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Pomology, Viticulture, and Small Fruits

DIURNAL VARIATION IN A CONTROLLED ENVIRONMENT OF A CONTAINERIZED PLANT

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A physical model of the soil-plant-atmosphere continuum was designed, constructed, monitored, and evaluated using potted apple trees (EM 26 'Yellow Delicious') in a greenhouse environment during summer and fall of 1986. A characterization scheme for acquiring, processing, and displaying quantified information from selected environmental variables was developed using current technologies and techniques.

Microclimates within the soil-plant-atmosphere continuum were compared for two diurnal cycles of high and low solar radiation. Special emphasis was placed on the amplitude and phase of vertical and horizontal temperature gradients.

The information pathway consisted of the following two major components: a Campbell Scientific 21X Micrologger measured and stored data from forty-five sensors at ten minute intervals; an AT&T 6300 Personal Computer was used to transfer, process, and display data using various software packages.

GC-MS QUANTITATION OF ENDOGENOUS ABA IN DORMANT APPLE SEEDS

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Endogenous levels of free cis,trans ABA were determined in embryonic axes, cotyledons, endosperm membranes and seed coats of dormant Northern Spy (M. domestica. Borkh) apple seeds during the course of stratification at 5C (cold) and 20C (warm control). Sample purification was done using Baker-10™ SPE disposable columns. Purification losses were corrected by the addition of hexadeuterated abscisic acid as an internal standard, and SIM quantitation done on a GC-MS. Abscisic acid levels in the embryonic axes and cotyledons remained fairly constant throughout the course of stratification. On the other hand, a significant reduction in the inhibitor levels in the endosperm membrane and the seed coat was evident after 30 days of stratification at both temperatures, at which time only cold stratified seeds were starting to lose their dormancy.

THE USE OF TRAPS AND OTHER MONITORING TECHNIQUES TO AID IN INSECTICIDE DECISIONS FOR PEAR PSYLLA ON PEAR TREES.

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A sticky trap was developed for monitoring adult pear psylla on pears. Different trap colors and locations were tested to achieve optimal trap efficiency. Traps and the standard limb-jarring method for monitoring adults were compared at commercial orchard sites in Connecticut. Adult collections obtained by both monitoring methods were highly correlated with the presence of pear psylla eggs and nymphs on pear terminals. Regression analyses were conducted to relate trap captures and limb jars to levels of nymphal infestation that would warrant a spray for control in Connecticut orchards. These analyses provided provisional action threshold levels for pear psylla management.

INTEGRATED PEST MANAGEMENT (IPM) FOR SWEET CORN AND APPLES IN CONNECTICUT.

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Sweet corn and apple growers in Connecticut have significantly reduced pesticide use by participating in an Integrated Pest Management (IPM) training program. IPM is a comprehensive strategy of pest control with major objectives to maintain high crop quality with the minimum use of pesticides. From 1982-1985 88% of the 44 growers that received IPM field training were able to reduce their pesticide applications by an average of 34% (3.5 sprays saved per grower) on sweet corn, and 17% (2.8 sprays) for orchardists. This was a reduction of 6,277 lbs. of pesticide that normally would have been applied to 2,275 crop acres. Pesticide cost savings in 1985 averaged $30 per acre for apples and $19 per acre for sweet corn. IPM growers completed a questionnaire and stated that prior to the program, IPM was used "somewhat" (38%), "seldom" (38%),"or not at all" (24%). Most growers (88%) stated that their future use of IPM will increase. All growers rated the IPM program as "excellent" (41%) or "good" (59%). Knowledge gained by growers among several topic areas was rated an average of 2.35 on a scale of 0 to 3 (poor to excellent). All pesticide savings were achieved while maintaining crop quality.

THE EFFECTS OF ROOTSTOCK ON APPLE RIPENING

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In 1980 a block of Starkspur Supreme Delicious apple trees on 9 different rootstocks (Ottawa 3, M.7A EMLA, M.9A EMLA, M.26 EMLA, M.27 EMLA, M.9, MAC 9 (Mark), MAC 24, and OAR 1) was established in Belchertown, MA. Beginning on September 15, 1986 and continuing until October 5 fruit were harvested every 5 days to measure internal ethylene concentration and to determine ripening rate. On September 29 fruit firmness, percent soluble solids, starch index value, and watercore index value were assessed. From these data it was determined that significant differences existed among the rootstocks as to their effect on fruit ripening. Fruit from trees on M.27 ripened first and those from trees on MAC 9 ripened last. Approximately 5 days separated fruit from these two rootstocks.

PROTECTION OF STRAWBERRY PLANTS FROM WINTER INJURY USING MANMADE SNOW

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'Midway' strawberry plants were covered with 15 cm of manmade snow in December 1983 and December 1984 using a Larchmont snow gun. Crown temperatures were recorded throughout both winters on these plants and plants covered with 15 cm of natural snow, 15 cm of straw mulch and control plants receiving neither snow nor mulch. Plots were covered during snow storms to prevent unwanted snow on the plants.

The manmade snow had a water content about twice that of the natural snow and within 24 hours had frozen into a dense layer. The insulating value, however, was similar to that of the natural snow. Minimum crown temperatures, plant mortality, total yield and fruit weight compared favorably between these two treatments and both treatments were superior to plants protected by straw mulch.

EFFECT OF N-(2-CHLORO-4-PYRIDYL)-N-PHENYLUREA (CPPU) ON FRUIT SET, FRUIT QUALITY AND FRUIT CHARACTERISTICS OF MCINTOSH APPLES

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Foliar sprays of 10 and 100 ppm N-(2-chloro-4-pyridyl)-N-phenylurea were applied either at early petal fall (PF) or 18 days later to mature McIntosh/M7 apple trees. All treatments thinned. The petal fall treatments reduced the crop load to the desired level, about 5 fruit/cm limb circumference. Fruit weight was increased 21% and 67% by the 10 and 100 ppm petal fall treatments, respectively. It appeared that CPPU, especially at the higher rate and at the PF + 18 day timing, retarded ripening. These fruit were firmer, red color was reduced, degradation of starch was delayed and at harvest it was more difficult to remove the fruit from the spur. Fruit L/D ratio and seed number were reduced by the PF + 18 day treatment.

EFFECT OF 2,4-DICHLOROPHENOXYPROPIONIC ACID, NAPHTHALENEACETIC ACID, AND DAMINOZIDE ON PREHARVEST DROP AND QUALITY OF MCINTOSH APPLES

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The effect of 5, 10, and 15 ppm 2,4-dichlorophenoxypropionic acid (DP), 10 and 20 ppm naphthaleneacetic acid (NAA) (applied 9/13), and 750 ppm daminozide (D)(applied 7/16) on cumulative drop of McIntosh/M26 apple trees was followed. D was the most effective stop drop material until October 1. Significant control of drop by NAA and DP did not occur until 9 days after application and 2 days after 20 kg of fruit was harvested from each tree. DP and NAA controlled drop comparably until October 1, but later in the season DP was more effective. On October 21, over 5 weeks after application, 10 and 15 ppm DP were effectively controlling drop although many fruit were cracked and split on the tree. Red color and soluble solids were comparable on all treatments harvested 7 days after NAA and DP application although flesh firmness was slightly reduced by the auxins.

WEED CONTROL IN LOWBUSH BLUEBERRIES WITH ATRAZINE

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Atrazine applied to a commercial lowbush blueberry (Vaccinium angustifolium) field at 4.5 or 9 kg/ha controlled grasses and herbaceous weeds but woody weeds were not adequately controlled at the 18 kg/ha rate. Significant injury to blueberries was observed at 18 kg/ha atrazine but not at the lower rates. The number of blueberry stems and flower buds increased with atrazine application up to 9 kg/ha but decreased at the 18 kg/ha rate. Regression analysis of yield data indicated that 6 kg/ha would maximize blueberry yield. Atrazine in combination with hexazinone did not increase efficacy over hexazinone alone.

COLD-INJURY TO APPLE TREES, WINTER 1985-1986

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Ten year old 'Empire' and 'Jonamac' on M.106 rootstock showed differential response to relatively mild minimum temperatures. Pre-injury variables included time of pruning, shading, white latex trunk paint, and naphthaleneacetic acid (NAA) as Pre-Bloom Sprout Inhibitor A-112. 'Empire' trees developed bark splits and dead bark and cambium above and below the graft union. 'Jonamac' trees showed similar injury below the graft union only.

Only time of pruning and shading were related to damage. Trees pruned after February 1 showed no damage. Where pruning was done between Christmas and January 22, 70-91% of trees developed injury. Light shading reduced the percentage of trees injured (21%), and reduced severity of injury.

Post-injury taping of split bark was not so satisfactory a treatment as nailing, as a means of mitigating further injury to damaged trees.

ANTIOXIDANT LEVEL: A POSSIBLE PREDICTOR OF APPLE SCALD SUSCEPTIBILITY AT HARVEST TIME.

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Cortland apples were harvested at different maturities, stored in 0°C air for 3 to 5.5 months, and assessed for scald development. Scald decreased with advancing maturity. Antioxidant activity in apples at harvest increased with advancing maturity, and was negatively correlated with scald development after storage. OD values at 200 nm of hexane extracts of whole apples were correlated (+0.63) with antioxidant activity at harvest, and were negatively correlated (as high as -0.86) with scald development. OD values and antioxidant activity at harvest were also negatively correlated with conjugated triene formation in apples during storage. We propose that OD 200 value of hexane extracts at harvest may represent antioxidant activity and be predictors of scald susceptibility of fruit.

SHORT CHAIN FATTY ACIDS AS POSSIBLE NATURALLY OCCURRING INHIBITORS IN APPLE SEEDS

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There have been several reports during the last 2-3 decades that normal saturated short chain fatty acids (SCFA) are naturally occurring inhibitory substances in plant systems. Their significance as endogenous growth regulators is uncertain. The inhibitory properties of normal saturated SCFA in the apple bud explant test is chain length dependent, maximum inhibition being obtained with chain lengths of C_8-C_{10} (M. K. Rogoyski and L. E. Powell, 1981. Acta Horticulturae 120:37-42.) We have examined changes in one of these SCFA (putative decanoic acid, C_{10}) in apple seeds of 2 cultivars which have moderately low (Idared) and high (Marin Onfroy) chilling requirements. Decanoic acid decreased in both cultivars as stratification proceeded, reaching relatively low concentrations by the time that stratification was complete in each cultivar. These preliminary findings are not meant to imply that SCFA are involved causally in apple seed dormancy, but suggest that additional research in this area might be worthwhile.

NUTRITIONAL REQUIREMENTS OF EMPIRE APPLES

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Results from orchard surveys and fertilizer trials conducted during the 1984 and 1985 seasons indicate tentative optimal leaf contents of 2.2 to 2.4% N; 1.35 to 1.80% K; 35 to 50 ppm Zn; and 7 to 12 ppm Cu. Leaf K levels were more closely correlated with subsoil (20 to 40 cm) than with topsoil (0 to 20 cm) K. When crop load plus fruit size were both considered in determining "cropping intensity" a leaf K level of at least 1.55% is considered necessary. Maximum fruit size was associated with leaf Zn of approximately 40 ppm. Yield was positively correlated with leaf Cu over the range of 5.0 to 8.1 ppm.

CHARACTERIZATION OF POLLEN STAINABILITY AND SEED SET IN CRANBERRY

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In fruit crops, both genetic and environmental factors associated with fertility can affect crop productivity. Two fertility parameters, pollen stainability and seed number/berry, were investigated in 10 cranberry, Vaccinium macrocarpon Ait., cultivars to determine whether genetic variation exists for fertility. In addition, the relationship between fruit size and seed number/berry was determined in 16 cultivars. Significant differences for pollen stainability and seed number/berry were found among the 10 cultivars. Pollen stainability ranged from 55.2% for 'Wilcox' to 92.7% for 'Franklin'. Seed number/berry ranged from 10.4 for 'Wilcox' to 21.9 for 'Stevens'. Pollen stainability was positively correlated ($r = .75, P \leq .01$) with seed number/berry. Fruit size was positively correlated with seed number/berry in all 16 cultivars examined. Coefficients of determination (R^2) ranged from .16 to .77. These results suggest that differences in fertility exist among cranberry cultivars and, consequently these differences may in turn contribute to differences in crop productivity.

FRESH MARKETING MAINE LOWBUSH BLUEBERRIES

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Maine lowbush blueberry growers are seeking alternatives to marketing their fruit through off farm processors. Alternatives must offer increased profits and growth potential. An Extension program which began in 1984 has been engaged in educating growers on the feasibility of marketing fresh lowbush blueberries. The first step in the education program was to assess needs and determine what marketing alternative fit those needs. Needs assessment was done using grower surveys, conversations with growers, and an analysis of potential markets. The second step was to increase grower awareness of market alternatives. Growers became aware of fresh marketing through Extension newsletters and meetings, as well as video tape presentations of existing fresh pack operations, and a conference on blueberry marketing. Extension then conducted activities to teach production and marketing methods. Activities included; in-field demonstrations, Extension publications, and Extension meetings with packers. Evaluation of the program was carried out by the program documenting client change. Future programming will include education of existing fresh packers as well as continuing the current program to extend new information to all blueberry growers.

SEASONAL DEVELOPMENT OF HIGHBUSH BLUEBERRY ROOTS UNDER SAWDUST MULCH

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Annual growth of white unsuberized roots from mature 'Earliblue', 'Bluecrop', and 'Lateblue' blueberry (*Vaccinum corymbosum* L.) plants relative to soil temperatures, shoot growth, and stage of development was studied for three years. The growth of roots continued throughout the year, but was much reduced at soil temperatures below 8°C. Two peaks in the growth of roots occurred, the first in early June and the second higher peak in September. Both peaks in root growth occurred with soil temperatures of 14° to 18°. The growth rate declined at soil temperatures outside this range. Growth of roots was concomitant with shoot growth.

Effect of Urea and Alternative Pruning Practices on Lowbush Blueberry Growth and Yield. John M. Smagula, Jeff Risser, and Edward J. McLaughlin, Department of Plant and Soil Sciences, University of Maine.

The response of lowbush blueberries to preemergent urea fertilization (0, 45, 90, 135, or 180 kgN/ha) and two fall pruning methods (flail-mowing or oil-fire) was studied. A split-block RCB design with six replications was employed. The following data were analyzed: stem length and branching, concentration of nutrients in leaf tissue, number of flower buds formed, number of flower primordia per bud, winter injury to flower primordia and fruit yield. There was no effect of pruning practice nor meaningful interaction of pruning method and rate of urea fertilization on any characteristic measured. Regression analysis indicated positive linear and quadratic trends in 1983 and 1985, respectively, for nitrogen concentrations in leaves with increasing rates of urea. Calcium and magnesium concentrations decreased linearly and quadratically in 1983 and 1985, respectively, as the rate of urea fertilization increased. Pre-treatment yields were collected in 1982 and used in analysing 1984 and 1986 yields which decreased linearly with increasing rate of urea fertilizer in both harvest years.

Vegetable Crops

EFFECT OF CRUCIFER TOXIN ON SEEDLING GROWTH OF OATS AS INFLUENCED BY pH.

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The sensitivity of extension growth of oats, Avena sativa, seedlings to the crucifer phytotoxin thiocyanate may be related to the pH of the growing media. Seedlings of oats were exposed for seven days to 0.75mM KSCN in sand medium initially adjusted to pH 5 or pH 6. Oats shoot and root length measurements taken after seven days exposure to the various treatments showed that media pH influenced the phytotoxicity of thiocyanate to shoot extension. The pH 5 treatment seemed to enhance the phytotoxicity of thiocyanate to elongation of oats shoots and increase thiocyanate uptake as compared to oats in pH 6 medium. The shoot elongation of oats grown at pH 6 appeared markedly less sensitive to thiocyanate than at pH 5 even though the seedlings took up significant amounts of thiocyanate. Root elongation of the oats was less affected by the various treatments than was shoot elongation.

GROWTH ANALYSIS AND COMPUTER SIMULATION OF GROWTH AND DRY MATTER PARTITIONING IN THE POTATO

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In the summer of 1985, 3 widely adapted potato cultivars and 3 relatively heat tolerant clones were included in field growth analyses. Emergence was counted daily and per cent row cover was measured weekly. Fresh and dry weights of leaves, stems, and tubers were measured at 3 monthly harvests. Main shoots were separated from branches for both leaf and stem dry weights. After the final harvest, tubers were sized into 5 diameter classes, and specific gravities and quality were determined. Hourly air temperature, relative humidity, irradiance, rainfall, and wind run were recorded throughout the growing season. Data from the field growth analyses were used to improve and test the Ng and Loomis model, POTATO (1984), which simulates growth at an hourly time step. Modifications were made to the model to gain an understanding of its behavior, and to improve its ability to simulate 'Katahdin' under New York weather conditions.

AMMONIUM-INDUCED ETHYLENE EVOLUTION BY HORTICULTURAL CROPS

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Tomato (Lycopersicon esculentum Mill.) cultivar Heinz 1350 grown in sand culture with ammonium nutrition evolved ethylene at a rate of 178 $nl \cdot g^{-1} \cdot hr^{-1}$ on a dry weight basis, whereas plants on nitrate nutrition evolved only 29 units of ethylene. Buffering of the sand with $CaCO_3$ alleviated the stresses of ammonium toxicity and prevented the burst of ethylene. Deficiencies of K, Ca, or Mg enhanced ethylene evolution, but deficiencies of N, P, or S had no effect on ethylene evolution relative to that of the plants receiving full nutrition, although the enhancement was much lower than that induced by ammonium nutrition. Coleus, lettuce, and other species grown in soil culture with ammonium nutrition had elevated rates of ethylene evolution relative to the same species grown with nitrate nutrition.

PHYSIOLOGY OF ETHYLENE EVOLUTION BY TOMATO PLANTS UNDER AMMONIUM-INDUCED STRESS

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Tomato (Lycopersicon esculentum Mill. cv Heinz 1350) plants subjected to the stress of ammonium toxicity in a soil-based medium showed a morphological disorder characterized by epinasty of the leaves. The disorder was accompanied by an increase in the rate of ethylene evolution by whole plants from about 15 nl/g/hr to 115 nl/g/hr. Development of necrotic stem lesions occurred prior to the increase in ethylene production. Following the burst in ethylene evolution, plants senesced rapidly and the rate of ethylene production decreased. In sand culture, potassium supplied in molar equivalency to the supply of NH_4 prevented the increase in ethylene evolution and the development of symptoms when the medium was buffered. In an unbuffered medium, K prevented the development of stem lesions, but did not prevent leaf epinasty or the senescence of plants. The mutant tomato genotypes yellow-green-5 and neglecta-1 exhibited tolerance to NH_4 toxicity and did not produce ethylene at an increased rate when supplied with solutions containing 0.04 M NH_4.

THE EFFECT OF TYPE AND SIZE OF TRANSPLANT ON CROP UNIFORMITY AND YIELD IN CABBAGE AND CAULIFLOWER

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Both uniformity of maturation and yield were evaluated for cabbage and cauliflower grown from either bare-rooted (BR) transplants or greenhouse-grown transplants (GG). BR transplants were used only for fall crops. Four different size GG transplants, ranging from a 4 cc cell size, to a 60 cc cell size were used for both spring and fall crops. In fall cabbage, the use of the largest size GG transplants significantly increased yields compared to either BR or smaller GG transplants. However, there was no effect of type or size of transplant on the uniformity of crop maturity in either spring or fall cabbage. In cauliflower, there was no consistent effect on yield due to either type or size of transplant. However, the uniformity of maturity of both spring and fall cauliflower was improved by the use of GG, rather than BR transplants. Harvest duration was decreased from 38 and 34 days for plants established with BR transplants to 21 and 16 days for GG transplants in spring and fall crops respectively.

THE USE OF PLASTIC AND FABRIC ROW COVERS TO EXCLUDE CERTAIN INSECT PESTS ON VEGETABLE CROPS.

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Slit clear plastic, Agronet and Kimberly Farms fabric row covers were tested for excluding insect pests from broccoli and summer squash. Significantly fewer root maggot adults (RMA) were captured on sticky traps under row covers as compared to traps in uncovered broccoli controls. RMA emerged earlier under Kimberly Farms and Agronet treatments than in uncovered broccoli plots. Significantly more diamondback moth (DBM) larvae were recorded on broccoli in the uncovered-unsprayed control than under Kimberly Farms and Agronet row covers. No difference in DBM was observed between slit plastic and uncovered-unsprayed treatments. Significant reductions in broccoli yields occurred when certain row covers remained in place for the entire production cycle. Weights of broccoli harvested under Kimberly Farms, slit plastic, and Agronet treatments were 70.7%, 76.2%, and 120.7% of the control, respectively. Significantly more striped cucumber beetles (SCB) and flea beetles (FB) were captured on traps in uncovered-unsprayed controls of summer squash than on traps under row covers. No significant differences existed in SCB and FB captures among row covers.

A MANAGEMENT SYSTEM FOR PRODUCTION OF SNAP BEANS IN LIVE MULCH

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A series of field experiments were conducted at the University of Connecticut Department of Plant Science Field Research Laboratory, Mansfield, CT to determine the effect of crop density, fertilizer rate and placement, and mulch suppression by mowing or herbicides on the growth and yield of snap beans (Phaseolus vulgaris L.) grown in a small white clover (Trifolium repens L.) living mulch. Fresh weight yields of beans grown in living mulch equalled those of beans grown under conventional tillage when 38 cm bean rows were used, complete or NP fertilizer was banded beneath bean rows and white clover was mowed at bean emergence. In order for beans to gain a competitive dominance over the white clover mulch, the bean canopy must close over the row middle early in the growth cycle. Banding fertilizer resulted in very rapid early bean growth. Row spacings of 38 cm permitted the bean canopy to close within 14-18 days of emergence. Mowing at bean emergence removed any shading effect the mulch might have exerted on the bean seedlings and tended to retard mulch growth for 7-10 days.

AN EVALUATION OF THE EFFECT OF THREE CYTOKININS ON PLATING EFFICIENCY IN PROTOPLAST POPULATIONS OF POTATO, SOLANUM TUBEROSUM L.

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Protoplasts were isolated from potato leaves cv. 'Russet Burbank' and plated in cell layers containing either BA, kinetin or 2ip at concentrations of 0, 0.005, 0.05, 0.5, or 5.0 mg/liter. After 17 days in culture, plating efficiencies were determined and BA, at the 0.5 and 0.05 mg/liter concentrations, was associated with significantly higher plating efficiencies than the other two sources, The methodology for following development of individual protoplasts is discussed.

DISEASES OF MUNG BEAN AND ALFALFA SPROUTS IN NEW ENGLAND.

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Mung bean and alfalfa sprouts are becoming increasingly popular in New England. In Massachusetts alone, approximately 5,000 tons are produced annually. Several new diseases of sprouts are reported here. Enterobacter cloacae was found to cause a stunting and browning of mung beans during production. Under experimental conditions, less than 10 cfu/petri dish-incubation chamber resulted in disease. Cell-free, filter sterilized culture extracts of the bacterium also reproduced the disease. Rhizopus stolonifera colonizes mung beans during production resulting in clumps of sprouts bound together by mycelium. Rhizopus was found to be air and seed-borne. Pythium ultimum var. ultimum, P. ultimum var. sporangiiferum and P. aphanidermatum cause a soft rot of alfalfa sprouts. Pythium was found to be associated with the seed and could be cultured from wooden structures in close proximity to the sprouts. Diseases previously reported elsewhere that have also been noted in New England include Erwinia chrysanthemi soft rot of alfalfa sprouts and hypocotyl collapse (calcium deficiency) of mung bean sprouts.

PHOTOSYNTHESIS AND TRANSLOCATION IN GREENHOUSE TOMATOES GROWN UNDER FLUCTUATING TEMPERATURE

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Greenhouse tomato plants (Lycopersicon esculentum L.) were grown into fruit production either under constant temperature, with a 3°C day to night variation with a mean of 17°C or under fluctuating temperature, with a 9°C day to night variation with the same mean. Fluctuating temperature increased fruit weight at the expense of the vegetative shoot. Photosynthesis of whole plants was measured over a 24 hour period in clear plastic assimilation chambers under ambient light and temperature. Neither daily integrated carbon exchange nor respiration rates at night differed despite the difference in day and night temperature. Translocation was measured after photosynthetic assimilation of $^{14}CO_2$ by whole plants. Under fluctuating temperature, translocation to the fruit within 5 hours of labeling was much faster than under constant temperature, but there was no consistent difference after 24 hours. Carbohydrate levels in the leaves alone were enhanced by growth under fluctuating temperature.

Floriculture, Ornamental Horticulture, and Landscape Horticulture

OVERVIEW OF AMERICAN PUBLIC HORTICULTURE

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The physical appearance of American public horticultural institutions has changed over the nearly three centuries of existence in North America, yet their purpose to benefit society has remained. Christopher Witt, physician and botanist, reportedly established the first botanical garden in 1708 in Germantown, PA presumably to collect and study medicinal plants and use the various parts for food and to treat the ill. Today, public horticultural activities may not be as easily recognized as they are often masked in such places as the New York Zoological Society's JungleWorld, Boston's Mt. Auburn Cemetery, and Deere and Company's Administrative Center in Moline, IL. A large majority of public gardens in North America, particularly arboreta and botanic gardens, still consider research and educational experiences very important purposes. Parks, nature centers and display gardens give aesthetics a high priority. Regardless of stated purpose nearly all North American public gardens have plant collections and are involved with grounds maintenance. There is no average American public horticultural institution in type, size, governing authority and budget, but the diversity is bridged by some common purposes which help guide the institutions for the good of society.

MAINTENANCE: FACING THE HARD FACTS OF LIFE
Mark Zelonis, Director Blithewold Gardens and Arboretum

Grounds maintenance is one of the most important, but most frequently under-budgeted aspects of public horticultural institutions. The level of maintenance reflects an organization's pride in its plantings and thoroughness in its planning processes. By knowing exactly what it has to take care of, a botanic garden, arboretum, park system, or zoo can more efficiently design and budget for their plantings necessary upkeep and long-range survival. Decisions regarding plant selection, equipment purchase, personnel hiring, and project scheduling are made easier and more logically when a manager knows how long it takes to maintain the areas under his/her control. Designers are urged to follow up on their creations to better ensure their project's success. Grounds managers should advise the designer of the feasibility of their proposal and of the virtues of certain labor-saving ammenities. Examples are given of instances where failure resulted from the designer not knowing his client's financial limitations, and where a grounds manager's knowledge of the pertinent facts led to success.

EDUCATION IN PUBLIC HORTICULTURE
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Developing the public's awareness and appreciation of the value of plants and open greenspace is an important part of the mission of public horticultural institutions as well as academic institutions. Through the use of innovative education programs there is the potential to draw students into horticulture (especially important during this period of declining enrollments) as well as to develop a consciousness of horticulture among the general population. Methods include both formal and informal classes; workshops, lectures, and tours; symposia and conferences; exhibits and displays; demonstration gardens; plant information services; publications; community and youth gardens; vocational training and internships; professional and teacher training programs; and radio, televison, video, and film programs. Approaching this education with a human or social perspective will enable horticulture to continue to be relevant in today's world. The goal is to bring people and plants together in a meaningful way and provide motivation for further learning.

PUBLICATION INTRODUCTIONS FROM PUBLIC GARDEN
Owen M. Rogers, Chairman, Department of Plant Science, University of New Hampshire.

Every state in the Northeast has a program for the improvement of ornamentals with the ultimate goal of introductory new plant material to the public. There are a number of agencies that exist to help in the question of making superior germplasm available. They include (1) the Northeast program (NE-9) headquartered in Geneva, NY. It is supported by active plant exploration trips and a massive germplasm storage and retrieval system. (2) Arboreta - these are the most visible clonal respositories for woody ornamentals. They co-sponsor many of the USDA's ornamental plant explorations and have a wealth of evaluation information. (3) Woody Plant Crop Advisory Committee - a newly formed USDA group that will be setting policy on collections and plant descriptions. They need your help. (4) NE-9 Ornamentals Sub Committee - the most accessable group for people in the Northeast since it is part of the regional NE-9 Project. The Committee has test sites from Maine to Washington, DC. Therefore, I submit that public horticulture is alive and well in the Northeast and that we have a wealth of superior ornamentals that they should know about. You can help in this cause by knowing your industry, having information about superior cultivars when you make you recommendations. You have a whole network of people to help.

COOPERATIVE EXTENSION EDUCATION CENTER: A NEW SOLUTION TO AN OLD PROBLEM
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The Cooperative Extension Education Center was established in January 1986 to meet the growing demand on Extension professionals from the private sector. The basic function of the Center is to handle, in the most efficient manner, all of the homeowner related questions and educational programs in the area of gardening and consumerism.

The Center is a statewide program housed on the URI Campus. It is staffed by two Extension faculty and three support staff. There are several hundred volunteers whose activities are coordinated through the Center. They are trained in the areas of basic gardening, plant pathology/entomology and consumer education.

The Center houses the Gardening and Consumer Education Hotline, the Plant Clinic and the volunteer training programs associated with these activities. Publications, soil testing and lots of free advice are also available at this facility. Since January 1986, our volunteers have responded to over 10,000 calls from Rhode Islanders on our Gardening and Consumer Hotline. They have diagnosed over 400 samples in our Plant Clinic.

EFFECT OF LEAF BUD OR SIDE VENEER GRAFTS ON ROOTING OF RHODODENDRON X. 'CUNNINGHAM'S WHITE' ROOTSTOCK.
John J. McGuire. Department of Plant Sciences, University of Rhode Island, Kingston, RI 02881

The effect of leaf bud and side veneer grafts of Rhododendron X 'Cunningham's White' will be discussed. Preliminary data suggest the methods may be used as bioassays for inhibitors in scions of difficult to root cultivars of Rhododendron.

INFLUENCE OF SUPPLEMENTAL IRRADIANCE AND HEAT ON PETUNIA HYBRIDA SEEDLING DEVELOPMENT IN PLUG FLATS.
David F. Graper* and Will Healy. Department of Horticulture, University of Maryland, College Park, MD 20742

Petunia 'Red Flash' seedlings, sown 13 February and grown in plug flats were given supplemental irradiation of 15, 70, 115 or 230 umol m2/sec using high pressure sodium vapor lamps with bottom heat at 27°C. Plants were treated for a five day period beginning at seedling emergence or 5, 10, or 15 days post emergence. Seedlings at the time of transplant were 17% larger if grown with bottom heat. If bottom heat was provided during days 15-20 post emergence, seedlings were 18% larger than when treated at other periods. No significant differences were seen between irradiance levels or bottom heat on the days to flower in seedlings sown on 7 March.

FIELD FERTILIZATION OF HEUCHERA SANGUINEA 'SPLENDENS'.
Marjorie L. Duarte* and Leonard P. Perry, Department of Plant and Soil Science, University of Vermont, Burlington, VT 05405, U.S.A.

Fertilizers and bed type were compared for 3 herbaceous perennials, of which Heuchera was the most responsive. A study over 1984-1985 growing seasons indicated raised beds increased overwintering survival over ground beds. After the first growing season greatest shoot dry weight and salability rating resulted from Osmocote® 14-14-14 (35.8 g N/m^2), followed by granular 10-10-10 (17.3 g N/m^2) then no fertilizer, with significant differences between each. After the second growing season, shoot dry weight increased with fertilizer compared to no fertilizers. Growth responses to fertilizers were not significantly different between fertilizers or bed types.

A 1985 study of the effects at equal rates, based on N, of Osmocote 14-14-14 and granular 10-10-10 indicated no significant differences between fertilizers. An application rate of 35.3 g N/m^2 rate caused significantly greatest height and shoot dry weight. Fertilizers at the 17.3 g N/m^2 rate caused significantly greatest height and shoot dry weight. Fertilizers at the 17.3 g N/m^2 rate caused significantly greater height and shoot dry weight than no fertilizer. These responses of Heucherain a Windsor sandy-loam in South Burlington, VT, may vary in other locations.

CHANGES IN ACC, MACC, ETHYLENE PRODUCTION, AND RESPIRATION IN SENESCING CARNATION FLOWER PARTS
Kathleen M. Hanley* and William Bramlage, Dept. of Plant and Soil Sciences, University of Massachusetts, Amherst, MA 01003

Greenhouse-grown standard carnation flowers (Dianthus caryophyllus L. cv Red Scanea) were harvested during the spring and fall to complete two replications per season. Flowers were cut when fully open and kept in 200 ppm Physan solution at 22 C and continuous light for 0 to 9 days. At each sampling day 15 flowers were separated into ovary, receptacle, styles, outer petals, and green tissue for analysis. Ethylene and carbon dioxide were measured after one hour. Floral parts were then lyophilized and analyzed for ACC and MACC.

Both ethylene and respiratory climacteric peaks occurred at seven days in all floral parts. ACC levels were low initially, with an increase after five days and a peak at six days. The levels of MACC were greater than those of ACC and changed with ageing in all flower parts.

THE EFFECT OF SELECTED FUNGICIDES ON NITRIFICATION IN AN ORGANIC CONTAINER NURSERY MEDIUM

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Three fungicides (Captan, etridiazole and metalaxyl) and a nitrification inhibitor (nitrapyrin) were each incorporated at five different rates including a zero control into a nursery container medium (pine bark, peat and sand) prior to planting privet (Ligustrum ovalifolium). Each treatment was replicated six times. Captan was incorporated at 0,66.6, 133.3, 200, and 266.6 ppm. Etridiazole treatments were 0, 33.3, 66.6, 100 and 133.3 ppm. Metalaxyl was incorporated at 0, 2, 4, 6 and 8 ppm. Nitrapyrin treatments were 0, 5, 10, 15 and 20 ppm. Each pot, containing one privet plant and 1200 g of the treated container mix was fertilized weekly with 100 ml of Hoagland's solution modified so that all nitrogen was supplied as ammonium sulfate. Soil was sampled from the pots and analyzed colorimetrically for nitrate and ammonium to determine if nitrification was inhibited. Captan and metalaxyl suppressed nitrification only slightly, while etridiazole and nitrapyrin were effective nitrification inhibitors.

PRODUCTION OF MULTIPLE PROPAGULES OF AFRICAN VIOLETS FROM FLORAL AND VEGETATIVE TISSUES

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Explants of leaves, petioles, and floral parts were obtained from six cultivars of African Violets and inoculated on agar plates in Murashige-Skoog medium containing combinations of 6-benzylaminopurine (BAP), 6-furfurylaminopurine (Kinetin), and alpha naphthaleneacetic acid (NAA). Explants were held in a controlled environment chamber at 22 degrees Celsius and 16 hour photoperiod under 400 foot-candles of light intensity supplied by broad spectrum fluorescent lamps. Plantlets with varying degrees of organ formation were obtained from all sources of both floral and vegetative explants. Most complete and normal organ formation was observed in media containing 0.5 mg BAP / liter in combination with 0.5 mg and 0.1 mg NAA / liter. Juvenile leaves and immature floral buds were more prolific in plantlet regeneration and normal organ formation than fully expanded leaves. Plantlets formed from mature leaves all originated from the cut margins at the ends of vascular strands. Plantlets arose uniformly from juvenile leaves and floral parts.

THE EFFECTS OF SILVER ON THE INTERACTION BETWEEN SEEDLING 'PELARGONIUM HORTORUM' B. AND 'PYTHIUM ULTIMUM'

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Seed propagated pelargoniums which were sprayed with silver thiosulphate (STS) are shown to have markedly increased susceptibility to the soil borne fungal pathogen Pythium ultimum (P.u.). STS inhibits ethylene effects, presumably by interfering with ethylene activity. Methods were devised to test STS effects on the pathogen as well as on the host. Using aseptic cultures, little ethylene could be measured in the host or the pathogen. However, ethylene evolution was enhanced upon systemic infection. Ethylene per se does not appear to be toxic to the pathogen; mycelial growth was not inhibited by the presence of ethylene. Pathogen virulence was not enhanced by STS. However, in the host, the generation of adventitious roots was inhibited in cuttings taken from STS treated plants grown under standard greenhouse conditions. This rooting inhibition is due to silver, not sodium thiosulphate. It can be overcome by IBA. The ethylene synthesis inhibitor aminooxy acetic acid (AOA) does not inhibit rooting. Thus, the silver-caused rooting inhibition does not appear to be mediated by ethylene. It is therefore proposed that the effects of STS in the Pelargonium-P.u. interaction are due to an altered host metabolism.

PHYSIOLOGICAL CHANGES THAT OCCUR DURING PETUNIA EXPLANT GROWTH IN VITRO.

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Current experiments begin to correlate biochemical changes and fluxuation of endogenous cytokinin concentrations with organogenesis. In order to monitor changes in endogenous cytokinin concentrations, immunochemical methods were developed. Polyclonal antibodies were raised against 2ip riboside. A goat was immunized with a 2ip-BSA conjugate in Freund's complete adjuvant. Serum showed no cross reactivity for benzyl adenine, adenine sulfate, BSA, kinetin, zeatin riboside and 2ip but did react with zeatin and 2ip riboside. Commercially available monoclonal antibodies were used to quantify endogenous trans-zeatin riboside (t-ZR). Using monoclonal antibodies t-ZR increased within 24hr of culturing, while no increase in t-ZR was noted on media without 2ip in the tissue culture media. This change is just prior to the increase in total protein content and appearence of a unique protein associated with callus initiation.