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Long Term Recovery of Net Photosynthesis and Chlorophyll in Chlorotic Apple Trees Injected with Ferrous Sulfate
W. Dennis Scott*, David R. Walker and Lyman S. Willardson. (Utah State University, Provo, UT 84602)

Severely chlorotic apple (Malus domestica Borkh.) trees growing in a calcareous soil (pH 7.8) were pressure-injected with a 1.0% solution of ferrous sulfate. Net photosynthesis (Pn) in iron-treated trees was 50% greater than the controls within one week after injection and remained at this level for two growing seasons. During the third season, Pn decreased as chlorosis reappeared, but remained significantly above the controls until September. Chlorophyll concentration closely paralleled changes in Pn. There was a slight increase in stomatal diffusive resistance (r,) in treated trees two days after injection after which there were no differences between treated and control trees. Foliar iron concentrations in treated trees increased for about two months after injection, then decreased until, by the end of the first growing season, levels were no longer significantly above the control. This suggests that it is not total iron which controls chlorophyll concentration. Ferrous sulfate increased shoot growth and fall leaf retention. These results indicate that an iron injection can remain effective for at least three growing seasons.

Fruit Bud Coatings of Dormant Oil Sprays Increase Cold Hardiness and Induce Bloom Delay In Peach Trees. Robert E. Call*, Schuyler D. Seelye. (Utah State University)

The use of dormant oils to increase cold hardiness and delay bloom of peach trees (Prunus persica cv. Glesson) was investigated. Applications of Superior dormant spray oils at concentrations of 2, 5, 10, 70 percent were made during late winter and early spring of 1984. Combinations of oil and a growth regulator, (Alar), were also applied. Hardiness differences were measured by determining the freezing temperature required to kill 50 percent of the buds. Bloom stages were evaluated visually. The growth regulator used did not increase hardiness or delay bloom in these tests. Oils alone, however, increased hardiness 6 degrees C and delayed bloom 4 days in the best treatments.

The Effect of Four Irrigation Levels on the Growth and Fruiting of J. H. Hale Peach Trees. W. Dennis Scott, David R. Walker and Lyman S. Willardson. (Utah State University, Logan)

Four levels of water were applied to 15 year old J. H. Hale peaches by a drip irrigation system. Two inch diameter aluminum access tubes were placed 4 feet and 5 feet deep. In the row near the drip emitters to monitor the soil moisture with a neutron probe. Irrigations occurred when the trees received the second highest level of water had stopped extracting moisture from the soil. At that time all of the trees were irrigated for 8 hours, with the different levels of water determined by using a different number of emitters. Trees from an adjacent row irrigated by the grower were used as a control. Plastic was laid under the trees to prohibit rain from interfering with the study. Yield, fruit size, soluble solids, trunk and shoot growth were measured to study the effect of the water stress on the trees. Significant differences in yield and fruit size occurred between the control and the treated trees.

Influence of Irrigation Regime and Soil Type on the Emergence of Dry and Pre-germinated Seed of Blanketflower. Phil S. Allen*, Tim D. Davis, and Ronald R. Walsner. (Department of Agronomy and Horticulture, Brigham Young University, Provo, Utah 84602)

Greenhouse studies were conducted wherein seeds of blanketflower (Gaillardia aristata Pursh.) were either sown dry or pre-germinated (in aerated water for 48 hours) before sowing in flats containing different soil types. Flats were watered either every 24 or 72 hours and experiments were conducted under cool (average daytime high= 21°C) and warm (average daytime high= 29°C) conditions. Seedling emergence was greatest in a 50-50 peat-perlite medium and was lowest in fine sand. Emergence was generally greater in flats watered every 72 hours and was about 75% greater under warm conditions as compared to cool conditions. Pre-germinated seed showed varying degrees of improved emergence compared to dry seed depending upon soil type, irrigation regime, and temperature conditions. Seedling mortality, however, was greater for pre-germinated than for dry seed. These results suggest that pre-germination of blanketflower seed may improve seedling emergence, but the degree of improvement varies greatly depending on environmental and soil conditions.

Brown Stain Disorder in Hazelnuts. Gyan K. Shrestha* and Maxine M. Thompson (Department of Horticulture, Oregon State University, Corvallis, OR 97331)

Brown stain disorder is a serious problem in "Barcelona" hazelnut (Corylus avellana L.). The disorder can reduce yield by as much as 49% in Oregon. Externally, brown or dark brown stains, either spots or streaks, appear on the shell; internal tissues become brown and watery, and kernels fail to develop. The disorder first appears the last week of June and continues to occur until September. Possible causative factors are discussed.

The Effect of Calcium Compounds on Splitting of 'Lambert' Sweet Cherry. Nancy W. Callan*, Western Agricultural Research Center, Corvallis, MT 59030

Preharvest applications of Ca(OH)2 reduced splitting of 'Lambert' sweet cherry (Prunus avium L.) in laboratory trials. Three sequential preharvest sprays of Ca(OH)2 consistently reduced splitting, while single sprays of Ca(OH)2 in combination with naphthalenesoacetic acid (NAA), (2-chloroethyl) phosphonic acid (ethephon) or boron were moderately effective. Calcium hydroxide was a more effective Ca source than CaCl2 for reduction of splitting. Calcium applications did not affect fruit size, but three applications of Ca(OH)2 increased fruit soluble solids.

Developing Predictive Models for 'Delicious' Apple Fruit Growth. Eric A. Curry* and Kenneth L. Olsen. (USDA, ARS, Tree Fruit Research Laboratory, Wenatchee, WA 98801)

Orchards in five locations at elevations ranging from 900 - 2100 feet above sea level were selected for evaluating fruit growth characteristics over a two-year period. Fruit growth models were based on days from full bloom, Julian date, growing degree days (45 - 88°C), and accumulated hours within certain temperature ranges. The best correlations were between fruit diameter and either growing degree days or accumulated hours in the range of 45 - 88°C during the first 30 days after full bloom.

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Differential thermal analyses (DTA) was run on accaled Golden Delicious apple trees. Whole trees were frozen to the point of the various exotherms that were determined by DTA. The tetrazolium chloride method (TTC) was performed and the trees were placed in the greenhouse to observe recovery.

There were 5 exotherms. Trees survived the first two exotherms, were severely damaged at the third and were dead at the last two exotherms. TTC showed damaged vascular tissue in relation to the survival.

Root Hardiness Studies with Concord grape (Vitis labruscana) roots. M. AHMEDULLAH* and A. KAMAREZI (Irrigated Agriculture Research and Extension Center, Prosser, WA, 99350, Washington State University. 

Electrical conductivity (EC), triphenyl tetrazolium chloride reduction (TTC), and tissue browning tests were conducted on Concord grape roots of 1-3 and 4-6 mm in diameter after subjecting the dormant one-year old plants to temperatures. Growth and survival tests in combination with EC and TTC tests showed that lethal temperature of Concord roots was -5°C. Plants exposed to -10°C grew in survival tests but subsequently died. Temperatures at -20°C or below were lethal. Tissue browning tests though qualitative were useful in evaluating root injury to tissues and can be used in conjunction with other tests.

Paclobutrazol and Adventitious Root Formation on Cuttings. TIM D. DAVIS, RONALD H. WALSER*, NARENDRA SANKHLA, and A. UPADHYAYA. (Department of Agronomy and Horticulture, Brigham Young University, Provo, Utah 84602.)

The ability of the anti-gibberellin-like growth regulator, paclobutrazol, to promote adventitious root formation was tested by placing cuttings in solutions of the chemical for 24-48 hours and then observing the rooting response. At relatively low concentrations (1.5 to 6.0 mg per liter), paclobutrazol approximately doubled the number of roots formed on cuttings of Electractrus australis and Phaseolus vulgaris. Paclobutrazol also promoted the rooting of Hibiscus rosa-sinensis and Ficus laurecrosa but did not affect rooting of Zebrina pendula. Paclobutrazol did not affect root length but did inhibit shoot growth during the rooting period. Paclobutrazol also increased the peroxidase activity in the base of the cuttings compared to controls. This compound may be useful in simultaneously promoting rooting and controlling shoot growth.

Growth and Net Photosynthesis of Poinsettias as Affected by Plant Growth Regulators. TIM D. DAVIS*, RONALD H. WALSER, AND NARENDRA SANKHLA. (Department of Agronomy and Horticulture, Brigham Young University, Provo, Utah 84602.)

Poinsettia (Euphorbia pulcherrima "Brilliant Diamond") plants were treated with four plant growth regulators which were soil-applied at recommended rates. Cyocel, paclobutrazol, and ancymidol reduced plant height to 70, 81, and 90 % that of the controls, respectively. The cytokinin-like growth regulator, NIP 3039, did not affect plant height. Cyocel reduced bract size and the number of leaves per plant considerably, while the other growth regulators did not greatly affect these parameters. All growth regulator treatments increased chlorophyll and carotenoid content in the leaves, but generally did not greatly affect net photosynthesis or stomatal diffusive resistance. At 29 and 54 days after treatment, however, net photosynthesis of cyocel-treated plants was about 20% greater than that of controls.


White rubber rabbitbrush (Chrysothamnus nauseosus spp. albicans) is a potentially useful desert shrub for rapid production, slope stabilization, and ornamental uses. Very little is known about the physiology of this highly adaptable plant and the present investigation was conducted to examine some basic aspects of rabbitbrush net photosynthesis (Pn). Under favorable field conditions, Pn ranged from 36 to 73 umol CO2 m-2 sec-1, which is relatively high for a C3 woody species. Photosynthesis did not light saturate even at quantum flux densities (QFD) equivalent to full sunlight. The light compensation point was rather high (about 100 umol m-2 s-1) perhaps due to the teneosme vestiture on the leaf surface. At high QFD, the stomatal conductance was high (about 520 mmol m-2 s-1) for a woody species. Ribulose bisphosphate carboxylase content of the leaves was about 20-22 mg per gram fresh weight which is similar to that found in most C3 crop species. These results suggest that this C3 shrub is fairly well adapted to maintain high rates of Pn, at least under non-stressed conditions, hence the potential exists for a high rate of biomass production.

Environmental stress and pollen viability of beans. M. L. WEAvER (Western Regional Research Center, ARS-USDA, Albany, CA 94710) and H. TIMM (Department of Vegetable Crops, University of California, Davis, CA 95616).

The effect of reduced soil moisture and diurnal changes in leaf moisture status on pollen viability was investigated for morphologically different bean genotypes. Pollen viability and leaf water status (relative water content, RWC, and leaf water potential, LWP) was extensively altered by air temperature and soil moisture. Pollen viability and RWC were negatively associated (r = 0.87**) even further, in flowers of plants grown in reduced soil moisture. Type of plant growth, indeterminate or semi-determinate, was not associated with pollen viability and leaf water status or pollen viability regardless of soil moisture conditions. High temperature destroys pollen function by direct effects on metabolic processes. At a given temperature, however, changes in leaf water status caused by differences in soil moisture also appear to play a significant role in determining pollen activity.

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