bleach (sodium hypochlorite) solution for 20 minutes. Two or three nodal cuttings were transferred to MS media (1962). About fifty percent of the cultures were contaminated with mold. Among the uncontaminated cultures growth of explants were observed after four weeks on media. After six weeks on establishment media, plants were removed and sectioned into two node cuttings and placed on MS media supplemented with 6-benzylaminopurine (BA). More lateral shoots were produced on the BA supplemented media than on the control. An average of three extra shoots was produced per explants. The acclimation phase included transferring plants from tissue culture to a small chamber to maintain a high humidly. Plants where transitioned to ambient environment over a 14 day period.

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(344) Investigating the Functional Roles of Genes Involved in Early, Middle, and Late *Rubus* Prickle Development

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Prickles are outgrowths of epidermal and sometimes cortical plant tissue that develop from a signaling cascade initiated by the head of glandular trichomes. These signals result in the division and growth of epidermal and underlying cortical cells. Due to the simplicity of their structure, prickle development is an ideal model to investigate how cells communicate to control growth, proliferation, and morphological differentiation. Understanding these modes of cellular communication could lead to significant insights to all developmental pathways including those in mammals. We are currently analyzing gene candidates and their function in prickle development to better understand the role of trichomes in prickle development. To this end, we hypothesize that lignification marks the end of prickle development. *PAL 1* and *PAL 2* are known to play a role in the lignification pathway, and have been targeted for functional analysis in this study due to their potential as stop signals in prickle development. We have also hypothesized that *GL1* and *GIS* are involved in promoting early trichome and thus prickle initiation in *Rubus*. *SIM* is hypothesized to also play a significant role in endoreduplication and subsequent trichome development. To this end, we are currently identifying orthologous ESTs (expressed sequence tags) from the trichome developmental pathway of *Arabidopsis*, *Fragaria*, and *Medicago* using a degenerate primer method. We have thus far identified several genes from *Rubus*, our prickle development model plant. Using these orthologous EST sequences we are carrying out functional analysis using *in situ* hybridization (ISH). One complicating factor is sectioning tissue at the exact point of the occurrence of a glandular trichome is difficult; therefore, we have initiated the investigation of whole mount ISH allowing us to look at the entire epidermal surface of the tissue rather than sections. Together, these data will provide insight as to the potential signaling pathways involved in prickle development.

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(345) Effect of Vernalization and Photoperiod on Flowering of Summer-flowering Chrysanthemum

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Chrysanthemum ×morifolium 'Qiyuetaohua' is a ground-cover cultivar characterized by flowering in early summer in Beijing, China. To identify the photoperiod respond type and effectively utilize the early flowering trait, vernalization

and photoperiod requirement for flower bud initiation and development were investigated, as measured by the days to the appearance of the bud and the terminal flower. All rooted cuttings were obtained from stock plants maintained in a vegetative state with long day (LD=14 to 16h photoperiod plus night interruption lighting, 2200 to 0200HR, using 400W incandescent lamps) and 24°C/20°C (day/night) temperatures. After rooting in sand for ten days with the same conditions as the stock plants, the treated rooted cuttings were vernalized for four weeks at temperature 3-7°C under LD condition and then transferred to three photoperiod treatments: short days (SD=black cloth pulled 0800/1600HR, providing 16h darkness), LD, natural day lengths during March to July at Beijing, China under greenhouse conditions with same temperature as stock plants. All summer-flowering 'Qiyuetaohua' treated by low temperature initiated flower buds and developed to anthesis at three photoperiod treatments. The mean days to flower bud initiation and development for vernalized plants at LD were 90 and 110 days, respectively, which showed 5 and 8 days earlier than that at SD. The mean days to flower bud initiation and development for vernalized plants at ND were 94 and 116 days respectively. However, the controlled plants (no vernalization) never developed any flower at any photoperiod treatments and remain vegetative for treated time. The results indicated that *Chrysanthemum × morifolium* 'Qiyuetaohua' is a day-neutral plant after vernaliztion and the early flowering phenotype under natural conditions could be attributed to low temperature at seedling stage.

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(346) Construction of Forward and Reverse Subtracted cDNA Libraries from *Opisthopappus taihangensis* (Ling) C. Shih. under Drought Stress

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Opisthopappus taihangensis (Ling) C. Shih. grows vigorously in both arid and saline soils, which indicates its strong resistance to drought stress. To study the molecular mechanisms of drought-stress resistance and obtain differential expressed genes in *O. taihangensis*, suppression substractive hybridization (SSH) was employed in this study. Forward and reverse subtracted cDNA libraries were constructed with leaves treated by PEG solution. Results of electrophoresis suggested noticeable differences in PCR bands between subtracted sample and non-subtracted sample, which indicated that the substraction was effective. In the substracted cDNA library, the recombination rate was 92%, with the size of inserts between 200-600bp. Through sequencing the partial clones of forward subtracted cDNA libraries, a number of genes related to drought resistance were obtained and verified with Northern hybridization, such as bZIP transcription factor, MADS-box protein, SOD, calcium-dependent protein kinase genes etc. The results provided important information for cloning new genes from *O. taihangensis* and led to further study of molecular mechanism related to drought resistance.

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Genetics/Germplasm/Plant Breeding: Cross-Commodity

(049) Effects of Planting Date and Stand Density on Sugar and Ethanol Yields of Sweet Sorghum Grown in Arizona

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