

Research Highlights

Susceptibility of Pecan to Black Pecan Aphids

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Abstract. The host-parasite interaction between the black pecan aphid (BPA) [*Melanocallis caryaefoliae* (Davis)] and pecan [*Carya illinoensis* (Wangenh.) K. Koch] was investigated. Three years of field observations of the ability of BPA populations to induce chlorotic blotches, or visual damage, on 32 pecan cultivars revealed considerable variation in cultivar susceptibility to BPA damage. Among the most commonly grown cultivars, 'Sioux', 'Cape Fear', 'Farley', 'Cowley', 'Grabohls', and 'Barton' exhibited the least damage, whereas 'Choctaw', 'Oconee', and 'Summer' exhibited the greatest, with 'Sioux' and 'Choctaw' exhibiting the greatest extremes in susceptibility. Subsequent evaluation indicated that the foliage of pecan genotypes can exhibit an antibiotic-like effect, resulting in the suppression of resident BPA populations. However, the relationship between the degree of this antibiotic effect and the degree of damage exhibited by trees, or field tolerance, was negligible ($r = -0.10$). For example, while 'Choctaw' foliage greatly suppressed BPA population growth, this population was able to inflict relatively severe damage to leaves. An evaluation of feeding preference indicated that BPA alate viviparae (winged females) preferentially feed upon host cultivars on which they have been previously feeding. This feeding preference was eliminated by rinsing leaves with distilled water; hence, a water soluble factor(s) appears to

be involved in host preference. *HORTSCIENCE* 33(5):798.

Vine Management Systems Affect Yield, Fruit Quality, Cluster Compactness, and Fruit Rot of 'Chardonnay' Grape

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Abstract. Three vine management systems were evaluated on 'Chardonnay' grapevines under Michigan growing conditions for five growing seasons to determine their influence on yield, fruit quality, cluster compactness, and the incidence and severity of fruit rot. These systems used mid-wire cordon (MWC) vine training, Umbrella Kniffin (UK) vine training, and a combination of those (UK/MWC). Over four growing seasons the UK and UK/MWC treatments had higher fruit soluble solids and higher yields than the MWC treatment. These higher yields were attributed to higher yields per node and the ability to retain more live nodes per vine than was possible with the MWC treatment. The UK and UK/MWC treatments also had less fruit rot than the MWC treatment in some years, which was related to reduced compactness of clusters. The UK and UK/MWC treatments produced greater numbers of mature canes per vine than the MWC treatment, and

the locations of the canes allowed full cropping the season following an extremely cold winter. *HORTSCIENCE* 33(5):806.

Interactions of Poultry Litter, Polyethylene Mulch, and Floating Row Covers on Triploid Watermelon

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Abstract. Triploid watermelon (*Citrullus lanatus* Thunb.) was grown on the same plots in 1990 and 1991 and fertilized with either poultry litter or commercial fertilizer. Additional treatments included bare soil or plots mulched with black polyethylene, and plots with or without spunbonded fabric row covers over both bare soil and mulch. Watermelon yields were unaffected by fertilizer source in 1990 but

were significantly higher for poultry litter than for commercial fertilizer treatment in 1991. Polyethylene mulch significantly increased postharvest soil NO₃ and leaf N concentrations in 1990 and increased yield and yield components in both years. There were no beneficial effects of row covers on yield in either year, presumably because no early-season freezes occurred. *HORTSCIENCE* 33(5):810.

Biostimulants and Soil Amendments Affect Two-year Posttransplant Growth of Red Maple and Washington Hawthorn

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Abstract. Humate-based products have been aggressively marketed as biostimulants that increase plant growth. Little data are available on their effect on tree establishment or their interaction with fertilizer and irrigation regimes. This experiment tested several types of biostimulants on posttransplant growth of *Acer rubrum* L. (red maple) and *Crataegus phaenopyrum* (Blume) Hara (Washington hawthorn) trees, both with and without irrigation and fertilization. Soil treatments were applied at planting as: 1) control (native backfill only); 2) compost (native backfill + yard-waste compost); 3) peat (native backfill + Canadian sphagnum peat); 4) granular humate, 100 g/tree; 5) granular humate, 200 g/tree; and 6) liquid humate +, a proprietary liquid mixture of humate, kelp extract, thiamine, and intermediate "metabolites." Irrigation regime \times soil treatment interaction was significant for red maple, but soil treatments did not increase height, stem diameter, top dry mass, or root length. For Washington hawthorn, soil treatments

did not increase height, stem diameter, or root length, but top dry mass in all treatments as a group and in humate-treated trees in particular was greater than that of controls. Roots of peat-treated trees of both species were longer than those in other treatments. Granular humate applied at 200 g/tree increased total root length more than did 100 g/tree in Washington hawthorn but not in red maple. Fertilizing at planting with N at 14.5 g·m⁻² had no effect on any parameter measured for either species. *HORTSCIENCE* 33(5):819.

The Use of Ground Covers during the Establishment of Heart-of-Palm Plantations in Hawaii

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Abstract. Pejibaye (*Bactris gasipaes* Kunth) is being evaluated in Hawaii for production of fresh heart-of-palm. Yields and offshoot (sucker) production were evaluated in response to woven black polypropylene mat (control), three legumes [*Arachis pintoii* Krap. & Greg., *Cassia rotundifolia* Pers., and *Desmodium heterocarpon* (L.) DC], and a grass (*Chloris gayana* Kunth) used as ground covers. *D. heterocarpon* and *C. gayana* formed closed canopies quickly and controlled weeds well, but required more frequent mowing. *A. pintoii* formed a closed canopy slowly and only controlled weeds after forming a thick canopy, but required less mowing. *Cassia rotundifolia* died out after flowering and setting seed. All vegetative ground covers delayed heart-of-palm harvest and had reduced yields 1.5 years after planting. A combination of polypropylene (adjacent to plants) and vegetative ground covers (in service rows) may provide the best solution to minimizing labor for vegetative management in this orchard crop. *HORTSCIENCE* 33(5):814.

Grapevines to Hydrogen Cyanamide

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Abstract. The effects of surfactants on the efficacy of hydrogen cyanamide (H₂CN₂) applied to 'Perlette' grapevines (*Vitis vinifera* L.) grown in the Coachella Valley of California were examined in 1994 and 1995. Vines were pruned in mid-December in both years and treatments applied at 1000 L·ha⁻¹ the following day to dormant spurs and cordons using a hand-held spray wand. In 1994, H₂CN₂ was applied at 0.5%, 1%, or 2% by volume in combination with 0%, 0.5%, 1%, 2%, or 3% by volume of the amine-based surfactant Armobreak. In 1995, H₂CN₂ was applied at 0.5%, 1%, or 2% by volume in combination with Armobreak at 0% or 2% by volume. In 1994, budbreak rate was highly dependent upon H₂CN₂ concentration when 0% to 1% Armobreak was used; budbreak was generally most rapid for vines treated with 2% H₂CN₂ and slowest for vines treated with 0.5% H₂CN₂. When 2% or 3% Armobreak was used, however, little effect of H₂CN₂ concentration was observed. Results were similar in 1995, but the budbreak of vines treated with 2% H₂CN₂ + 2% Armobreak lagged behind that of vines treated with 1% H₂CN₂ + 2% Armobreak. The number of days after treatment required for 70% budbreak generally declined as the concentrations of H₂CN₂ and Armobreak were increased. A separate experiment conducted in 1995 revealed that several surfactants varying in chemical composition, Armobreak, Activator 90 and Agridex, had similar effects on H₂CN₂ efficacy. The results indicate that the addition of surfactants to H₂CN₂ solutions can significantly reduce the amount of active ingredient necessary for maximum efficacy on grapevines. Chemical names used: hydroxypolyoxyethylene polyoxypropylene ethyl alkylamine (Armobreak); alkyl polyoxyethylene ether (Activator 90); paraffin petroleum oil (Agridex). *HORTSCIENCE* 33(5):857.

Seed Lines, Population Density, and Root Size at Harvest Affect Quality and Yield of Cut-and-peel Baby Carrots

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Abstract. Carrot (*Daucus carota* Mill. cv. Caropak) was studied under four population densities, and three numbers of seed lines per bed, and was harvested under three root size harvest parameters. Four phases (cutting, grading, peeling, and marketable yield) in the cut-and-peel baby carrot process were evaluated. Root length was most desirable when plots were harvested when 25% to 35% of the roots measured >2 cm in diameter. Roots were longest (14.7 cm) in the treatments containing six seed lines per bed. The harvest criteria of 25% to 35% root diameter >2 cm also produced the highest fresh mass (48.1 t·ha⁻¹), and the highest cut and graded mass (37.7 and 32.3 t·ha⁻¹, respectively). A population density of 321 plants/m² produced the highest fresh and cut mass. Percent cut waste (21.6% crowns and tips) was not affected by root size at harvest, but percent graded waste was lowest (14.2%) when plants were harvested at the greatest root size. Four seed lines per bed produced the highest graded (18.4%), and total waste (61.2%), but not cut waste. The lowest total waste, estimated at 59.7% and the highest projected marketable yield (19.4 t·ha⁻¹) occurred when roots were harvested using the 25%

to 35% root diameter >2-cm parameter. Total waste and marketable yield were obtained using a fixed waste value of 40% in the peeling phase (peeling, polishing, and grading before packing). This percentage could vary depending on the equipment specifications and quality control of a given processing facility. Root size at harvest proved to be the main factor affecting projected marketable yield of cut-and-peel baby carrots at the population densities used in this study. *HORTSCIENCE* 33(6):972.

Evaluation of Oriental Trellis Cucumbers for Production in North Carolina

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Abstract. Eighteen cucumber (*Cucumis sativus* L.) cultivars (15 oriental trellis and three standard American slicers) were grown on trellis and flat-bed production systems during the spring and summer seasons of 1995. Vine, flower, fruit quality, keeping ability, and yield traits were measured. Vine length, incidence of powdery mildew, fruit shape, fruit quality, fruit firmness, yield of Fancy plus No. 1 grade slicer fruits, marketable yield, and percentage of culled fruits were all higher when cultivars were grown on trellis support. Anthracnose damage, fruit length, fruit diameter, average fruit mass, fruit color, overall impression, fruit shriveling, seedcell size, branch number, percentage of staminate nodes, and total yield were not significantly affected by production system. The best cultivars for marketable yield (mass of Fancy, No. 1 and 2 grade slicers) were 'Summer Top', 'Tasty Bright', and 'Sprint 440' on trellis support and 'Sprint 440' and 'Poinsett 76' on flat bed. The cultivars with the best fruit quality were 'Tasty Bright', 'Summer Top', and 'Sprint 440' on trellis and 'Poinsett 76', 'Sprint 440', and 'Tasty Bright' on flat bed. The best cultivars overall on the trellis production system were 'Sprint 440', 'Summer Top', 'Tasty Bright', and '89-211', and the worst were 'Sky Horse', 'Hongzhou Green 55', and 'Fengyan'. The best cultivars overall on the flat bed were 'Poinsett 76', 'Sprint 440', and '89-211', while the worst cultivars were 'Sky Horse'

and 'Hongzhou Green 55'. *HORTSCIENCE* 33(5):891.

Response of Injury to Strawberry Crowns Caused by European Corn Borer Larvae

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Abstract. Larvae of several insects injure and kill strawberry (*Fragaria ×ananassa* Duchesne) plants by burrowing into and hollowing out plant crowns. Occasionally, these infestations are serious enough to cause heavy economic losses to fruit producers and nursery plant growers. In 1997 in Beltsville, Md., we observed wilting and dying mature plants and unrooted runner plants in two experimental strawberry plantings. Injury by larvae was extensive; large cavities occurred in crowns, and the central pith tissues were removed from stolons and leaf petioles. Often, insect frass was seen at entrance holes. Larvae removed from hollowed-out parts of injured plants were identified as the European corn borer (*Ostrinia nubilalis* Hübner) in their fifth instar stage. Their presence in this instance also was associated with a cover crop of millet [*Setaria italica* (L.) P. Beauv., 'German Strain R'] planted between the strawberry rows for weed suppression. This is the first published report of the European corn borer attacking strawberry. Although this insect may occur only sporadically in strawberry plantings, it may become important in the future. Growers and other professionals should become aware of this new strawberry pest and recognize that its management in strawberry will be different from management of other crown-boring insects. *HORTSCIENCE* 33(5):866.

Species and Their Relationships with Air and Soil Temperatures

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Abstract. Royal palms [*Roystonea regia* (HBK.) O.F. Cook], coconut palms (*Cocos nucifera* L. 'Malayan Dwarf'), queen palms [*Syagrus romanzoffiana* (Chamisso) Glassman], and pygmy date palms (*Phoenix roebelenii* O'Brien) were grown in a rhizotron to determine the patterns of root and shoot growth over a 2-year period. Roots and shoots of all four species of palms grew throughout the year, but both root and shoot growth rates were positively correlated with air and soil temperature for all but the pygmy date palms. Growth of primary roots in all four species was finite for these juvenile palms and lasted for only 5 weeks in royal palms, but ≈ 7 weeks in the other three species. Elongation of secondary roots lasted for only 9 weeks for coconut palms and less than half of that time for the other three species. Primary root growth rate varied from 16 mm \cdot week $^{-1}$ for coconut and pygmy date palms to 31 mm \cdot week $^{-1}$ for royal palms, while secondary root growth rates were close to 10 mm \cdot week $^{-1}$ for all species. About 25% of the total number of primary roots in these palms grew in contact with the rhizotron window, allowing the prediction of the total root number and length from the sample of roots visible in the rhizotron. Results indicated that there is no obvious season when palms should not be transplanted in southern Florida because of root inactivity. *HORTSCIENCE* 33(6):995.

DRIS Evaluation of the Nutritional Status of Processing Tomato

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Abstract. Diagnosis and Recommendation Integrated System (DRIS) norms were derived for processing tomato (*Lycopersicon esculentum* Mill.) from a 1993–94 survey of >100 fields in the Sacramento and San Joaquin Valleys of California. Relative foliar N, P, K, Ca, Mg, and S concentrations were expressed in ratio form, with DRIS norms calculated as the means of fields with fruit yield ≥ 90 Mg \cdot ha $^{-1}$. Norms were developed for three growth stages: first bloom, full bloom, and 10% of fruits ripe. Optimum foliar nutrient concentration ranges were calculated by regression analysis from DRIS nutrient indices of high-yield fields. These optimum ranges were in general agreement with existing empirically derived sufficiency ranges for N and P, higher for Ca, Mg, and S, and much lower for K. The relatively low foliar K levels observed were attributed primarily to the strongly determinate growth habit of currently used cultivars. In the fields sampled, yield-limiting nutrient deficiency appeared to be rare. *HORTSCIENCE* 33(5):830.

Phosphate Starter Fertilizer Temporarily Enhances Soil Arsenic Uptake by Apple Trees Grown under Field Conditions

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Abstract. Monoammonium phosphate (MAP) is a popular starter fertilizer in Pacific Northwest tree fruit orchards; however, its use on soils contaminated with lead arsenate pesticide residues can enhance As solubility, thereby increasing As phytoavailability. 'Fuji'/EMLA.26 apple trees (*Malus \times domestica* Borkh.) were planted in Mar. 1992 on a lead arsenate-contaminated Cashmont gravelly sandy loam soil (HCl-extractable soil As range: 60–222 mg \cdot kg $^{-1}$) using in-hole starter fertilizer application of either MAP or ammonium sulfate at equivalent N and anion rates. In ensuing years, all trees received identical applications of ammonium ni-

trate only. Relative trunk cross-sectional area was inversely related to soil As concentration in the year of planting but not in subsequent years, and was independent of starter fertilizer treatment. Leaf and fruit As were positively related to soil As in all years. Leaf As was initially higher in the MAP-treated trees; however, this effect diminished over time and disappeared by 1995. Fruit As was independent of starter fertilizer treatment, and was substantially lower than the tolerance established for As in fresh produce. The experimental results indicate that MAP starter fertilizer can increase soil As phytoavailability to apple trees grown under field conditions; however, the effects on tree growth and food safety are insignificant. *HORTSCIENCE* 33(5):826.

Use of Prodiamine as a Preemergence Herbicide to Control Annual Bluegrass in Kentucky Bluegrass

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Abstract. Annual bluegrass (*Poa annua* L.) is an intractable weed problem on golf courses. Much has been written about annual bluegrass, but there is little documentation of regional germination period(s) and the proper timing of preemergence herbicides targeted for the control of the annual biotype (*P. annua* ssp. *annua* [L.] Timm. = AB). The objectives of this field study were to determine the optimum prodiamine rate and timing for effective AB control. The turf was a mature stand of 'Kenblue' Kentucky bluegrass (*Poa pratensis* L.) maintained under conditions similar to those imposed for golf course roughs. Three rates of prodiamine (0.36, 0.73, and 1.1 kg \cdot ha $^{-1}$) were applied on three dates in 1995 (11 Aug., 14 Sept., and 13 Oct.) and 1996 (29 Aug., 16 and 30 Sept.). All rates applied 11 Aug. or 14 Sept. 1995, and 29 Aug. or 16 Sept. 1996 effectively controlled AB. None of the rates applied 13 Oct. 1995 reduced

AB cover, and the 0.36 kg·ha⁻¹ rate applied 30 Sept. 1996 provided relatively poor AB control. Data and observations indicated that the major germination period for AB was between late September and early December. Effective AB control was achieved whenever prodiamine, regardless of rate, was applied between mid-August and mid-September. These prodiamine rates and this application window may be effective only in relatively high cut turf (i.e., >5.0 cm) in the mid-Atlantic region. Chemical names used: *O,O*-bis(1-methylethyl) S-[2-[(phenylsulfonyl)amino]ethyl] phosphorodithioate (bensulide); *N,N*-di-*n*-propyl-2,4-dinitro-6-(trifluoromethyl)-*m*-phenylenediamine (prodiamine). HORTSCIENCE 33(5):845.

Surfactants Improve the Susceptibility of Five Landscape Pines to Pitch Canker Disease, Caused by *Fusarium subglutinans* f. sp. *pini*

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Abstract. Pitch canker, caused by *Fusarium subglutinans* f. sp. *pini*, causes branch dieback and stem cankers in many species of pine. Monterey pine (*Pinus radiata* D. Don), one of the most widely planted pines in the world, is extremely susceptible to pitch canker. Four other pine species, which might serve as alternatives to Monterey pine in landscape settings, were found to be relatively resistant, based on the size of lesions resulting from branch inoculations under greenhouse conditions. Of these species, Japanese black pine (*P. thunbergiana* Franco) was the most resis-

tant, followed by Canary Island pine (*P. canariensis* Sweet ex K. Spreng), Italian stone pine (*P. pinea* L.), and Aleppo pine (*P. halepensis* Mill.). Consistent with these findings, a field survey conducted in Alameda County, Calif., revealed Monterey pine to have the highest incidence of infection, with significantly lower levels in Aleppo, Canary Island, and Italian stone pines. Japanese black pine was not observed in the survey area. HORTSCIENCE 33(5):868.

In-furrow Starter Fertilization Enhances Growth and Maturity in Early Sweet Corn

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Abstract. Field studies were conducted in 1994 and 1995 to evaluate the effects of in-furrow-placed (i.e., applied directly in the seed channel) starter fertilizer on the emergence, maturity, and yield response of early sweet corn. In both years, three starter fertilizer treatments were applied: APP, with N and P at 13 and 19 kg·ha⁻¹, respectively (13N-19P kg·ha⁻¹), either banded (5 cm below and 5 cm to the side of the seed) or placed in-furrow, and a control (no starter fertilizer). Additionally, in 1995, the rate of APP was increased to supply 26N-38P kg·ha⁻¹ in combination with either band (5 × 5 cm) or in-furrow placement. Seedling emergence was delayed whenever starter fertilizer was applied with the seed; however, significant reductions (≈21%) in plant stand occurred only at the high rate of in-furrow placement. In both years, all starter treatments had a positive effect on seedling dry-matter production, and hastened silking. In-furrow application of 13N-19P kg·ha⁻¹ increased marketable ear yields 34% in 1995, but had no effect in 1994. Lack of yield response to the high rate of in-furrow fertilizer in 1995 was primarily a function of reduced stand, as ear number and ear mass per plant, and average ear size were similar to those in the other starter treatments. Based on these results, in-furrow APP at 13N-19P kg·ha⁻¹ appears to be an effective starter fertilization regime for early sweet corn, comparable in effect to banded 26N-38P kg·ha⁻¹

¹. However, high rates of in-furrow APP may reduce stands. Although significant yield response to in-furrow starter fertilizer may not always be realized, the increased early seedling growth may itself be a benefit, since fast-growing seedlings are more likely to be tolerant of adverse environmental conditions than are less vigorous plants. Chemical name used: ammonium polyphosphate (APP). HORTSCIENCE 33(6):1007.

Root and Shoot Growth Patterns in Four Palm Flowering of *Leucanthemum ×superbum* ‘Snowcap’ in Response to Photoperiod and Cold Treatment

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Abstract. ‘Snowcap’ Shasta daisy [*Leucanthemum ×superbum* Bergmans ex J. Ingram (syn: *Chrysanthemum ×superbum*, *C. maximum*)] was grown under various photoperiods and temperatures to determine their effects on flowering. In the first experiment, plants were held for 0 or 15 weeks at 5 °C and then were grown at 20 °C under the following photoperiods: 10, 12, 13, 14, 16, or 24 hours of continuous light or 9 hours with a 4-hour night interruption (NI) in the middle of the dark period. Without cold treatment, no plants flowered under photoperiods ≤14 hours and 65% to 95% flowered under longer photoperiods or NI. After 15 weeks at 5 °C, all plants flowered under all photoperiods and developed three to four or 10 to 11 inflorescences under photoperiods ≤14 or ≥16 hours, respectively. To determine the duration of cold treatment required for flowering under short photoperiods, a second experiment was conducted in which plants were treated for 0, 3, 6, 9, 12, or 15 weeks at 5 °C, and then grown at 20 °C

under 9-hour days without or with a 4-hour NI. Under 9-hour photoperiods, 0%, 80%, or 100% of plants flowered after 0, 3, or \geq 6 weeks at 5 °C, and time to flower decreased from 103 to 57 days as the time at 5 °C increased from 3 to 12 weeks. Plants that were under NI and received \geq 3 weeks of cold flowered in 45 to 55 days. For complete and rapid flowering with a high flower count, we recommend cold-treating 'Snowcap' for at least 6 weeks, then providing photoperiods \geq 16 hours or a 4-hour NI during forcing. *HORTSCIENCE* 33(6):1003.

Nutrition Affects Pre- and Posttransplant Growth of Impatiens and Petunia Plugs

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Abstract. Pre- and posttransplant growth of plug seedlings is affected by the nutrition of the plants. The effects of weekly applications of nutrient solution with different N (8–32 mM) or P and K (0.25–1.0 mM) levels on the growth and nutrient composition of impatiens (*Impatiens wallerana* Hook. f.) and petunia (*Petunia \times hybrida* hort. Vilm.-Andr.) plug seedlings were quantified. Impatiens and petunia pretransplant seedling growth was most rapid with a NO₃ concentration of 24 or 32 mM (N at 336 and 448 mg·L⁻¹), while P and K had little effect. Increasing the N concentration in the fertilizer also increased shoot tissue N levels of both impatiens and petunia and decreased shoot P level of impatiens and K level of petunia. Posttransplant growth was most rapid in plants that received N at 16 to 32 mM. Decreasing P and K from 1 to 0.25 mM in the pretransplant fertilizer reduced posttransplant growth. Shoot P level of impatiens 15 d after transplanting decreased from 6.9 to 4.8 mg·g⁻¹ as the pretransplant fertilizer N concentration increased from 8 to 32 mM, while N level increased from 18 to 28 mg·g⁻¹ as P and K fertilizer concentrations increased from 0.25 to 1 mM. Using posttransplant growth as a quantitative norm for plug quality, the sufficiency ranges for tissue N level are 28 to 40 mg·g⁻¹ for impatiens and 30 to 43 mg·g⁻¹ for petunia

plugs. These results indicate that fertilization programs for high-quality plug production should focus on N nutrition, and that plugs can be grown with greatly reduced levels of P and K. *HORTSCIENCE* 33(6):1014.

Comparison of Cabbage Seedling Growth in Four Transplant Production Systems

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Abstract. "Float-bed" (FB) is a simple hydroponic system used by the tobacco industry for transplant production. "Ebb-and-flood" (EF) is a modified FB system with periodic draining of the bed to limit water availability and control plant growth. Field-bed cabbage (*Brassica oleracea* L. gp. *Capitata*) transplant production was compared with FB, EF, and overhead-irrigated plug-tray greenhouse systems. Plants were produced in May and June and transplanted in a field near Blacksburg, Va., in June and July of 1994 and 1995, respectively. Beds for FB and EF production consisted of galvanized metal troughs (3.3 \times 0.8 \times 0.3 m) lined with a double layer of 0.075-mm-thick black plastic film. In 1994, both EF and FB seedlings were not hardened before transplanting, were severely stressed after transplanting, and had higher seedling mortality compared with plants from other systems. Plug-tray transplants showed the greatest increase in leaf area following transplanting and matured earlier than seedlings produced in other systems. In 1995, EF- and FB-grown cabbage plants were hardened by withholding water before transplanting, and seedlings had greater fresh mass and leaf area than plug-tray or field-bed seedlings 3.5 weeks after transplanting. Less succulent cabbage transplants were grown in EF and FB systems containing 66 mg·L⁻¹ N (40% by nitrate) and 83 mg·L⁻¹ K. Compared with the FB system, the EF system allowed control of water availability, which slowed plant growth, and increased oxygen concentration in the root zone. Both EF and FB systems are suitable for cabbage transplant production. *HORTSCIENCE* 33(6):976

Priming and Seed Orientation Affect Seedcoat Adherence and Seedling Development of Muskmelon Transplants

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Abstract. The effects of seed priming and seed orientation on seedcoat adherence and seedling development of containerized muskmelon transplants were investigated. Seeds of muskmelon 'Top Net SR' were primed for 6 days in darkness at 25 °C in an aerated solution of KNO₃ (0.35 M). Primed and nonprimed seeds were individually planted in Styrofoam trays in the greenhouse. Seeds were carefully oriented with the radicle down, up, or in the horizontal position, and covered with 0.5 cm of the growing mix. Seed priming and seed orientation affected both seedcoat adherence and seedling development, and interaction between priming and orientation was significant for seedcoat adherence. Our data indicate that seed priming can minimize seedcoat adherence during emergence of muskmelon seeds. *HORTSCIENCE* 33(5):847.

Heat Treatment Affects Postharvest Quality of Kale and Collard, but not of Brussels Sprouts

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Abstract. Mature leaves of kale (*Brassica oleracea* L., Alboglabra group) and collard (*Brassica oleracea* L., Acephala group), and Brussels sprouts (*Brassica oleracea* L., Gemmifera group) were heated by moist air at 40, 45, 50, or 55 °C for durations of 0, 30, 60, or 90 minutes. Heating of kale at 45 °C for 30 minutes was effective in maintaining better post-harvest quality, delaying yellowing, and reducing losses of sugars and organic acids during subsequent storage at 15 °C. Exposure of collard at 40 °C for 60 minutes also delayed yellowing and maintained turgidity of the leaves. Other treatments were either less beneficial, not effective, or caused injury. Heat injury occurred when temperature and duration exceeded the tolerance levels. In some cases, heat-injured tissues remained green but developed fungal infection. Heat treatments had no measurable effects on the rate of senescence or storage quality of Brussels sprouts. *HORTSCIENCE* 33(5):881.

Using Ethephon and GA₃ to Overcome Thermoinhibition in 'Jalapeño M' Pepper Seed

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Abstract. 'Jalapeño M' pepper (*Capsicum annuum* L.) seeds were soaked for 40 h in solutions of 0.0, 0.5, 1.0, 2.0, or 3.0 mM GA₃ (using Release, 10% GA₃) and 0.0, 1.75, 3.5, 7.0, or 10.5 mM ethephon in all combinations in petri dishes at 25 °C. The seeds

were rinsed, dried for 24 hours, then germinated at either 25 or 40 °C. Thermoinhibition was induced at 40 °C, as nontreated seeds failed to germinate, but 99% of the seeds germinated at 25 °C after 7 days. Pretreatment with H₂O alone partially alleviated thermoinhibition at 40 °C (41% germination). Pretreatment with ethephon alone resulted in up to 50% germination and with GA₃ alone up to 79% germination. The effects of the GA₃ and ethephon were additive, as the highest germination percentage (91%) at 40 °C was obtained with 3.5 mM ethephon + 3.0 mM GA₃. The percentage of abnormal radicles was <1% in all treatments. Chemicals used: (2-chloroethyl) phosphonic acid (ethephon); gibberellic acid (GA₃). *HORTSCIENCE* 33(6):1026.

Spectral Filters Affect Growth, Flowering, and Postharvest Quality of Easter Lilies

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Abstract. The role of light quality on growth, flowering, and postharvest characteristics of 'Nellie White' Easter lilies (*Lilium longiflorum* Thunb.) was evaluated in two growing seasons using 4% CuSO₄ and water (control) as spectral filters. The CuSO₄ filter significantly reduced plant height and internode length. However, the height reduction was smaller in the 1994–95 season (9%) than in the 1995–96 growing season (32%). The number of days to flower bud appearance and flower opening, and the number and diameter of flowers were not significantly affected by the spectral filters in either

season. The CuSO₄ filters reduced flower longevity by 3 days in nonstored plants, and by 5 days when plants were subjected to 1 week storage at 4 °C prior to placing in the postharvest room. Results suggest that spectral filters are effective in controlling height and producing compact Easter lily plants without causing a delay in flowering or reducing number of flowers per plant but flower longevity can be adversely affected. *HORTSCIENCE* 33(6):1028.

Plant Growth Regulators Reduce Postproduction Leaf Yellowing of Potted Asiflorum Lilies

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Abstract. The postharvest quality of potted Asiflorum lily 'Donau' (*Lilium* hybrid) was evaluated after plants were sprayed with 0, 50, 250, or 500 mg·L⁻¹ (BA equivalent) of Promalin (GA₄₊₇ to BA ratio was 1:1) or Accel (GA₄₊₇ to BA ratio 1:10) and stored at 2 to 3 °C for 0, 10, or 20 days. As storage was prolonged, more leaves senesced once plants were removed for evaluation. Leaf senescence declined with increasing concentrations of either Promalin or Accel, but Promalin was more effective. Application of 250 mg·L⁻¹ Promalin completely eliminated leaf senescence over the 20-day shelf-life evaluation period, irrespective of duration of cold storage. The treatments did not affect flower bud opening or plant height. Chemical names used: gibberellin (GA₄₊₇); benzyladenine (BA). *HORTSCIENCE* 33(6):1036.