S09.067

Silver Nano Particles and Essential Oils as Novel Agents for Explant Sterilization of Bermudagrass in *in vitro* Culture

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The tedious part of plant *in vitro* techniques is sterilizing materials and maintaining aseptic conditions. Ideally the disinfectant must be effective against a wide variety of microbial at high dilutions. Specific surface area is relevant for catalytic reactivity and antimicrobial activity in silver nanoparticles (SNPs). Also, use of natural compounds such as Essential Oils (EOs) could be a promising strategy. The main objective of this experiment was aimed to studying the substitution probability of SNPs, thymol and carvacrol as novel sterilization agents in tissue culture of bermudagrass. The nodal segments of bermudagrass (*Cynodon dactylon*) cultured on MS medium supplemented with 30 $g \cdot l^{-1}$ sucrose, 7 $g \cdot l^{-1}$ agar and 2 $mg \cdot l^{-1}$ 2,4-D. Explants sterilized with 70% ethanol for 2 min then 30% Clorox for 15 min, as common method. Sterilization complementary treatments (SNPs, thymol and carvacrol) were applied at different concentrations (100 and 200 $mg \cdot l^{-1}$) and exposure times (30, 60 and 120 minutes). A completely randomized design (CRD) with factorial arrangements was used for this experiment. According to the results, infection of bermudagrass nodal explant (fungi and bacteria) was controlled successfully by SNPs, thymol and carvacrol. Examination of various concentrations in different exposure time of showed that 200 $mg \cdot l^{-1}$ SNPs combination with 100 $mg \cdot l^{-1}$ thymol in 60 min were inhibited growth contamination. Thymol and carvacrol were more effective in controlling bacterial and fungal contamination, respectively. All treatments were not effect on producing callus and necrosis sign of explants. The antifungal activation of SNPs, thymol and carvacrol were dependent on the concentration and exposure treatments. Finally, these novel agents specially SNPs, could be use as an alternative to common chemical procedures for elimination and control microbial population explant in the *in vitro* condition.

S09.068

Advanced Research on Germplasm Resources of *Chrysanthemum* ×*morifolium* Ramat. in China

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Chrysanthemum ×*morifolium* Ramat., an exotic flower, origins from China, was spread throughout the world. During 1600 yeas' cultivation history, rich cultural connotation and lofty horticulture cultivation technique were merged into this plant. There are at least 3,000 varieties in China. Recent 50 years, a lot of work about wild relatives and cultivation groups of Chrysanthemum was developed based on morphology, cytotaxonomy, isozymes, DNA finger prints, numerical taxonomy and cladistic study. Though there are plenty of data for Chrysanthemum breeding, the quantity and quality of its resources are still inadequate compared with its large number of cultivars. Especially, the less study of traditional varieties in China, restricts the development of industrialization of Chinese Chrysanthemum. So collection, preservation, study and evaluation of Chrysanthemum germplasm resources are important and turf work. For 8 years, we have collected more than 800 Chrysanthemum varieties of traditional style which were selected by Chinese florists. Morphological taxonomic study shows that these samples can be classified at least 5 corolla shapes and 30 flower head types. Numerical taxonomic and cladistic studies show that 3 wild species among 17 in China are closed to the cultivars. The numbers of chromosomes generally vary from 50 to 70, in some of the varieties are above 60; 'HuangXiangLi' has 70 chromosomes and is conferred to be octploid. Most varieties are hexaploid and aneuploid, The karyotypes of the most varieties are 2A or 2B, which is considered a kind of the symmetrical karyotype. Chromosome satellites are obviously observed in most varieties especially in the traditional ones. Based on all these genetic analysis, RAPD, AFLP, ISSR and SSR markers performed on over 200 hundred varieties were used to identifying these samples, and they can all bring about informative data for classification. All these genetic analysis are important to develop and utilize *Chrysanthemum* resources.

S09.069

Selection and Breeding Woody Plants as Alternatives for Invasive Ornamentals

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Invasive plant problem brought our attentions in recent years. Some attractive ornamentals escaped from the cultivation, invaded in local ecosystems, alternated natural habitats and caused significant financial loss. When you ask growers remove some cash making invasive ornamental plants from their inventories, you should give them some alternatives! After studying invasive *Berberis thunbergii*, *Enouymous alatus* and other invasive plants in northeastern USA for the past six years, we presented our approaches to produce woody plants as alternative for some invasive ornamentals. 1) We selected native plants with ornamental potential from their wild populations. Native plants have their positions in the landscape and we have selected several new plants from Maine and New England native populations (*Aronia* spp, *Vaccinium angustifolium* 'Burgundy', *Cornus canadensis* 'Downeast', *Empetrum nigrum* 'Compass Harbor', *Arctostaphlos uva-ursi*, *Comptonia peregrina*, *Ilex verticillata*, *Myrica* spp. and *Vaccinium* spp. 2) If seeds of the above targeted species are available, we will germinate seeds and select better plants from their seedling populations. The challenges are the difficulty of seed germination and clonal propagation and our researches are focusing on their reproduction strategies. 3) We are working on establishing a rapid woody plant breeding system with aid of modern techniques of molecular analysis and tissue cultures. The goal is to breed new potential ornamental plants in a much short period at 2-5 years. 4) We collaborate with state, regional, national, and international ornamental plant researchers and growers and bring some plants with great ornamental potential, but definitely non-invasive to our University of Maine trail gardens. After evaluation, we can introduce some better ornamental plants to the green industries and reduce the sale of invasive ornamental plants. Together, we, the ornamental professionals, can better contribute to our living environments and continue our legacy in general public.

S09.070

Breeding of Carnations (*Dianthus caryophyllus* L.) for Resistance to Bacterial Wilt (*Burkholderia caryophylli*)

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Bacterial wilt caused by *Burkholderia caryophylli* is the most damaging disease of carnations in Japan. Therefore, Japan's NIFS initiated a breeding program for resistance to bacterial wilt in 1988. Previously, we found a highly resistant wild species, *Dianthus capitatus* Balbis ex DC. ssp. *andrzejowskianus* Zapal. Subsequently, we succeeded in introducing the resistance from *D. capitatus* into carnations to produce a new bacterial wilt-resistant line, 'Carnation Nou No. 1'. 'Carnation Nou No.1' had unsuitable traits for ornamental carnation production, such as small flower diameters and short stems etc. We had run backcross breeding programs to introduce the resistance derived from *D. capitatus* into cultivated carnations. Finally, we could develop a new cultivar 'Tsukuba No. 4' in BC5 generations and release in 2010. 'Tsukuba No. 4', a red standard-type cultivar, was selected from the cross between 'Miracle Rouge' with long vase life and BC4 resistant line, 4AZ31-5. This new cultivar had the highly resistance, and the productivity or the other trait for ornamental are almost the same compared to modern cultivated cultivars. At the beginning of the breeding, we selected the resistant lines by the cut-root soaking