

IRRIGATION NOZZLE HEIGHT INFLUENCES WATER CAPTURED BY CONTAINERS

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Rain drop momentum, based on the height from which it falls, is an important factor in drop penetration of plant canopy. This may explain why nursery operators report that substrates appear wetter from rain than from an equivalent amount of water applied with overhead irrigation. We investigated the influence of irrigation nozzle height on amount of water captured by *Rhododendron* sp. 'Formosa' grown in 10-liter containers. A Wobbler® (#8, 7.6 liters·min⁻¹) irrigation nozzle was positioned 1.2, 2.4, 3.6, 4.8, or 6.0 m above grade. Plants were placed in a circle 3.6 m from the riser base for the 1.2-m-high nozzle, 4.5 m from riser base for the 2.4-m-high nozzle, and 5.4 m from riser base for all other heights and irrigated for 3 hours. Prewashed disposable diapers were placed on substrate surface of each container with and without (control) plants. Diapers were weighed after irrigation and water captured was calculated and expressed as percentage of control containers. Capture increased from 144% at 1.2 m to 178% at 3.6 m then declined with increasing height. The decline was likely due to small drops with low momentum striking plants because plants remained 5.4 m from the riser base.

HANK KEMBLE DOESN'T WORK HERE ANYMORE

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Hank Kemble is the only county agent role ever cast in a network television series. On *Green Acres*, Mr. Kemble always had advice for novice farmer Oliver Douglas. Unfortunately, Mr. Kemble's advice was usually vague and uncertain. More unfortunate is that this is the only image many people have regarding Cooperative Extension. As the last segment of the land-grant system established, Extension personnel were the last recognized as equals among faculty. The mistaken image of the county agent as a book-trained farm boy with no common sense and a government job has been reinforced by declining respect for the farming community. In reality, county agents today deal with social and agricultural issues in urban and rural communities. Agents work with reduced staffs while being educators, scientists, and administrators in addition to routine duties. Extension specialists routinely teach and conduct research. National and international recognition and peer-reviewed publications are necessary for promotion while conducting traditional duties, too. As educational requirements of agents and specialists increased, numbers of undergraduates entering Extension dropped (<1% of Univ. of Georgia horticulture graduates in the last 5 years). Georgia specialists with a PhD increased from 60% (1979) to 89% (1996). Agents with MS degrees increased from 36% (1987) to 45% (1996). Image, salary, and job security determine if Extension can attract qualified personnel. Extension was never a Hank Kemble organization and graduates must be convinced that Extension is a viable and respectable career and Hank Kemble doesn't work here anymore.

CROPPING SYSTEM AND POULTRY LITTER EFFECTS ON RESIDUAL SOIL NO₃-N AND P

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Primary environmental concerns regarding application of poultry litter (PL) for crop production are nitrate leaching into ground water and increased levels of P in the soil that can erode into surface water. This study was initiated to investigate use of warm- and cool-season annual forage crops to remove excess nutrients supplied by PL in rotational-cropping systems on a Bowie fine sandy loam (fine-loamy, siliceous, thermic, Plinthic Paleudults). PL was applied at one (1x) or two (2x) times the recommended rate in the spring, fall, or spring and fall. Rates were based on N requirement of the crop and percent N in the litter. Comparisons were made to fertilizer blends (FB) and control treatments with no PL or FB. After 3 years of treatments, NO₃-N

increased at the 122-cm depth by 30 and 50 mg·kg⁻¹ from the 1x and 2x rate, respectively. The greatest accumulation was from FB (72 mg·kg⁻¹). With PL applied in spring only, spring vegetables followed by a fall cover showed a significant reduction in NO₃-N leaching and accumulation. Regardless of cropping system, rate, or time of application, P concentration increased by 40 mg·kg⁻¹ in the surface 15 cm of soil when compared to FB. If applied in an environmentally sound manner, PL will be less of a threat to pollution of ground water than similar rates of FB. Applying PL rates sufficient to meet crop needs for N results in P accumulation that can lead to nonpoint source pollution of surface waters.

A PHOTOCATALYTIC REACTOR FOR THE REMOVAL OF ETHYLENE IN AIR: PERFORMANCE UNDER CONDITIONS RELEVANT TO HORTICULTURE

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A reactor designed to catalyze ethylene to carbon dioxide and water in the presence of UV radiation was tested under a wide range of conditions applicable to horticulture. The reactor was constructed of a hollow stainless steel housing into which a 4-W UV lamp was inserted. Fourteen grams of zirconia-titania catalyst crystals, particle size 0.50 to 0.75 mm, filled the space between lamp and housing. Polysulfone end caps sealed the unit on each end and provided fitting by which air was directed in one end and out the other. Increasing dewpoint temperature (5, 11, 17, and 22C) resulted in decreasing ethylene removal. Increasing reactor temperature (20, 30, 40, 60, and 80C) resulted in increasing ethylene removal. Increasing air flow (106, 255, 385, 665, 1000, and 2000 ml·min⁻¹) resulted in a decreasing proportion of ethylene removed from the air stream but an increasing total amount of ethylene catalyzed per unit time (μl·day⁻¹). Increasing ethylene concentration (65, 147, 260, and 1131 ppb) resulted in increasing ethylene removal. The reactor performed well under all these conditions, and these data will be used to design ethylene removal systems for a wide variety of horticultural applications.

EFFECT OF HARVESTING METHOD AND DRYING TREATMENT ON THE ANTIOXIDANT ACTIVITY OF SAGE

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Sage contains the antioxidant thujone, which can be used to preserve foods in place of synthetic antioxidants. This study was conducted to determine if different harvesting methods would affect greater retention of antioxidant activity (AOA) of sage. The harvesting methods evaluated included sickle harvest, hand harvest, and flail harvest. Harvested samples were air-dried (temperature range 15 to 49C) and oven-dried (continuous 49C). Leaf area analysis indicated that flail harvesting induced substantial chopping and size reduction of the harvested material. AOA of sample extracts was measured using a carotenoid bleaching process against a standard BHT solution. Our results show a definite difference in retention of AOA between the harvesting methods (sickle 65%, hand 55%, flail 50% of BHT). This difference between harvesting methods was the same over the two drying treatments, although oven drying resulted in a decrease in AOA for all harvesting methods. Supported by USDA grant 93-34150-8409 and the Oklahoma Agricultural Experiment Station.

THE EFFECTS OF LIGHT QUALITY ON ENDOGENOUS CYTOKININ LEVELS IN IPT-TRANSGENIC TOBACCO

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Similarities exist between the effects of phytochrome and cytokinins on plant growth and development (e.g., chloroplast development, amaranthin synthesis, seed germination). It is unclear, however, if and how these two systems interact. The coaction between phytochrome and cytokinins was investigated by using *Nicotiana plumbaginifolia*

nance, with the exception of one midseason pruning of petunia, was performed on any of the cultivars. *Catharanthus roseus* 'Blush Cooler' was the best performer in 1995 with a mean rating of 4.1 (of 5.0). *Salvia farinacea* 'Victoria Blue' and *Petunia xmilliflora* 'Fantasy Pink' performed well, with a mean rating of 3.5. In 1996, the cultivar with the highest mean rating was *Gomphrena globosa* 'Lavender Lady' (4.1). Second highest was *G. globosa* 'Strawberry Fields' (4.0). Other cultivars that performed well in 1996 and had high mean ratings were *Verbena xspeciosa* 'Imagination' (3.6) and *Melampodium paludosium* 'Derby' and 'Medallion' (3.5 and 3.5).

Growth Differences in Hydroponic and Container-grown Geraniums

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Seeds of Dynamo white geraniums were started in a soilless media in the germination chamber. After germination, one-third of the plants were placed under an intermittent mist system, and two-thirds were placed in rockwool cubes (7.62 cm x 7.62 cm x 6.35 cm) and placed into the hydroponics system. Plants that were placed under the mist system were transplanted into 16 cm x 16 cm (width x depth) plastic pots containing a soilless media of 1 peat moss : 1 perlite (v/v). After 45 days, half of the hydroponically grown plants were transplanted into 16 cm x 16 cm plastic pots containing peat moss and perlite. Observations included final plant height, top fresh weight, and top dry weight. The hydroponically-grown geraniums were significantly taller than the pot-grown geraniums and the hydroponic/pot-grown geraniums, 58.17 cm, 36.42 cm, and the 41.75 cm, respectively. The hydroponically grown plants were also significantly higher in top fresh weight and top dry weight.

A Comparison of Recycled Paper as a Growth Substrate in Container Production of Azaleas

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Wet Earth (WE) is a recycled paper product that may substitute for peat moss as a growth substrate. WE is available at various pH levels and may be formulated using: 1) paper production byproducts (WES), or 2) recycled corrugated cardboard (WEC). Use of WE by commercial growers would reduce demand for both landfill space and for slowly renewable resources such as peat and pine bark. Experiment objectives included: analyzing plant performance of azaleas (*Rhododendron obtusum* 'Hino Crimson') in WE-based growth substrates at pH 3.4 and pH 6.6 and in peat-based growth substrates (Trial pH), 2) analyzing plant performance of WES, WEC, and peat moss-based growth substrates (Trial SC), and 3) determining changes, if any, in substrate physical properties from planting to harvest. Shadehouse experiments were conducted in summer of 1996. Ratios of pine bark to WE tested were 100% pine bark, 1 : 3, 1 : 1, 3 : 1, and 100% WE by volume. Plant heights, widths, and visual quality ratings were obtained monthly throughout the 16-week experiment. Leaf, shoot, and root dry weights and leaf nitrogen concentration were determined at harvest. Changes in volume, bulk density, porosity, and air space were also measured. Plants performed poorly in WES, pH 3.4, with mortality exceeding 90%. Peat and WEC yielded similar (and best) results. Optimum plant performance for all substrates occurred in 1 : 3 and 1 : 1 (WE : pine bark) mixes. At concentrations over 50%, increases in bulk density and reductions in volume and percent air space in WE substrates were severe enough to negatively impact root growth and plant quality.

The Effect of Mulch Type and Fertilizer Placement on Marigold (*Tagetes erecta* 'Hybrid Gold') Growth in Landscape Plantings

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The objective of this study was to examine the influence of mulch material and fertilizer application method on nutrient availability in a landscape situation. Beds containing four mulch materials (pine bark,

cypress pulp, pine straw, and cottonseed hulls) and three fertilizer application methods (granule, liquid, and time release) were established. Fertilizer placement included application either above or below the mulch horizon. Beds with and without mulch cover and no fertilization were established as controls. Marigolds, *Tagetes erecta* 'Hybrid Gold', were planted within the beds. Plants in unmulched or fertilized control beds had greater dry weights than plants in beds with mulch alone. Only plants grown in the cottonseed hull control demonstrated a slight improvement and cottonseed hulls demonstrated the best plant performance overall. The greater nitrogen content of cottonseed hulls may influence less immobilization of nitrogen in the soil solution during decomposition and reduce competition for nutrients between microorganisms and plants. Fertilization improved plant growth in all treatments except pine bark. Beds using pine bark showed significant reduction in plant dry matter accumulation. Potential toxicity or changes in soil chemistry by pine bark may have influenced these results and will be examined in further experiments. Fertilizer placement had no effect on plant growth.

Seed Storage Media Effects on Persimmon Germination

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Common persimmon, *Diospyros virginiana*, a medium to large, attractive native tree of narrow habit, is potentially a valuable landscape tree due to its tolerance of diverse environmental conditions. Previous work by the authors demonstrated that seed stored in perlite or peat moss had a higher percent germination following cold storage than seed stored without media. Seeds were prepared for cold storage by two methods: 1) moist seed—cleaned (cap, skin, and the easily removed pulp discarded), and (2) dry seed—cleaned, dried for three days, and the remaining pulp removed. The media were either dried or moistened, but not saturated. The treatments were: 1) moist seeds; 2) dry seeds; 3) moist seeds in dry perlite; 4) moist seeds in moist perlite; 5) dry seeds in dry perlite; 6) dry seeds in moist perlite; 7) moist seeds in dry peat moss; 8) moist seeds in moist peat moss; 9) dry seeds in dry peat moss; 10) dry seeds in moist peat moss. Seed was stored at 4.4° for 142 days. Germination of seed stored in dry perlite was not significantly different from that stored in moist perlite or peat moss, but dry peat moss significantly limited germination regardless of seed preparation.

Influence of Seed Treatments on Germination and Initial Growth of Ornamental Palms

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Experiments were conducted in the Dominican Republic to determine the effect of physical and chemical treatments on the germination of the ornamental palms *Roystonea hispaniolana* Bailey (Royal palm), *Acrocomia quisqueyana* Bailey (Corozo palm), *Sabal umbraculifera* Mart (Cana palm), *Phoenix canariensis* (Canary Islands date palm), *Veitchia merrillii* (Becc) Bailey (Manila palm), *Chrysalidocarpus lutescens* Wendl (Areca palm), and *Caryota urens* (Fishtail palm). Treatments were seed immersion in water or gibberellic acid 3 (GA₃) solution for 72 hours, immersion in concentrated nitric acid for 5 minutes, or cracking of the seed coat. Rate and percentage of emergence 90 days after treatment were measured. The best results for *Roystonea*, *Phoenix*, *Veitchia*, *Caryota*, and *Chrysalidocarpus* were obtained soaking the seeds in water or a 200-ppm gibberellic acid solution. Nitric acid and seed coat cracking significantly reduced the germination percentage in all the species, except *Acrocomia quisqueyana* and *Sabal umbraculifera*. Seeds of *Acrocomia* did not germinate as a response to any of the treatments tested. *Sabal* seeds germinated only after coat cracking or nitric acid treatment.

Effect of Cropping System on Residual Soil P from Poultry Litter Application

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When poultry litter (PL) is applied to meet the nitrogen (N) needed for plant growth, phosphorus (P) can accumulate, leading to non-point

source pollution of surface water. This study was conducted at Overton, Texas on a Bowie fine sandy loam (fine-loamy, siliceous, thermic, Plinthic Paleudults) to investigate the use of warm- and cool-season forage legumes in rotational cropping systems to remove excess P. Cropping systems were: spring legume-fall vegetable (SL-FV), spring vegetable-fall legume (SV-FL), and spring vegetable-fall vegetable (SV-FV). Warm- and cool-season legumes were Iron and Clay cowpea and crimson clover, respectively. Poultry litter rates were 0, 1X, 2X, 4X, and commercial blend (CB) as subplots. Fertility treatments were applied to vegetable plots only. The crop, 1X PL and CB rate for each season were: spring 1995—watermelon, 2.2 t-ha⁻¹, 48.8N–12.2P–28K kg-ha⁻¹; fall 1995—turnip, 8.3 t-ha⁻¹, 89.6N–24.4P–28K kg-ha⁻¹; spring 1996—tomato, 6.7 t-ha⁻¹, 100.9N–17.1P–78.5K kg-ha⁻¹. Soil P increased at all depths sampled (0–15, 15–30, and 30–45 cm) as PL rate increased. Residual P from CB was equal to the control. Through spring 1996, soil P concentration in the surface 0–15 cm was increased by all systems. System SV-FL reduced P accumulation by 35.6 mg·kg⁻¹ when compared to SL-FV and 44.7 mg·kg⁻¹ when compared to SV-FV. Residual P continued to increase as PL rate increased. Rate of increase was reduced by a system of SV-FL.

* Potential of Cool-Season Legumes for Removing Excess P From Poultry Litter Application

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Phosphorus (P) concentration in surface waters from non-point agricultural sources is an increasing resource management concern. This study was conducted at Overton, Texas, on a Bowie fine sandy loam (fine-loamy, siliceous, thermic, Plinthic Paleudults) to evaluate cool-season legumes for P uptake following poultry litter (PL) application rates on spring vegetables. Treatments were PL rate (0, 1X, 2X, 4X) and a commercial blend (CB) for comparison. Cool-season legumes, consisting of crimson clover, berseem clover, hairy vetch, and red clover, were the subplots. The vegetable crop in Spring 1995 was watermelon. The 1X PL rate was 2.2 t-ha⁻¹ and the CB was 44.8N–0P–32.5K kg-ha⁻¹. Dry matter yield was decreased by the 4X PL rate. Plant P concentration increased linearly as PL rate was increased. The greatest P uptake (4.1 kg-ha⁻¹) was at the 2X rate. Hairy vetch had the greatest yield (1,875 kg-ha⁻¹), plant P concentration (0.53%), and P uptake (9.6 kg-ha⁻¹). PL rate increased soil P concentration at all depths. The least amount of P accumulation was from CB and was equal to the control. Hairy vetch appears to have the capability of removing a greater amount of P and reducing soil concentration when compared to the other legume species tested.

Initial Observations on Cassava (*Manihot esculenta* Crantz) Establishment and Adaptability in the Rio Grand Valley

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Four cassava (*Manihot esculenta* Crantz) accessions were received from the USDA, ARS Plant Introduction Station in Mayaguez, PR on 16 Jan. 1996. The next day the 15- to 20-cm-long cuttings were propagated individually in 1-gal. pots containing Metro Mix No. 4 for 10 weeks before field setting into a transition Hidalgo-McAllen fine sandy loam soil on a USDA, APHIS site near McCook, Texas. Three plant establishment methods, control (no soil amendment), addition of 15 Mt bagasse/ha, or 50 kg cross-linked polyacrylamide/ha into the planting trench were evaluated. The 2 × 1.2 m spacings on 15-cm-high beds provided 4036 plants/ha. Plants received a total of 35.8 cm of water between field planting and harvest (230 days). Mid- and late-season soil moisture (kg/m³) at 38 cm depth only was lowest in soil containing bagasse. Establishment method had little or no effect on plant size, leaf nutrients, leaf pigment concentrations, root dry matter, or root yield. Accessions differed in many of these attributes except root yield, the means of which ranged from 5 to 9 Mt/ha. Only roots survived an air temperature of –5.4 °C on 19 Dec.

Using Phenomenological Interviewing: A Qualitative Research Method for People-Plant Studies

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Phenomenological interviewing is a research approach used extensively and successfully in the social sciences and has implications for

those working with people-plant interactions. Although many research methods are available for horticulturists to use in obtaining information about a target audience, most methods used (e.g., surveys and questionnaires) are quantitative in nature in that they provide numerical data on statistical generalizable patterns. Phenomenological interviewing allows investigators, through open-ended interview questions, to obtain more in-depth data than traditional quantitative techniques. Transcribed interview tapes become the data from which analysis and interpretation follows. "Coding" the data by searching for words, phrases, patterns of behavior, subjects' ways of thinking, and events which are repeated and stand out classify and categorize the data helping with its interpretation and write up. Writing up such data must develop how you interpret what you found by carefully integrating themes that support a thesis and create or augment theoretical explanations. This research method allows investigators to understand and capture the points of view of the participants without predetermining those points of view through prior selection of questionnaire or survey categories.

Breedlove Dehydrated Foods Feeding Hungry People Worldwide in Partnership with Fruit and Vegetable Growers

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Breedlove Dehydrated Foods (BDF), the largest charitable dehydration plant in the world, is capable of dehydrating 6,000 lb. raw product/hr. BDF dehydrates and distributes nutritious fruits, vegetables, and legumes to charitable organizations which feed hungry people. At least 35,617 people die from hunger in our world every day! Thousands of tons of nutritious but slightly imperfect horticultural products are wasted yearly in the United States. Donations totaling \$7.8 million funded construction of BDF. Texas A&M and Texas Tech Universities provided expertise to plan and operate BDF. BDF dehydrated over 30 million lb. of fruits and vegetables in the initial two years of operation. BDF is a model of people focused on an unusually high goal and working together.

Components of Resistance to *Colletotrichum acutatum* in Strawberry (*Fragaria xananassa* Duch.)

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Two experiments were designed to study components of resistance to *Colletotrichum acutatum* on runners of three strawberry cultivars: incubation period, latent period, length of the lesion and spore production, and infection frequency with three levels of inoculum density (10⁴, 10⁵, 10⁶ spores/cc) were considered. Rate of disease development was also determined. There were significant differences in all the components among the resistant and susceptible cultivars. Both 'Chandler' and 'Sweet Charlie' expressed susceptible reactions. The length of the lesion, number of spores/cm of the lesion, incubation period, latent period, and rate of anthracnose development were statistically similar in 'Chandler' and 'Sweet Charlie'. The only significant difference among them was found in infection frequency. 'Chandler' had a greater number of infection sites with all three concentrations of spores included. The cultivar Pelican showed a high level of partial resistance associated with longer incubation and latent periods, lower number of spores/cm of lesion, shorter lesion, smaller number of infection sites, and lower rate of disease development.

Conservation Tillage of Sweetpotato

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A cultural practice that can modify and conserve the soil environment is needed in sweetpotato [*Ipomoea batatas* (L.) Lam.] production. The objective of this research was to evaluate conventional and conservation tillage of sweetpotato with four cover crop species (fallow, ryegrass, rye, and wheat). The cover crops were seeded in late Oct. 1995, and the sweetpotato transplants ('Beauregard') were transplanted at two dates the following spring (May and June). Conservation tillage significantly lowered soil temperature (10 cm depth)

plastic deteriorated quickly and by 78 days after laying was brittle. Where paint treatments provided adequate coverage, deterioration was greatly reduced. Weed growth under clear plastic was a problem early, but weeds soon died due to heat accumulation under the clear plastic. Despite a lower cost, limited agricultural use could be made of this material.

Controlling Deer Damage to Vegetable Crops with Organic Products

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Because deer pressure in Alabama is high, the efficacy of Garlic Barrier™ (GB) in controlling deer damage was evaluated with sweetpotato (SWP), southernpea (STP), sweet corn (SC), and zucchini squash (ZSQH). GB was applied on or around the plots at 10× the recommended rate. Damage was rated three times weekly on a 0 (0% damage) to 5 (100%) scale between 15 June and 18 Sept. All damage observed was unambiguously attributed to deer. GB on the plot significantly ($P < 0.02$) reduced grazing damage to SWP and STP, but not enough to prevent economical losses. Protection from GB around the plots was similar to the unsprayed control. Damage to SWP began 3 days after establishment. Damage to STP was limited to the developing pods. No damage was observed to SC and ZSQH ($P > 0.37$) during vegetative and reproductive stages. These results document scientifically the deer-repellent property of GB under natural conditions when applied directly on the plants. However, in its present formulation and under severe deer pressure, GB alone may not provide economical protection.

*Soil Phosphorus Removal as a Function of Cropping System

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A factored experiment was established at the Texas A&M Univ. Research and Extension Center at Overton in Spring 1995. The objective was to investigate the use of warm- and cool-season legume cover crops in vegetable cropping systems for reducing phosphorus (P) accumulation from poultry litter (PL) and commercial blend (CB) fertilizer. PL rates were based on soil test nitrogen (N) requirement of the vegetable crop and percent N content of the litter. This was considered the 1X rate. Fertility treatments were applied to the vegetable crop only. PL was applied at 0, 1X, 2X and 4X rates. CB was applied at recommended rates for N, P, and K. The vegetable crops were: Spring 1995—watermelon; Fall 1995—turnip; Spring 1996—tomato; Fall 1996—collard; Spring 1997—squash. The legumes were: spring—Iron and Clay cowpea; fall—crimson clover. Dry-matter yield of cowpeas and clover was not affected by fertility treatment in any of the years studied to date (Spring 1995, 1996, 1997). Plant concentration of P for both cover crops was increased all 3 years as rate increased. PL applied at the 1X rate maintained P levels in the surface 0–15 cm of soil at 60 mg·kg⁻¹ over the five-season study period. CB maintained levels of P equal to the control. A cropping system of spring vegetable–fall legume greatly reduced P accumulation. A reduction in P was also noted from a system of fall vegetable–spring legume, but not as pronounced. The greatest accumulation was with a system of spring vegetable–fall vegetable.

Recovery of Declined Pear Tree Vitality through Grafting with Scions from a Vigorous Cultivar

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Taiwan, located in subtropic regions, naturally is not an ideal region for temperate-zone fruit trees' production due to the supra-optimum temperature, heavy rainfall, and higher relative humidity in summer and insufficient chilling in winter. Higher relative humidity and temperature in summer and autumn months cause excessive vegetative growth, resulting in poor flowerbud initiation and formation. Typhoon invasions result in the severe damage of twigs as well

as the loss of quality and yield of fruits. In order to overcome these natural barriers, Hengshan (*Pyrus serotina* Rehd.) pear has been selected as a major cultivar for lowlands in Taiwan. It has low-chilling requirement and higher temperature tolerance. Branches of Hengshan are pulled and tied to a horizontal wire net to adapt to the environmental status. This trellis system enhances flowerbud initiation through the retardation of vegetative growth. It also induces numerous water shoots. Scions from high-chilling cultivars grown at a high altitude on mountains are grafted onto water shoots of Hengshan pear trees. The system has been successful in the production of both high-chilling pears in June and the Hengshan pears in August, and has made production of both pears an important industry in Taiwan. Heavy load and trellis systems, however, result in hastening the senescence of Hengshan trees. Vitality of trees could be restored by grafting scions from a vigorous cultivar, *P. koehnei*, onto the terminal position of the branches. The practice resulted in several advantages including: 1) uniform growth of branches, 2) redistribution of water shoots, 3) inducing formation of calluses on old damaged trunks, 4) quick recovery of mealybug-damaged branches, 5) rejuvenation of branches, and 6) termination of dormancy.

Flower Bud Initiation in Primocane-fruiting, Tetraploid Blackberry Germplasm

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Floral initiation (FI) was studied both in greenhouse- and field-grown plants of primocane-fruiting (PF) blackberries recently developed by the Univ. of Arkansas. Root cuttings of A-1836 and APF-13 were dug from the field and planted in a greenhouse on 1 Mar. 1997. NC 194 was included only in the field study. Terminal apices were sampled weekly starting at 0 (just before emergence) nodes of growth on 21 Mar. Floral primordia were first seen at five and six nodes of growth in greenhouse-grown A-1836 and APF-13, respectively, 35–42 days after root cuttings were planted (DAP). Under field conditions, the same event was not observed until 21 May when A-1836 and APF-13 reached at least 20 nodes; NC 194 did not show evidence of floral parts until 10 July. Once FI occurred, floral differentiation proceeded uninterrupted until completion. Blooming occurred 32–35 and 40–45 days after FI in APF-13 and A-1836, respectively; NC 194 bloomed in late August. The first fruits of APF-13 were harvested 120 DAP. These findings demonstrate that PF blackberries form flowerbuds soon after a short period of vegetative growth. This information should be useful for implementing horticultural practices, such as programming of the harvest date.

In Vitro Germination of Native Terrestrial Orchids

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Scarification treatments (a control, a 10-minute vacuum, or a 1.5-minute ultrasound), different media (modified Norstog and Van Waes) and growth regulators [benzyladenine (BA) at 0, 1, 1.5, or 2 mg·L⁻¹ and 6-(*r,r*-dimethylallylamino)-purine riboside (2iPR) at 0, 1, 1.5 or 2 mg·L⁻¹] were used in combination to increase seed germination of *Cypripedium calceolus* var. *parviflorum*. Seeds treated with ultrasound had higher germination (58.0%) than those treated with vacuum (27.4%) or controls (19.2%). Germination rates increased with 2iPR level and reached a maximum between 1.5 and 2 mg·L⁻¹. Seeds on Van Waes medium, which were not transferred to fresh medium after germination, had a severe browning problem causing many protocorms to die. Those on Norstog medium continued to grow into seedlings with less browning. Germination rates of *Calopogon tuberosus* × *Calopogon* 'Adventure' and *Liparis liliifolia* were determined on the different media and growth regulator treatments. Multiple shoots of *Calopogon* developed from single seeds on media containing growth regulators. Flower buds formed in vitro on *Calopogon* in media containing 1 mg·L⁻¹ or higher BA 5 months after germination. *L. liliifolia* seeds in Norstog medium had a higher proportion of germination than those in Van Waes medium.