

(high-P). Fourteen-week-old plants were assessed for growth (biomass), AMF colonization, concentrations of anthocyanins, total phenolics, specific polyphenolics, and mineral nutrients. In general, increased P-rate and inoculation with AMF increased fresh and dry biomass production. Non-inoculated plants were not colonized by AMF and AMF colonization of inoculated plants was not influenced by P-rate. Across all cultivars, increased P-rate enhanced uptake (concentration and content) of P and Ca. Inoculation with AMF enhanced uptake of N, K, S, Mg, and B in low-P plants and enhanced uptake of S, B, and Zn in high-P plants. Differences in uptake of other nutrients between low-P and high-P plants and between non-inoculated and AMF-inoculated plants were a function of plant size. Rosmarinic acid was the predominant polyphenolic produced by all cultivars and differences in rosmarinic acid content between treatments were a function of plant size. Increased P-rate and inoculation with AMF enhanced production (concentration and content) of several polyphenolics and resulted in treatments altering the phenolic composition in the whole plant and aboveground structures. Across all cultivars, P-rate and AMF inoculation only had a similar production enhancing effect on one phenolic compound—chicoric acid. Results indicate that fertilizer management can be used to alter phenolic composition of basil and that AMF inoculation may provide an additional strategy for optimizing basil quality beyond benefits obtained from just altering plant nutrient status.

### **(055) Cannabis USA: Snapshot 2011**

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*Cannabis* cultivation for medicinal use is now legal at varying levels in 15 states with several more pending in 2011. An update and review will be offered via a compare and contrast of various laws and their implications to horticulturists involved in the production of medicinal-grade *Cannabis*. A review will also be on valued-added products inc. MIPs (Medically Infused Products) and other issues facing the industry as a whole.

### **(056) Specialty Crop Collaborations in Mississippi: Past, Present, and Future**

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A research partnership between Mississippi State University and the University of Mississippi was established in 2000 to develop new crops, production systems, and products that may enhance human health and the region's economy. This research initiated with a USDA-NRI grant to develop a domestic source of podophyllotoxin which is the starting material for the semi-synthetic anticancer drugs etoposide, teniposide, and etopophos. American mayapple (*Podophyllum peltatum* L.) and eastern red cedar (*Juniperus virginiana*) were evaluated as alternative sources of podophyllotoxin. The objectives of the podophyllotoxin project were to secure a reliable domestic source and to provide a high quality product to the pharmaceutical industry while providing opportunities for agricultural producers of high-value specialty products. Later, the partnership has extended to scientists of USDA/ARS (Natural Products Utilization Research Unit) that have evaluated basil (*Glomus intraradices*), skullcap (*Scutellaria baicalensis*), peppermint (*Mentha x piperita*), artemisia (*Artemisia annua*), and oregano (*Origanum vulgare* subsp. *hirtum*) as new specialty crops for Mississippi farmers. Scientists at the USDA/ARS Thad Cochran Southern Horticultural Laboratory in Poplarville, MS, continue to evaluate a number of plant species, such as Mayan marigold (*Tagetes nelsonii*) and dog-fennel (*Eupatorium capillifolium*), for their antifungal and insecticidal activity and they have characterized and compared five *Eucalyptus* essential oils and their repellent activity against the yellow fever mosquito (*Aedes aegypti*). As for the near future, the partnership will focus on botanicals to treat and prevent diet-related chronic diseases, such as diabetes, obesity, and cancer, thus we will evaluate inulin containing crops such as yacon (*Smallanthus sonchifolius*) and some of our native rabbiteye blueberries (*Vaccinium ashei*) as new or improved specialty crops for Mississippi. The MSU Extension Service will facilitate a tour of the research plots and facilities at Mississippi State University and at the Natural Products Utilization Research Unit, University of Mississippi for interested ASHS members.

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### **(057) Volatile Compounds from Buds and Fruits of *Magnolia officinalis* Rehd. et Wils**

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*Magnolia officinalis* Rehd. et Wils. belongs to Magnoliaceae and its dried bark (root and branch bark) could be used as medicine. A number of studies on the volatile oils of *Magnolia officinalis* had been reported. But the extraction method used in these studies was exclusively steam distillation given by 'Chinese Pharmacopie' (Ed. 2005). There have been no reports on the volatile oils of buds and fruits of *Magnolia officinalis*. We employed the headspace solid-phase micro-extraction (HS-SPME) to extract the bud and fruit volatile oils and gas chromatography-mass spectrometry (GC-MS) for composition analysis. A total of 31 compounds were identified from the bud extraction. Among them, caryophyllene (25.04%), [2R-(2 $\alpha$ .,4 $\alpha$   $\alpha$ ., 8 $\alpha$   $\beta$ )]- $\alpha$ .,  $\alpha$ ., 4 $\alpha$ -trimethyl-8-methylene-decahydro-2-naphthalenemethanol (14.82%) and borneol (11.83%) were main components. A total of 32 compounds were identified from the fruit extraction. The major components were borneol (14.78%), caryophyllene oxide (11.24%), and  $\beta$ -eudesmol (9.76%). There were no significant differences in major volatile components between the buds and fruits, but their contents were different. Both buds and fruits of *Magnolia officinalis* could be utilized for extracting compounds for medicinal purposes.

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12:30–1:15 pm

Kona Ballroom

## Human Issues in Horticulture

### (377) Plant Characteristics That Help Alleviate Human Stress

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Depression is a serious human problem, and estimates by the World Health Organization (WHO) indicate that depression affects about 121 million people worldwide. Fewer than 25% of those affected, however, receive appropriate care due differences in the level and duration of depression, lack of trained health providers, side effects of medications, costs of treatment, social stigmas associated with mental disease, and variation in gender, age, and symptoms among individuals. Horticulture therapy, the

process of utilizing plants and horticultural activities to improve social, educational, psychological, and physical adjustment of body, mind, and spirit, has a history in medicine for rehabilitating and healing. Yet, the characteristics of plants and plant materials that counter disorders associated with mood changes, burnout, and increased heart rates have not been studied. To determine plant traits that would exhibit positive effects on individuals, our laboratory recruited university students in a psychology class to view and touch plant materials, ascertaining favored physical characteristics of plants as a suggestion of plant traits that would have positive effects on stressed and depressed patients. Large-sized, flowering, aromatic plants were more attractive to test subjects than smaller, non-flowering non-aromatic plants. A follow-up study using computer generated pictures and students in a plant science class demonstrated a preference for colored flowers over white flowers and indecision over robust and simple flower shapes. All studies had the approval of the University of Massachusetts Office of Human Research Protection.

### (378) People's Psychophysiological Responses to Tropical Trees in Urban Landscapes of Hawaii

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Previous studies have indicated the affects of plants and natural landscapes have on people's emotional and physiological states. These studies have shown that interacting or being near plants can reduce people's stress levels, help increase their reaction time in performing certain tasks, aid in their recovery from hospital stays, and increase their concentration. In addition, other studies have revealed that people have preference for particular tree shapes, tree colors and urban landscapes with trees and shrubs as opposed to those without. For Hawaii, this is extremely relevant since Hawaii is one of the world's top travel destinations. Specifically, due to the millions of dollars that are spent on trees and tree care for a variety of social, environmental and economic benefits to the State, the need for proper tree care is even more relevant given that tourism is the State's number one economy and the large amount of trees planted in urban areas. An alarming aspect of tree care in Hawaii is that people seem to have an almost antagonistic relationship against them instead of embracing trees in the landscape for their aesthetic and environmental qualities. Examples of this throughout the islands are the way trees are maintained and pruned. Large heading cuts, those that leave stumps are the norm, and are not only unsightly, but severely shorten the life of a tree exposing it to disease and pest invasion. This becomes problematic when the tree structure fails such as falling limbs of weakly attached re-growth limbs without warning and becomes a hazard tree jeopardizing property and lives. Improper pruning cuts of this magnitude are not only detrimental to the trees, but it is hypothesized that peoples' responses to viewing these trees negatively impacts their emotional and physiological states. The main goal of this study is to characterize the differences in peoples' emotional and physiological responses to proper and improper tree care practices in Hawaii. This has been accomplished through respondents viewing video pictures of proper