusions include: 1) The One-Child Family Policy did effectively decrease the family size and stabilize the fertility rate at a reasonable level for nearly twenty years from 1990 till today, 2) Extremely strict restrictions and son preference forced people to conceal their true family compositions and to take measures to minimize the number of girls, which directly impacted the sex ratio to be abnormally high, and 3) In the future, it is likely that the policy will be relaxed, permitting two-child families which are preferred by majority of couples. The two-child families will be both genders with male being born first. The sex ratio may gradually recover from male dominance to be more balanced. Also, it is likely that the order of birth may not be a strong consideration for families in the future.

Increasing Public Interest in the Celebration of Chinese New Year in the Bluegrass Region. CHERYL PAN, Department of Curriculum and Instruction, University of Kentucky, Lexington KY 40506.

Chinese New Year is the most important holiday for people of Chinese origin and it is associated with many Chinese cultural traditions. The objective of this project was to assess the public interest in this holiday in the Bluegrass Region. Chinese New Year celebration was held in Lexington for the last three years. The programs consisted of performance of Chinese songs and dances. Data were collected on public attendance, media reports and involvement of public officials. A survey was also conducted on a convenient sample of participants to the events. The number of people attending the public celebration has increased from about 300 in the first year to nearly 1500 in the last year. The racial composition of the participants has changed from mostly Chinese Americans to mostly Caucasians outnumbering Chinese Americans. The supporting public identities for latest event included the school systems, universities, city government and the governor's office. Majority of the participants were people 20–50 years old with some

school age children and senior citizens. These results indicate that there is a growing interest in the celebration of Chinese New Year in the Bluegrass Region, as a result of efforts by prominent artists, community organizations and government agencies.

## BOTANY

Influence of Elevation, Host Species, and Host Size on the Density of Mistletoe, *Phoradendron robustissimum* (Viscaceae) in Costa Rica. JESSICA R. PRICE, Department of Biology, Berea College, Berea, KY 40404.

*Phoradendron robustissimum* (Viscaceae) is an ever-green, dioecious, epiphytic hemiparasitic plant dispersed by birds of certain host trees in Mexico, Costa Rica, and other Central American countries. Its haustorial roots tap into the xylem tissue for water and minerals, while the plant produces its own photosynthate. This study was conducted during the spring of 2008 in the Monteverde Region, Puntarenas Province, of Costa Rica, to examine whether the density of mistletoe, *Phoradendron robustissimum*, is a function of the host species, host size (diameter at breast height [dbh]), and/or elevation of the host species. Eighty-eight *Phoradendron robustissimum* infested trees were identified, and station botanists verified those identifications. Data were then collected on the density of mistletoe by visually counting mistletoe clumps of the infested tree species. The dbh was taken on each host species and the elevation was recorded for each location of *Phoradendron robustissimum*. Within the study site, *P. robustissimum* was found on *Sapium glandulosum* (43 host trees), *S. laurifolium* (2 host trees), and *S. macrocarpum* (43 host trees) in the Euphorbiaceae. Both ANCOVA and ANOVA were run but no significance was found in the data for either test. The small data sample of *Sapium laurifolium* was not used in either of these statistical tests.

Roadside Pennycress (*Thlaspi alliaceum*, Brassicaceae) in Kentucky (1982–2008): An Invasive Exotic Plant and Brassicaceae Associates. RALPH L. THOMPSON\*, Berea College Herbarium, Department of Biology and KATRINA RIVERS THOMPSON, Department of Child and Family Studies, Berea College, Berea, KY 40404.

Garlic or Roadside Pennycress (*Thlaspi alliaceum* L.) is a naturalized, European, fast-growing annual in the Brassicaceae. Its name is derived from the garlic-like odor of the foliage. It typically inhabits ruderal highway roadsides and other disturbed corridors. In the last three decades, it has become abundant along eastern United States interstates, parkways, and main highways in DE, IN, KY, LA, MD, MO, NC, NJ, OH, PA, TN, VA, and WV. Seeds are dispersed in rural corridors through high traffic volumes, extensive mowing programs, and construction and maintenance projects. Garlic Pennycress was discovered as a new species for Kentucky in 1982 by John W. Thieret. During the 1980s, Roadside Pennycress was reported in six counties, 26 counties in the 1990s, and 40 counties from 2000–2006. In 2007–2008, we docu-



mented it in 76 more counties for the current total of 116/120. It was not found in Ballard, Carlisle, Crittenden, and Hickman Counties. Roadside Pennycress has 78 associated species recorded among the 116 counties. Fifty-nine are naturalized (75.64%) of which 24 are state-listed invasive species (40.68%). Twelve species in the Brassicaceae (11 naturalized, 1 native) are associates: *Cardamine hirsuta*, *Barbarea vulgaris*, *Draba verna*, *Thlaspi perfoliatum*, *Thlaspi arvense*, *Brassica rapa*, *Lepidium campestre*, *Alliaria petiolata*, *Capsella bursa-pastoris*, *Arabidopsis thaliana*, *Erysimum repandum*, and *Lepidium virginicum*. *Thlaspi alliaceum* should be strongly considered listing as an invasive exotic pest plant based on its rapid spread into fallow fields, cultivated fields, pastures, and forested borders in Kentucky.

Preliminary Floristic Survey of Old Mulkey Meeting House State Historic Site, Monroe County, Kentucky. RALPH L. THOMPSON\*, Berea College Herbarium, Department of Biology, Berea College, Berea, KY 40404 and RONALD L. JONES, Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475.

Old Mulkey Meeting House State Historic Site, a 32.0 hectare tract of mostly forested land, is located in Monroe County approximately 0.7 km south of Tompkinsville. It was designated a state historic site in 1931. Old Mulkey was originally built in 1804 during the "the Great Awakening" religious movement with John Mulkey as the first preacher. Old Mulkey has historic significance because it is the oldest meeting house in Kentucky, the oldest wooden building of its kind west of the Appalachians, and cemetery of several Revolutionary War soldiers and early pioneer settlers. The historic site lies in the Eastern Highland Rim of the Interior Low Plateau. Elevation ranges from 232 m at Mill Creek to 274 m on an upland ridge. Bedrock is Mississippian shaly calcareous siltstones of the Fort Payne Formation, and shales, siltstones, and limestones of the Salem and Warsaw Limestone Formation. Residual deep, acidic, and well drained soils are Garmon shaly silt loam, Lowell silt loam, Waynesboro loam, and Waynesboro clay loam. Mixed Mesophytic Forest is found in a spring-fed stream ravine and on lower to upland side slopes. Oak-Hickory Forest predominates on higher upland elevations. The known vascular flora comprises 358 specific and infraspecific taxa in 244 genera from 100 families. Taxonomic distribution is nine Polypodiophyta, four Pinophyta, and 345 Magnoliophyta (Liliopsida 81 and Magnoliopsida 264). Asteraceae (46), Poaceae (41), Fabaceae (23), Cyperaceae (18), and Rosaceae (15) are the largest families. Sixty-six (18.4%) are naturalized taxa including 37 Kentucky invasive species.

#### GEOGRAPHY

Threatening Change: Distance and Vicinity to 2001–2005 Temporal Land Cover Change for the Calibration Sites of the 2001 Kentucky Landscape Snapshot Project.

DEMETRIO P. ZOURARAKIS, Kentucky Division of Geographic Information, Frankfort, KY 40601.

A set of 338 calibration/training sites utilized in the creation of the Kentucky portion of the 2001 National Land Cover Dataset (NLCD01) by the Kentucky Landscape Snapshot project (KLS) was selected. The sites were characterized by their proximity to temporal, significant land cover change experienced during the 2001–2005 period, based on a dataset created as a 2005 update of the Kentucky portion of the NLCD01, produced during the Kentucky Landscape Census (KLC) project. Straight line – or Euclidean distances to the training sites from areas of land cover change sites (LCCs) and summary statistics were calculated. While "straight line" distance metrics to changed (2001–2005) areas indicated that training sites still persist in their basic land cover type, 50% of the sites were at 1.4 km or less from a LCC. When grouped by class, the mean distance from calibration sites to LCCs showed slight variation: Oak/Deciduous Bottomland, Floodplain and Woodland Wetland (Total = 423 LCCs; Average = 2.21 km); Oak-Pine, and Hemlock-Deciduous (Total = 236 LCCs; Average = 2.21 km); and Pine, Red Cedar and Hemlock (Total = 136 LCCs; Average = 1.06 km); and Oak, Yellow Poplar and Mixed Deciduous (Total = 595 LCCs; Average = 1.56 km). This proximity to potentially significant landscape change areas is of concern, despite that some of the sites were located on "protected" lands.

#### GEOLOGY

Seasonal Changes in a Eutrophic Lake, Wilgreen Lake, Madison County, Kentucky. RICHARD D. STOCKWELL\* and WALTER S. BOROWSKI, Department of Geography and Geology, Eastern Kentucky University, Richmond, KY, 40475.

Wilgreen Lake (Madison County, Kentucky) covers ~169 acres, and was formed in 1966 by damming Taylor Fork. The Wilgreen watershed drains residential developments, modified woodlands, cattle pasture, and some industrial/urban areas in the city of Richmond. The lake is deemed "nutrient impaired" by the EPA. Our main objective is to document the seasonal changes in key lake parameters from summer stratification through fall overturn over four months of sampling, August through November, 2008. We collected temperature, oxygen, pH, and conductivity data from 19 stations at depth intervals of one meter using an YSI multi-probe. Concurrent with collecting these framework data, we took water samples, also at one-meter intervals, and measured phosphate ( $\text{PO}_4^-$ ), ammonium ( $\text{NH}_4^+$ ), and nitrate ( $\text{NO}_3^-$ ) concentration. Summer stratification exerts a large control on processes occurring within the lake, as does stream inflow. August and September surface temperatures ranged from 25 to 26.5°C, considerably cooler than in 2006 and 2007. The summer thermocline was located between 6 to 7 m. Oxygen concentrations are highest in surface layer of the lake, become disoxic below 3 to 4 m, and are anoxic only for the bottom several meters at our deepest stations. In



2008, a much smaller volume of the lake was anoxic. We attribute these annual differences to a much cooler and wetter early summer in 2008. Much higher nutrient concentrations occur near the largest stream inputs into the lake, either from watershed runoff or from anthropogenic sources near the lakeshore such as septic systems.

Determination of Suspended Sediment Concentrations, Instantaneous Suspended Sediment Loads, and Potential Sources for Suspended Sediment, Dry Creek and Morgan Fork, Rowan County, Kentucky. SAMUEL WILLIAMS\* and STEVEN K. REID, Department of Physical Sciences, Morehead State University, Morehead, KY 40351 and CHRISTINE MCMICHAEL, Institute for Regional Analysis and Public Policy, Morehead State University, Morehead, KY 40351.

The 2007 Kentucky Environmental and Public Protection Cabinet list of impaired streams identifies a segment of Dry Creek from its mouth to 0.5 miles upstream as partially supporting aquatic life due to sedimentation/siltation and organic enrichment (sewage). Urbanization in the Dry Creek watershed is accelerating. This study provides a snapshot of suspended sediment concentrations (SSC) and instantaneous suspended sediment loads in Dry Creek and Morgan Fork (a major tributary) and includes preliminary results of reconnaissance to identify sources of contamination. Suspended sediment sampling used the methods of Edwards and Glysson (1998). Whenever possible, the equal-width-increment (EWI) method and DH-48 sampler were used. Very high or low discharge events required the use of dip or single vertical sampling. Suspended sediment analysis followed procedures of ASTM D3977-97 and Guy (1969). Discharge (Q) was measured using the velocity-area method or neutrally buoyant object method (Rantz et al., 1982) depending on flow conditions. SSC values range from 0 to 341.30 mg/L. Instantaneous suspended sediment loads range from 0 to 510 tons/day. A crude band has begun to emerge on plots of SSC vs. Q. Potential sediment sources include bank erosion and slumping, highway construction, and poor land management practices. Results of this study have led to a new study involving bank-pinning and measurement of channel cross-sections to quantify sediment contributions due to bank instability. In addition, a focused study of the impact of a KY 519 highway construction project has been initiated.

#### HEALTH SCIENCES

Human Sex Ratio and Family Size for a Selected Sample from the India Population in 2007–2008. ARCHANA LAKKARAJU\* and PRAMOD GUPTA, Department of Public Health and ELMER GRAY, Department of Agriculture, Western Kentucky University, Bowling Green, KY 42101.

The human sex ratio is of great interest especially in highly populated countries such as India. When there exists a strong gender preference, efforts to limit population growth may impact the gender balance. In

2007 and 2008, students at nine colleges in Andhra Pradesh, India, were surveyed for family size and secondary sex ratio data. The 1190 respondents (595 of each gender) provided data on parental, present, and projected generations. Average numbers of children were 4.27, 2.99, and 2.10 and sex ratios (males: 100 females) were 101, 87, and 99 for families in the parental, present, and projected generations, respectively. For the present generation, percentages of families stopping with 1, 2, 3 and 4 children were 6.6, 32.9, 32.8 and 17.1%, respectively. A total of 123 or 10.4% of the families had more than four children. For desired families, the percentages wanting 0, 1, 2, 3, and more than 3 children were 5.0, 14.9, 68.6, 8.47, and 7.94%, respectively. More than two-thirds (68.6%) of the respondents desired two children. For desired families of two and three children, preferences were for both sexes with the male being born first. Within all desired families, all males were preferred over all females, indicating a continuing son preference. However, the presence of both sexes in families of the present generation and the preference for both sexes in families of the projected generation were associated with smaller families than those with all male.

Life Expectancy and the Human Sex Ratio. PRAMOD R. GUPTA\*, Department of Public Health and ELMER GRAY, Department of Agriculture, Western Kentucky University, Bowling Green, KY 42101.

Both life expectancies and secondary sex ratios vary among countries of the world. The secondary sex ratio (males: 100 females) changes with advancing age of life. The objectives of the present study were to characterize life expectancies and sex ratios for countries of the world and to explore possible relationships between these two indices of the human population. Data for the year 2006 were obtained for 209 countries from Central Intelligence Agency World Fact Book (ISSN 1553-8133). Life expectancy data were available for males and females and sex ratio data were provided for different stages: at birth, under 15, 15 to 65, over 65, and total. Life expectancies ranged from 32.6 in Swaziland (M 32.1 to F 33.2) to 83.5 in Andorra (M 80.6 to F 86.6). Worldwide women live longer than men in virtually all countries; female mortality rates are lower than males at practically all ages. Averages and ranges for the sex ratios (males per female) were: 1.049 (1.0 to 1.17 at birth), 1.041 (0.96 to 1.13 under 15), 1.021 (0.70 to 2.24 for 15 to 65), 0.812 (0.46 to 2.84 over 65), and 1.004 (0.77 to 1.84 total). The sex ratio at birth is highest. Due to generally higher life expectancy of females, sex ratio tends to even out in adult population and result in an excess of females among the elderly. Linear correlations between sex ratios for adjacent stages of life were positive and significant; however, correlations between ratios of separated stages were not significant. Correlations between life expectancy and ratios at birth and under 15 were positive and significant but not significant for other stages or for the total sex ratio because the most important single factor in



increase in life expectancy is reduction of death in childhood. There were great variations in life expectancy worldwide, mostly caused by differences in public health, medicine and nutrition from country to country.

Effects of a Body Conditioning Class on the Body Weight and Body Composition of College Students. JO SLOAN\*, CECIL BUTLER, LINGYU HUANG, and CHANGZHENG WANG, Human Nutrition Program, Kentucky State University, Frankfort, KY 40601.

The lack of physical exercise is one of the major factors responsible for the obesity epidemic in the United States. Kentucky State University offers a body conditioning class to college students to motivate them to be active and provide instructions on how to adopt various exercises into their daily life. The objective of this study was to determine the potential impact of this class on body weight and composition of college students. A total of 50 students enrolled in the class met twice per week for 17 weeks. Each class lasted 50 minutes. The students were given instructions first and then engaged in a series of flexibility exercises, track exercises and localized body strengthening activities. The students were measured for body weight, height and body fat percent at the beginning and the end of the semester with a Tanita TBF -521 body composition analyzer. No consistent changes in body weight and fat percent were observed among these students during the semester. This result suggests that modifications of the course content may be necessary to encourage the students to become more active physically.

#### PHYSIOLOGY AND BIOCHEMISTRY

Sugar Modifies the Water Activity and Water Phase Salt Content of Smoked Paddlefish Meat. KIA RODRIGUEZ\*, CECIL BUTLER, LINGYU HUANG, CHANG ZHENG WANG, RICK ONDERS and STEVEN D. MIMS, Human Nutrition Program, Kentucky State University, Frankfort, KY 40601.

The Food and Drug Administration requires that smoked fish contains a minimum of 3.5% water phase salt to ensure the water activity of the product is low enough to inhibit the growth of *C. botulinum*. The objective was to determine the effects of sugar added to the brining solution on the water activity and water phase salt content of smoked whole paddlefish. Three paddlefish each were brined in a 15% salt solution with 92.5 g, 185 g or 370 g of sugar per gallon of brine in a vacuum tumbler for 1 hr. At the end of the brining, fish were rinsed in tap water and left to dry at 4°C overnight. They were hot smoked until the internal temperature reached 145°C for 30 min. After cooling down in a refrigerator, the smoked fish were vacuum-packed and stored at -20°C before analysis. The smoked meat was homogenized in a grinder. Two-gram samples were soaked in distilled water for two hrs. The supernatant was used for salt analysis by a salt analyzer. The water activity of fish brined with 92.5 g sugar was above the safe range. Added sugar tended to reduce the salt content of the smoked fish meat, but kept

the water activity below 0.95. The results indicate that adding sugar into the brining solution may help to reduce water activity and avoid extreme saltiness without compromising safety of smoked fish products.

#### PSYCHOLOGY

The Impact of Enhanced AD/HD Knowledge on Successful Malingering of Childhood Symptoms on the Wender Utah Rating Scale. CASSIE M. WATKINS\* and SEAN P. REILLEY, Department of Psychology, Morehead State University, Morehead, KY 40351.

Attention Deficit/Hyperactivity Disorder (AD/HD) is a prevailing disorder among children and increasingly more common among adults. It is possible for college students with a diagnosis of AD/HD to get special accommodations from their college or university such as untimed tests and rescheduling of exams, not to mention the stimulant medications involved. With these potential benefits, students could attempt to feign AD/HD symptoms especially on behavioral ratings scales commonly used to establish the diagnosis. The current study examines the resiliency of the Wender Utah Rating Scale (WURS) to malingered childhood AD/HD symptoms following enhancements of AD/HD knowledge. The WURS is a unique empirical instrument for evaluating adults' retrospective reports of childhood AD/HD. Previous research has shown the WURS to be significantly more effective in preventing falsification of AD/HD compared to other behavioral rating scales. Using an experimental approach, college students were assigned to an AD/HD knowledge enhancement condition or a control condition. Pre-post tests were completed regarding the participants' knowledge of AD/HD and the impact of this knowledge on subsequent instructions to report honestly or to fake AD/HD childhood symptoms on AD/HD rating scales, including the WURS. Our data supported the notion that the WURS is affected by malingering similar to other AD/HD rating scales. The results are discussed in relation to adult AD/HD assessment of childhood symptoms. Research supported by a Morehead State University Undergraduate Research Fellowship and a prior grant from KY EPSCoR.

The Impact of Malingering on the Child and Current Symptoms Scales for AD/HD. HANK SCOTT\*, RACHEL COOLEY and SEAN P. REILLEY, Department of Psychology, Morehead State University, Morehead, KY 40351.

Attention deficit hyperactivity disorder (AD/HD) is a commonly diagnosed mental health disorder among children, adolescents, and adults. One widely used measure for assessing AD/HD symptoms is the use of behavior rating scales, such as the Barkley & Murphy Childhood and Current Symptoms Scales. Little research has addressed whether knowledge of AD/HD is necessary to successfully mangle on these particular rating scales. Using a mixed experimental approach, the current study evaluated the impact of reviewing information about AD/



HD vs. a control condition in which non-AD/HD mental health information was provided on subsequent successful malingering of Childhood and Current Symptom Scales scores as well as Social Phobia, a control condition. The present data indicated that even without increased knowledge of AD/HD, it is possible to successfully malingering on the Barkley and Murphy Scales. The results are discussed in terms of enhancing adult AD/HD assessment. Research supported in part by a prior grant from the KY EPSCoR.

**The Impact of Studying Specific AD/HD Symptom Information on AD/HD Knowledge and Malingering of AD/HD Symptoms.** KELLY D. GRUBER\* and SEAN P. REILLEY, Department of Psychology, Morehead State University, Morehead, KY 40351.

Recognition and diagnosis of Attention Deficit/Hyperactivity Disorder (AD/HD) is increasing among mental health providers of adults with the disorder. Adults diagnosed with AD/HD may be eligible for college-level academic accommodations, stimulant medications, or disability. As a result of current technology, information pertaining to diagnostic symptoms, general knowledge, case histories, and treatment of AD/HD is easily accessible. Multiple sources of information via the internet and library disclose a large amount of information about AD/HD. Studying these sources of AD/HD information has been shown to increase physician's knowledge of AD/HD. In malingering research concerning AD/HD, an omitted area concerns the impact of knowledge on successful malingering. Using an experimental approach, the current study tested and found that specific enhancements in diagnostic information regarding AD/HD symptoms did positively impact AD/HD symptom knowledge, but not other aspects of AD/HD knowledge (e.g., treatment). Symptom knowledge provided a unique contribution to successful AD/HD malingering. The results are discussed in relation to adult AD/HD assessment. Research supported by a Morehead State University Undergraduate Research Fellowship and a prior grant from KY EPSCoR.

**The Impact of Math Anxiety and Math Self-Efficacy on Math Performance of Students with Remedial and Non-Remedial Math Deficiencies.** EVELYNN HUDSON\* and SEAN P. REILLEY, Department of Psychology, Morehead State University, Morehead, KY 40351.

Math anxiety, a form of test anxiety, is a problem frequently encountered in college students taking mathematics classes. Math anxiety can have a serious negative effect on math performance. It is believed several factors influence the development and maintenance of math anxiety. These factors include math skill deficiencies, negative prior math experiences, negative attitudes towards math, and low math self-efficacy. Understanding the impact of math anxiety and other related factors is extremely important given the large amounts of students who arrive unprepared for college level mathematics. In

the present study, college students completed a packet of questionnaires including the Abbreviated Math Anxiety Scale and the Math Self-Efficacy Scale and then completed in a counterbalanced fashion the Math Calculation, Math Application, and Nonverbal Reasoning tests from the Scholastic Abilities Test for Adults. Consistent with expectations, high math anxiety provided a moderate impact on math performance, but not for the nonverbal reasoning test. Low Math Self-efficacy also provided a moderate impact on math performance, but not for nonverbal reasoning performance. These relationships were also more pronounced in students reporting remedial math deficits. Finally, partial correlations revealed a significant unique contribution for math anxiety to math performance when controlling for math self-efficacy. Research work was funded in part by a prior grant from the Institute for Regional Analysis and Public Policy at Morehead State University.

**The Impact of Reviewing Information from AD/HD Case Studies on AD/HD Knowledge and Malingering of AD/HD symptoms.** NORA WEYH\*, MATT BERRY, and SEAN P. REILLEY, Department of Psychology, Morehead State University, Morehead, KY 40351.

Attention deficit hyperactivity disorder (AD/HD) is a complex, and frequently diagnosed psychological disorder in children, adolescents, and adults. Behavioral rating scales are among the most commonly used measures in AD/HD evaluations in addition to a clinical interview. A gap in the current assessment literature concerns the susceptibility of AD/HD measures to malingering due to review of multiple sources of public information about AD/HD via the internet. Using an experimental approach, the current study tested whether studying published psychiatric case studies about patients with AD/HD would lead to increased AD/HD knowledge, and successful malingering on common AD/HD rating scales. Our data were supportive of these relationships and the results are discussed in relation to malingering concerns in adult AD/HD assessment. Research supported by a prior grant from KY EPSCoR.

## ZOOLOGY

**The Perception of Phagostimulants is Context Dependent in Larval *Manduca sexta*.** YILI GAN\*, JORDAN HARRISON, TRICIA STEPHENS and MARC ROWLEY, Department of Biology, Berea College, Berea, KY 40404.

*Manduca sexta* larvae are good model organisms for studying caterpillar feeding behavior. Previous research has determined specific reference compounds that act as either feeding stimulants or feeding deterrents. The simplest model of a feeding decision system would suggest that these gustatory inputs would be considered in an additive manner. Thus, we hypothesized that increasing the concentration of stimulants in a mixture would result in increased feeding on that mixture. Conversely, increasing the concentration of deterrents



would result in decreased feeding on that mixture. We tested this hypothesis by assaying feeding behavior on mixtures of the feeding stimulants glucose and inositol and the feeding deterrents caffeine and KCl. Our results indicate that rather than this simple additive model, the feeding decision system of larval *M. sexta* is influenced by the overall pattern of inputs such that addition of stimulants to a mixture does not necessarily result in an increase in consumption.

Behavioral Ecology and Translocation of the Endangered Stephens' Kangaroo rat (*Dipodomys stephensi*). JESSICA R. PRICE, Biology Department, Berea College, Berea, KY, 40404.

Stephens' Kangaroo Rat (*Dipodomys stephensi*), a federally endangered rodent species in the Heteromyidae, is an endemic, nocturnal granivore known from western Riverside County, California. This rodent is endangered because of accelerated habitat loss through degradation and destruction from urbanization and farming. In the summer of 2008, a research study was conducted on a population of the endangered Stephens' Kangaroo Rat at the Metropolitan Water District of Riverside County by

translocating individuals from the area under risk for urban development to the protected Lake Skinner Reserve in Riverside County. Data was collected and observations were made for 48 individuals to better understand the social interactions between and among these individuals for a more successful translocation. Individuals were caught in Sherman live traps using millet and oat bait. Data was collected on each individual trapped including weight and reproductive level; fecal samples also were taken. After each kangaroo rat was ear-tagged, observations were made to identify different interactions between individuals and to better understand home ranges. Each individual was fitted with a radio transmitter and held in captivity in cages to monitor their physical condition. Based on the previous observations done, each individual was moved into an acclimation cage at the release site on the Lake Skinner Reserve. To ensure a successful translocation, the release site was monitored, protected, and managed for the Stephens' Kangaroo Rats. After being monitored in the acclimation cages, individuals were released and radio telemetry data was taken to determine the success of the translocations.





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