Abstracts of the ASHS Northeast Region Annual Meeting

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Graduate

EFFECT OF SEED SIZE AND CULTIVAR ON EMERGENCE OF BROCCOLI IN CRUSTED SOIL

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Greenhouse and field experiments were conducted in 1988 and 1989 to determine the effect of seed size and cultivar on seedling emergence through crusted soil for several hybrid broccoli cultivars (Brassica oleracea ssp. italica). Seed was separated into four sizes (2.0, 1.8, 1.6 and 1.4 mm diameter) for the greenhouse investigations and soil crusting was achieved with a chemical resin. In 1989, field experiments using three seed sizes (small=1.4-1.6, medium=1.7-1.9 and large=2.0-2.2 mm diameter) were planted at the Long Island Horticultural Research Laboratory in a Riverhead sandy loam which crusted readily after rainfall. Seedling emergence data from both greenhouse and field studies indicate that both seed size and cultivar significantly affect stand establishment. Seedling stand, dry weight and final yield significantly increased as seed size increased for both cultivars in the field experiments. The emergence of 'Mariner' was generally found to be significantly greater than that of 'Greenlady' for each seed size. Emergence was also influenced by seed weight.

SEASONAL GROWTH PATTERNS IN MATURE ASPARAGUS.

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Asparagus officinalis L. cv. Centennial established with seedling transplants in 1983 was maintained with a conventional tillage (CT) or a no-till (NT) system with either metribuzin or metribuzin + napropamide being applied for weed control. Marketable yield was assessed from 1985-1989. In 1989, in addition to yield data, destructive harvests were made every three weeks from March to November to evaluate the effects of tillage on fern, crown and bud growth and root carbohydrate levels. Yields were reduced in CT when compared to NT during all years. Asparagus growth (crown and fern weight, bud cluster, bud and fern numbers) was greater in NT than CT throughout the year although seasonal patterns of growth were similar for both tillage systems. Root carbohydrate levels were higher in NT than CT before the harvest season began. Carbohydrates for both tillage systems reached their lowest level in late July before recovering to pre-harvest levels in late September. Use of metribuzin + napropamide did not reduce fern number or yield but significantly reduced the number of bud clusters, buds and fern when compared to metribuzin alone.

ORNAMENTAL TREE LEAF PUBESCENCE AND MULCHING TO MAINTAIN FAVORABLE WATER STATUS DURING DROUGHT

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This study was undertaken to determine if there was a combination of tree species and mulch type which resulted in a most favorable plant water potential when plants were subjected to induced drought. Fraxinus pennsylvanica, glabrous, and F.p. 'Emerald', pubescent, trees were combined with either a four cm application of medium grade gravel, shredded bark, a fused polypropylene geotextile or no mulch treatment. After the first drought period, across all treatments, the pubescent 'Emerald' trees maintained less negative water potentials than the Fraxinus pennsylvanica trees. In the species comparison the particulate mulches, shredded bark and gravel, were associated with less negative water potentials then the other treatments. Between these, the shredded bark was associated with the least negative readings. After the second consecutive dry down there was not a significant difference in predawn water potentials between the species and cultivar. However, within the 'Emerald' comparison there was a non-significant difference between the particulate mulches and the shredded bark was associated with the least negative potentials.

FIELD ESTABLISHMENT OF TISSUE-CULTURED 'HERITAGE' RED RASPBERRY

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Tissue-cultured (TC) plantlets are gaining wide acceptance as the standard transplanting stock within both the fruit and nursery industry. However, research and grower experiences suggest that management practices used for conventionally propagated raspberry plants may need to be tailored for successful field establishment of the TC plantlet. The effects of weed control practices, rowcovers, and fertilizer placement on the performance of newly planted TC 'Heritage' red raspberry were evaluated during two years. Weed control treatments included straw mulch (ST), black polyethylene mulch (B), white on black polyethylene mulch (WB), napropamide herbicide (N), simazine herbicide (S), hand-weeding (HW), and an untreated control (U). Rowcovers were used during the first six weeks of establishment on the mulched and hand-weeded treatments. Calcium nitrate was placed in the planting hole or on the soil surface around the plant. Second year yields were directly proportional to soil moisture levels during the summer of the planting year. Plants mulched with ST, B, or WB during the planting year produced greater early yields during the fruiting year. Primocane density was highest in the ST treatment. Rowcovers consistently increased both soil temperature and soil moisture, but tended to cause a reduction in cane length the first growing season. Fertilizer placement had no consistent effect on any measured variable.

Ornamental

AN ICE-NUCLEATION BARRIER IN COLD HARDY AZALEA BUDS: THE EFFECT OF SUBLETHAL HEAT TREATMENT UPON BARRIER INTEGRITY AND RESULTANT BUD HARDINESS

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Hardy buds of Azalea spp. were subjected to a sublethal heat stress of 45°C for 2 hours. Two hours after treatment the low temperature exotherms (LTE's) of the primordia were determined by differential thermal analysis (DTA). The LTE's of

buds exposed to heat stress were either fewer in number and/or occurred at higher temperatures than in controls. Visual examination of the flower buds following DTA confirmed that treated buds were killed at higher temperatures than control buds. Cold hardy buds which have been pretreated as described also have lower resultant hardiness compared to controls as evidenced by controlled freezing experiments. These studies suggest the presence of an ice barrier within the buds of the plants which avoid freezing by supercooling, and that the barrier is partially overcome by sublethal heat stress.

INFLUENCE OF PHOTOSYNTHETIC PHOTON FLUXES ON CALCEOLARIA AND ASTER

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The first study was undertaken during fall 1989 and the second in winter 1990 using Callistephus chinensis 'Pink Carpet', and Calceolaria herbeohybrida 'Anytime mixture' seedlings. In both experiments, four photosynthetic photon flux levels were used; 30, 60, 90 and 120 mmol $m^{-2}s^{-1}$ to obtain a 16 hr photoperiod. All lighting treatments were provided by HPS lamps (400 W) and compared to natural light condition (control). The utilisation of this electrotechnology not only increased vegetative growth but also reproductive development which resulted in shortening production time. Flower number was also greatly enhanced. Differences measured between control plants and those having received a supplementary light treatment were greater during fall 1989 than winter 1990 study.

Posters

EFFECTIVENESS OF FOLIAR-APPLIED MOLYBDENUM IN PREVENTING MOLYBDENUM DEFICIENCY OF POINSETTIA

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'Annette Hegg Brilliant Diamond' plants were cultured under Mo stress conditions by using an unlimed sphagnum peat and perlite potting medium and by supplying all trace elements but Mo in the fertilizer solution. Plants were untreated or sprayed with solutions of 1, 10, or 100 μg Mo·liter^{-1} 5, 8, or 11 weeks after pinching. Untreated plants developed foliar symptoms of Mo deficiency (interveinal chlorosis, marginal necrosis, and marginal curling) and leaf tissue contained Mo below the critical level of 0.5 $\mu g \cdot g^{-1}$ and NO_3-N above 1.0%. At 5 or 8 weeks all Mo spray concentrations prevented deficiency symptoms, increased tissue Mo, and reduced tissue NO_3-N. Some symptoms were visible when plants were treated at 11 weeks. Mo sprays at this time did not eliminate the symptoms but reduced the number of leaves showing symptoms to about one-half that of untreated plants when the experiment was ended 15 weeks after pinching.

ORGANOGENESIS FROM CEPHALOTAXUS HARRINGTONIA CALLUS: ESTABLISHMENT OF SHOOTS AND ROOT CULTURES

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Fast growing callus was derived from Cephalotaxus harringtonia stem explants placed on MS basal salt medium with B-5 vitamins, 3% sucrose, 1 µM kinetin and 4.5 µM 2,4-D. Callus placed on basal medium with 10 µM kinetin and 0.45 µM 2,4-D turned green and organogenesis was observed upon subculture onto basal medium without hormones. Shoots were excised and placed on 1/2 strength MS salts and 10% sucrose for further shoot development. During the process of organogenesis, we also observed the differentiation of roots. Rapidly growing root cultures were established by culturing them under a 24 hour light regime of 35 µM/m^2/s. Two grams of root tip explants cultured on B-5 medium with 2% sucrose were capable of producing an average of 24 grams of roots within 11 days. A 20-fold increase in fresh weight was achieved within 3 weeks when 15 grams of these roots were cultured in a 3 liter air-sparged bioreactor. C. harringtonia contains a number of alkaloids that exhibit cytotoxicity and are being evaluated as chemotherapeutic agents. We are currently in the process of establishing growth characteristics for these roots and assaying roots for the presence of these alkaloids. All cultures were grown under a 12 hour light regime unless otherwise stated.

LOW INPUT CRANBERRY PRODUCTION: FIELD DEMONSTRATION AND ANALYSIS

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Low input cranberry production was carried out at 4 sites (2 each for the common MA cultivars) to demonstrate: 1. reduced pesticide and fertilizer input; 2. enhanced water quality (compared to standard management); 3. ecomonic feasibility. Presented results: 1. number of insecticide applications reduced 60%, number of fungicide applications reduced 40% (at least half were copper based non-synthetics), broadcast herbicides used at less than 1/2 allowed rate (if at all), fertilizer N input reduced 30% on average; 2. reduced chemical input impacted positively on water quality; 3. crop quality was maintained but yield was reduced. Because the MA cranberry crop was down by up to 40% due to weather-related factors, crop reductions cannot be accurately assigned to cultural and management practices. The project will continue for at least 2 more years.

STRAWBERRY DEVELOPMENT AS EFFECTED BY VARYING DEGREES OF FROST INJURY

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A light frost in a field of strawberries (cv. Redchief) resulted in varying degrees of injury to blossom receptacles. Five injury categories were established: 1. No damage; 2. Brown discoloration only at the tip of the receptacle; 3. Brown discoloration over approximately 1/2 of the receptacle; 4. Brown discoloration over the entire receptacle; 5. Black discoloration over the entire receptacle. From each category four blossoms at anthesis were tagged and allowed to develop for 30 days. Blossoms with no visible injury on the receptacle developed normally. When browning was observed on the tip of the receptacle or on approximately 1/2 of the receptacle, various deformities developed, tending to be more pronounced in the latter category. Blossoms with brown or black receptacles generally died. Thus, expression of frost injury on strawberry blossoms in the field can vary greatly.

INFLUENCE OF SOIL FUMIGANTS AND A NEMATICIDE ON GROWTH AND YIELD OF 'MCINTOSH' APPLE TREES ON VARIOUS ROOTSTOCKS

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'Rogers Red McIntosh' apple (Malus domestica Borkh.) trees on MM.111, MM.106, M.7a, or M.26 were planted in 1984 on an old orchard site, diagnosed with an apple replant disease (ARD) problem. Soil treatments included Telone C-17, Vorlex, Nemacur 3, or not treated. After six years, tree performance problems usually associated with severe ARD did not develop. Lesion nematode [Pratylenchus penetrans (Cobb) Filipjev and Schuurmans-Stekhoven] populations feeding within or on the surface of roots were not affected by nematicide treatments nor rootstocks, even though slightly damaging levels were found in 1986. At the end of the sixth growing season, trunk cross-sectional areas were similar for trees in treated and in untreated soils. Trees on MM.111 and MM.106 were the largest, and those on M.26 were the smallest. Cumulative yield was not influenced by soil treatments, but trees on MM.111 produced the greatest cumulative yields, whereas trees on M.26 were the most yield efficient.

EFFECT OF MINI-TUNNEL TYPE AND VENTILATION ON TOMATO

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In 1988 and 1989, three tomato (Lycopersicon esculentum Mill.) cultivars, Springset (cold-tolerant), Celebrity (standard) and Hope No. 1 (heat-tolerant) were grown under clear and white perforated mini-tunnels that were either vented ten

days prior to anthesis to maintain temperatures below 29°C or non-vented. Controls had no mini-tunnel treatment. Maximum temperatures were highest under the clear-nonvented tunnels. Minimum temperatures were lower in the clear and white vented tunnels compared to the control and non-vented tunnels in 1989. Springset had the highest early and Celebrity the highest total yield. The clear non-vented tunnels gave significantly lower early yields compared to the other tunnel treatments in 1988. In 1989, treatments had no effect on early yield. The percentage of early yield that was marketable varied from 58-82% in 1988 and 72-85% in 1989. For both years, total yields did not differ significantly.

A RAPID METHOD FOR EVALUATING α-FARNESENE, TRIENE AND ANTIOXIDANT LEVELS IN APPLE SCALD PHYSIOLOGY STUDIES

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Superficial scald on apples is effectively controlled by the currently registered inhibitors, diphenylamine and ethoxyquin. However, the availability of these chemicals as scald inhibitors in the future is uncertain. There is renewed interest and need for scald research to develop prediction systems and non-chemical control measures. Scald is believed to be caused by the oxidation of α-farnesene into trienes. The reaction is partially inhibited by the presence of antioxidants in the peel.

We have developed a new method to evaluate scald reaction compounds. This method was used to show that differences exist in reaction compound concentrations between the blushed and nonblushed sides and scalded and normal portions of 'Rome' apples. The benefits of this method over the conventional method will also be presented.

EFFECT OF STORAGE TEMPERATURE ON SPAWNED COMPOST FOR AGARICUS BISPORUS PRODUCTION.

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Several studies have demonstrated the importance of physical, chemical and microbiological properties of compost on Agaricus bisporus growth and yield. However, to our knowledge, no experimentation has been conducted to determine the effect of storage on the properties of spawned compost. For this study, our objective was to compare the properties of spawned compost stored under different temperature regimes. The microflora and, the chemical and physical properties of pre-spawned compost pressed in shrink wrapped blocks were first determined and mushroom yield evaluated. Subsequently, composts that had been stored at 4°C, 15°C, 24°C for 10 and 14 days were analysed for the same variables. Our results showed that storage temperature affected some properties of compost but these changes did not affect mushroom yield.

PROPAGATION OF *JUNIPERUS SCOPULORUM* 'WICHITA BLUE' BY GRAFT-CUTTING

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The main objective of this research was to determine the propagation potential of *Juniperus scopulorum* 'Wichita Blue' through grafted cuttings while using *Juniperus chinensis* 'Hetzii' and *Juniperus Sabina* 'Blue Danube' as a rootstock. The experiment took place in a glass greenhouse, the propagation material was either placed under a polyethylene film or intermittent mist. In each of these growth conditions the graft union was either wax coated or buried in a humid substrate. Grafting method was a side veneer graft. Each treatment was repeated three times and the experimental unit was made up of ten specimens.

Best results were obtained from the experimental trial covering the period of february to may (12 weeks). During this trial period we observed a similar rate of successful graft union whether grafted cuttings or conventional graft was used with *J. S.* 'Blue Danube', while grafted cuttings was more successful with *J. c.* 'Hetzii'. Grafted cutting obtained the best results with *J. S.* 'Blue Danube' when graft union was buried in perlite and placed under an intermittent mist. Rooting quality of rootstock cuttings was slightly inferieur to conventional cuttings for *J. S.* 'Blue Danube' this difference was more prononced in the case of *J. c.* 'Hetzii'

FOLIAR APPLICATION OF BENZYLADENINE INCREASES ENDOGENOUS LEAF CYTOKININ IN APPLE

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Two experiments were conducted to examine the effects of growth regulator application on cytokinin levels in developing apple leaves. In experiment 1, gibberellin $GA_{4/7}$ (100 mg·liter^{-1}) and benzyladenine (BA, 100 mg·liter^{-1}) were applied alone or in combination as a foliar spray to 'Golden Delicious' 7 days after full bloom. In experiment 2, BA was applied at 50 or 100 mg·liter^{-1} as a foliar spray to 'Morespur McIntosh' 18 days after full bloom. *Trans*-zeatin riboside-like (*t*-ZR) levels were determined by immunoassay. In experiment 1, $GA_{4/7}$ had no effect and BA increased *t*-ZR-like levels. In experiment 2, BA increased *t*-ZR levels quadratically with application rate. The increase in endogenous cytokinin levels with BA treatment occured within 2 hours. Initially, *t*-ZR-like levels were 47 times higher in the BA (100 mg·liter^{-1}) treated leaves as compared to check leaves. Over the next 8 days, *t*-ZR-like content in treated leaves decreased in a cubic manner.

INFLUENCE OF WINTER PROTECTION ON EARLINESS OF STRAWBERRY PRODUCTION

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A 3-year study was carried out on the use of row covers as a substitute to straw for winter protection of five strawberry cultivars. Seven cover treatments were tested: "Agronet" removed on May 2, 12 and 19; "Kimberlay farms" removed May 19; perforated polyethylene removed May 16; conventionnal straw mulch removed in mid-April, and no row cover protection. Row covers advanced first harvest for all cultivars. There was a 10-day gain in earliness with perforated polyethylene followed in decreasing order by "Kimberley farms", "Agronet", straw mulch, and no protection. Treatments favoring early yields tended to shorten the period of production and to reduce total yield. Of the "Agronet" treatments, the May 12 removal increased the yield for the first 4 harvests compared to the May 2 and May 19 removals.

EVALUATION OF STRAWBERRY CULTIVARS WITH DIFFERENT DEGREES OF RESISTANCE TO RED STELE

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Sixteen commercially grown strawberry cultivars with different degrees of resistance to red stele were evaluated for yield, plant characteristics and fruit quality. 'Bounty', 'Midway', and 'Sparkle' had sufficient interior and exterior fruit color, good to satisfactory flavor and suitability for freezing. However, these cultivars as well as 'Redcoat' lacked sufficient fruit firmness. 'Bounty', 'Redcoat', 'Redchief' and 'Sparkle' had the highest yield in the three-year test. 'Annapolis', 'Earliglow' and 'Scott' had reflexed calyx whereas 'Allstar', 'Annapolis', 'Cornwallis', 'Earliglow', 'Guardian' and 'Sunrise' were characterized by a raised neck suitable for mechanical dehulling. 'Sunrise' appeared to be the only cultivar free of leaf scorch and leaf spot. 'Tristar', 'Redchief', 'Lester', 'Darrow' and 'Arking' roots had the lowest incidence of red stele when planted in a naturally-infested field. No relationship between fruit characteristics was observed which suggests the necessity to examine each individual trait.

'OKA' STRAWBERRY

Shahrokh Khanizadeh*, Michel Lareau and Deborah Buszard Agriculture Canada, St-Jean-sur-Richelieu and Macdonald College of McGill University.

'Oka' is a mid-season, high yielding June-bearing strawberry cultivar with excellent productivity, good fruit color, flavor and firmness. It is recommended for fesh market and pick your own for the Southern Québec region. 'Oka' plants are of medium size, and vigor with five to seven inflorescences per mother plant. They can tolerate winter temperatures of -25 C. Inflorescences are held erect on medium to long peduncles during bloom, and become semi-erect as fruit mature. Fruits are large, wedge shape and the calyces are semi-reflexed. Skin is moderately shiny, light red at full maturity, and the flesh is light red. Fruit flavor is similar to 'Bounty', 'Chambly', 'Glooscap' and 'Sparkle'. Fruits are medium firm to firm, and can not be decapped as easily as 'Bounty', 'Chambly' or 'Glooscap'. More than 50% of harvested fruit have long pedicels. Percent juice loss after thawing does not differ significantly from other popular cultivars. 'Oka' has outyielded 'Bounty', 'Redcoat' and 'Sparkle' at L'Acadie and 'Bounty', 'Glooscap', and 'Veestar' in New Brunswick. Plants can tolerate the herbicide terbacil. No symptoms of powdery mildew or leaf scorch were observed during the course of its evaluation. However some symptoms of leaf spot were observed late in the season before the onset of dormancy. Preliminary studies show that 'Oka' is resistant to races 2, 4, 5, 8, 9 and 10 of *P. fragariae*.

INTERACTIVE VIDEO FOR LEARNING LANDSCAPE TREES

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Repetitive exposure to plant morphology and characteristics is necessary for students to learn to identify woody landscape plants. We developed a computer operated video program which will supplement what students learn in outdoor labs and in lecture.

The interactive video tutorial allows the computer integration of script with control of a large collection of video images that come from 35 mm slides, video images, photographs, drawings and actual plant specimens. We have tried the less expensive still video floppy technology (Kodak SV7500 Still Video Multidisk Recorder) and the Write-Once laser disc technology (Panasonic TQ-3031F Optical Disc Recorder). Both systems have advantages, but the latter offers more options at a much higher cost. Motivation for use of the program comes from self tests and the possibility to review visual examples.

COMPARATIVE WINTER INSULATING VALUE OF SEVERAL SNOW DEPTHS, STRAW AND PLASTIC MULCHES

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Treatments, applied in one meter square wooden frames, were snow at 7.6, 15.2 and 30.5 cm deep, straw at 11 mT/ha, straw at 2.2 mT/ha, straw at 2.2 mT/ha covered with clear polyethylene, clear polyethylene and no mulches. The frames were covered during storms to exclude unwanted snow and keep mulching materials dry. Temperatures below the mulches were recorded throughout two winters.

Temperatures under 30.5 cm of snow did not go below -3°C when exposed soil surface temperatures were -22°. Temperatures below 11 mT/ha of straw and 2.2 mT/ha straw plus polyethylene were comparable to temperatures below 15.2 cm of snow. Straw at 2.2 mT/ha provided about the same protection as 7.6 cm of snow cover while clear polyethylene alone provided little insulation.

MULCHING STRAWBERRIES WITH CHOPPED NEWSPAPER - A PRELIMINARY TRIAL

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A preliminary trial was conducted to investigate the feasibility of using chopped newspaper for winter mulch over strawberries. Crown temperatures recorded throughout the winter suggested that the insulating value of the newspaper was comparable to that of straw mulch with both decreasing if they were not kept dry. Yields however, were lower when paper was used compared to straw and also lower when both paper and straw mulch were covered with clear polyethylene plastic. Preventing chopped paper mulch from blowing was a major problem.

NATURAL ECOSYSTEMS AS TOOLS FOR TEACHING LANDSCAPE DESIGN

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Native plant ecosystems, such as meadows and forests, demonstrate how plant communities are physically organized in response to a variety of natural factors and environmental processes. By visiting native ecosystems and diagramming the spatial patterns of naturally evolving plant communities, landscape design students quickly gain confidence about the variety of spaces they can create with plants. In addition, they develop an understanding that the physical organization of plants can have ecological meaning, deeper than simple utility, function, or decoration.

Fruit Session

GROWTH AND FRUITING OF 'DELICIOUS' APPLE ON CLONAL ROOTSTOCKS IN THE 1984 NC-140 PLANTING IN MAINE

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In 1984 trees of 'Starkspur Supreme Delicious' apple (Malus domestica Borkh) on 16 rootstocks were planted at 30 sites in North America according to guidelines established for cooperative testing by the North Central Regional Cooperative Project (NC-140). Tree loss and root suckering in the Maine planting have been low, similar to that of other sites. Tree size in Maine is smallest amoung all sites after seven seasons. Trees on Budagovsky 9 (B.9) rootstock were the most precocious, producing significantly higher flower numbers and yield in the third year. Other precocious rootstocks in this planting included C.6, M.26EMLA, M.7EMLA and P.1. After seven years, B.9, C.6 and M.26EMLA were the most productive amoung the dwarf trees, and consequently are the most efficient. P.1 and M.7EMLA were the most productive amoung the more vigorous stocks. This trial will be conducted for 3 more seasons, however it appears that B.9, C.6 and P.1 may have potential as rootstocks for commercial apple orchards in New England.

DEVELOPMENT OF CARBOXYLATION CAPACITY IN TISSUE-CULTURED STRAWBERRY FOLLOWING TRANSPLANTING.

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Strawberry plantlets (*Fragaria X ananassa* Duch. cv. Kent) were submitted to a factorial arrangement of 2 photosynthetic photon fluxes (PPF) (80 and 150 $\mu mol \cdot m^{-2} \cdot s^{-1}$, PAR) and 2 CO_2 concentrations (330 and 3000 ppm) during the *in vitro* rooting stage. Leaves were tagged and placed in a growth chamber for acclimatization. Photosynthetic capability of leaves from different origins was determined by measuring the initial and total activity of Ribulose-1, 5-bisphosphate carboxylase/oxygenase (rubisco), but the contribution of Phosphoenolpyruvate carboxylase (PEPCase) to fixation was also examined. High CO_2 concentration and PPF significantly increased fresh weight and surface area *in vitro* and after 4 weeks ex vitro. Improved growth was not the result of increased autotrophy *in vitro* since initial rubisco activity was 10 times lower than that of *de novo* formed leaves and declined under high CO_2 and PPF. Carbon dioxide concentration and PPF had no effect on total activity of rubisco. Low activation state and total activity of rubisco in *in vitro* leaves is the cause of poor photosynthetic activity *in vitro*. Persistent *in vitro* leaves after 4 weeks of acclimatization did not have higher total activity of rubisco, but the activation state was 4 times larger than the corresponding activity *in vitro* which might thus provide for non-negligible contribution to photosynthetic carbon assimilation. The possible inhibition of photosynthesis by the presence of sugar in the medium is discussed.

ALTERNATIVE METHODS FOR APPLYING ZINC TO APPLE TREES

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Zinc deficiency is prevalent in apple orchards throughout the Northeast. Zinc contained in various fungicides is partially effective in meeting zinc requirements of apple trees.

Foliar application of EDTA-zinc chelates in two or more post-bloom cover sprays are effective in supplying zinc under most conditions. Alternative materials for such applications are also being studied.

Post-harvest or pre-bloom plus post-harvest applications of alternative sources of zinc did not produce consistent improvement of growth, yield, fruit size or color, or subsequent season zinc levels in leaf samples. Application of chelated zinc through trickle irrigation systems has provided significant improvements in leaf-zinc levels and is considered to be an effective means of supplying this element.

ALTERNATIVE ORCHARD GROUNDCOVER MANAGEMENT SYSTEMS INFLUENCE EARLY APPLE YIELDS AND MORTALITY.
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Eight groundcover management systems (GMS) have been studied since 1986 in an apple orchard replant site. Tree-row GMS consisted of post-emergence "killed sods" and pre-emergence herbicide strips, a crownvetch "living mulch," hay-straw mulch, clean cultivation, a close-mowed sod, and an unmowed but chemically growth-regulated sodgrass. Trees initially grew best in the straw-mulch treatment, but nearly 40% have succumbed to Phytophthora crown rot since 1988, apparently due to excessive soil moisture. Meadow vole populations have been higher, and vole injury to lower trunks has been more frequent and severe on trees in crownvetch and straw-mulch GMS, despite routine rodenticide baiting. Cumulative yields per tree have been highest in straw-mulched trees, but yields per acre have been much lower, because of the increased tree mortality in this treatment.

THE USE OF INTERPLANTED COVER CROPS FOR PEST MANAGEMENT IN STRAWBERRIES
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Non-chemical methods for weed management are becoming important as fewer herbicides are labelled for use and as the market demands pesticide-free produce. We have studied the use of interplanted cover crops in strawberry plantings as an alternative/supplement to chemical weed management. Several different cover crops (tall fescue, marigold and sudangrass) were seeded between rows of newly planted strawberries in late June as runnering was commencing. An additional seeding of sudangrass was made in late July. For comparison, untreated plots and diphenamid treated plots were included in the experimental design. Measurements were taken throughout the season of soil moisture, light levels, crop nutrient concentrations, nematode numbers in soil and crop roots, runner biomass, and weed composition and biomass. Cover crops were incorporated in late fall and the planting was mulched. The following spring, crop nutrient concentrations, nematode numbers in soil and crop roots, weed composition and biomass, yield, individual fruit size, and aboveground strawberry biomass was assessed. The marigolds were too competitive for moisture to be an effective companion cover crop. The early planting of sudangrass was too tall, and fescue was too competitive for nutrients. The untreated plots contained many more weeds than other treatments, nematode levels were higher in the strawberry roots in these plots, and harvesting fruit was very difficult. The late seeding of sudangrass, however, provided significant weed control while not reducing yield relative to herbicide-treated plots.

A REVIEW OF METHODS TO CONTROL VEGETATIVE GROWTH OF APPLE TREES
Duane W. Greene, Department of Plant and Soil Sciences, University of Massachusetts, Amherst, MA 01003

The trend toward planting high density apple orchards continues. Closer tree spacing requires a greater degree of growth control to reduce shading and to prevent the decline in fruit quality and productivity as the planting become older. Chemical, rootstock, pruning, and management techniques will be reviewed that may control growth directly by reducing vegetative growth or indirectly through effects on increasing flower bud formation and fruit set. Pruning and management techniques will be discussed that can selectively reduce vigor in the tops of trees while allowing growth of the less vigorous lower portion of a trees to continue.

THE INFLUENCE OF RASPBERRY CANE TYPE AND CULTIVAR IN A SCHEDULED PLANTING AND HARVESTING SYSTEM
Michel J Lareau* and Michel Lamarre, Agriculture Canada, Station de Recherches, St-Jean-sur-Richelieu, Qué., Canada J3B 6Z8

A new raspberry production system has indicated the feasibility of marketing fresh fruit during August and September, 60-90 days after planting. Full length dormant canes planted late and managed similarly to the strawberry plantings using "waiting bed" plants produced more than 6.0 t/ha. Large canes (>13 mm) produced more laterals and 3 times more fruit than small ones but fruit size was the same. There was little difference between the June 1 and June 20 plantings and 'Killarney' outyielded 'Festival'. In spite of higher establishment costs, it appears that the higher value for the fruit marketed in late summer and the possibility of using this system for the establishment of a new planting would justify its use.

General

RELATION OF AMMONIUM ACCUMULATION AND ETHYLENE BIOSYNTHESIS IN EXPRESSION OF PHYSIOLOGICAL STRESS IN PLANTS
Allen V. Barker, Kathleen M. Ready, and Jinan Feng. University of Massachusetts, Amherst, MA 01003

Several factors inducing physiological stress in plants were investigated for their effects on foliar ammonium accumulation and ethylene evolution in tomato (Lycopersicon esculentum Mill.). Plants grown on ammonium nutrition (0.015M NH_4^+) in solution culture had elevated rates of ammonium accumulation and ethylene evolution relative to plants grown on nitrate nutrition at the same molar concentration. Inhibitors of ethylene action (0.001 mM Ag^+) or synthesis (0.01 mM amino-oxyacetic acid) restricted ammonium accumulation and ethylene evolution relative to rates by untreated controls receiving ammonium nutrition. The inhibitors lessened the expression of ammonium toxicity. Stress from salinity, drought, or flooding in soil increased ammonium accumulation and ethylene evolution. Plants infected with root-knot nematode had variable rates of ethylene evolution in response to variations in ammonium accumulation. Ammonium accumulation and ethylene evolution appear to be factors in the expression of physiological stress.

HORTICULTURE RESEARCH CENTER AT LAVAL UNIVERSITY (CRH)
Blanche Dansereau* and André Gosselin, Dép. de phytologie, CRH, FSAA, Université Laval, Québec, Canada, G1K 7P4

The CRH consists of 20 professors and researchers as well as more than 50 graduate students enrolled at the master or doctorate level in the various departments of the Faculty of Agriculture and Food. The scientific program of the CRH is articulated around the theme of quality and availability of Quebec horticultural products. This multi-disciplinary program comprises: production systems, plant pathology, in vitro culture and somatic hybridization, bio-climatology, and engineering of these processes as well as post-harvest technology and marketing of horticultural products. Our goals are evidently to improve production systems but they are also aimed at the quality and innocuity of horticultural products as well as using environment-friendly technologies.

ALTERNATIVES TO ROCKWOOL; COAL BOTTOM ASH AND PINE WOOD PEELINGS IN NUTRICULTURE.
M.A. Woodard[1], B.C. Bearce[2] and E.C. Townsend[3]. Division of Plant and Soil Science, West Virginia University, Morgantown WV 26506.

A recycling nutriculture system was redesigned to improve growth and flowering of Tagetes erecta L., cv., Inca Yellow in four media; loose rockwool (RW), coal bottom ash (CBA), pinewood peelings (PWP) and CBA:PWP (1:1, v/v). Three nutricycle frequencies of 12, 6 and 4 per 12 hour light period were set with a nutricycle duration of 5 minutes. Volume, height and fresh and dry weights of marigolds in CBA, PWP and CBA: PWP were comparable to that of marigolds in RW. Flower diameters of plants in CBA, PWP and CBA:PWP were increased and days to harvest decreased compared to plants in RW. Plants in CBA: PWP increased in fresh weight compared to CBA or PWP plants. No interaction occurred between media and nutricycle frequency at 12 or 4 cycles per 12 hours; however a malfunctioning timer caused prolonged flooding of plant root zones at the 6 cycle setting. This resulted in decreased plant volume and fresh and dry weights at this frequency. These results show that growth and flowering of marigolds in CBA and PWP comparable with that in RW can be achieved with more than 1 nutricycle frequency.

PESTICIDE RESIDUES ON FRESH AND PROCESSED VEGETABLES
Marie-Hélène Michaud*[1], Joseph Makhlouf[2], Nicolas Tremblay[1] and André Gosselin[3], [1]Agriculture Canada Research Station, 430 Gouin Blvd, St-Jean-sur-Richelieu (Que) J3B 3E6, Canada.

A research project was undertaken in 1990 with the objective of improving both quality and productivity of peas, beans and sweet corn grown and processed in Quebec (Canada). It was conducted with the technical and financial help of five processing companies. Cultivar trials were undertaken as part of this project together with an evaluation of commercial practices in the areas of pest control, fertilization and crop mana-

gement. Samples of fresh and processed products were analysed for nutritional quality and pesticide residues. During this presentation we will show preliminary results of the pesticide residue analyses and will compare fresh and processed products. So far, determination of dimethoate, trifluralin and bentazone (peas), azinphosmethyl and permetrin (beans) and cypermetrin (sweet corn) showed no concentration exceeding the Canadian norm (<0,1mg/kg), with the exception of a bean field with azinphosmethyl residues. Canning and freezing operations greatly reduced pesticide residues so that all processed samples tested below detectable levels.

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DISEASE CONTROL BY NUTRIENT SPRAYS IN VEGETABLE CROPS
Nicolas Tremblay*[1], Tarif Charbaji, François Fournier[1] and Odile Carisse[2], *Agriculture Canada Research Station*, 430 Gouin Blvd, St-Jean-sur-Richelieu (Que) J3B 3E6, Canada.

Scientific literature contains several examples of disease development influenced by fertilization practices. A set of data collected by the «Scouting and Research Network, South of Montreal Area» and consisting of disease and tissue analysis data on carrot and onion crops was made available for principal component analysis. It was hypothesized from the analysis that high N tissue levels would reduce Cercospora carotae and Botrytis squamosa importance on carrot and onion leaves, respectively. In a controlled environment study, Cercospora spots were inversely related to urea levels sprayed on carrot leaves although urea had no influence on plant growth. In a field study with onion, however, urea sprayed at 10 kg/ha, alone or in combination with a fungicide, had no effect either on Botrytis or on maturation or yield. With these mixed results, more research seems needed to assess the potential of nutrient sprays in reducing pesticide use.

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Colloquium

THE ABCs OF WRITING FOR POPULAR PUBLICATIONS.
Meg Ashman, Office of Information, College of Agriculture and Life Sciences, University of Vermont, Burlington, VT 05405.

Before writing your horticulture article for a popular publication, consider your target audience and your purpose. If you know who your readers are and what you want them to be able to do after reading your information, you can choose, limit, and treat your topic suitably. While writing, strive for accuracy, brevity and clarity. Extension-type articles and publications succeed with a lively, conversational tone. After writing, review your draft and get feedback from others. Revise accordingly. Although you are the subject matter authority, your editor is the communication specialist. Rely on your editor to help you reach your communication goal.

MAKING A GOOD TELEVISION/VIDEO PROGRAM
Leonard P. Perry, Department of Plant and Soil Science, University of Vermont, Burlington, VT 05405.

Many have been involved with broadcast television, and others will be, and most have been involved with video production either at home or work. As a powerful educational and motivational tool for teaching, research and extension, it deserves more and improved use.

Opportunities will be discussed for broadcast television, with a short video presentation of examples, including regular shows, periodic features or interviews, "live" call-ins, or tips using video or slides. Video production will be covered in more depth including general tips, technical aspects such as formats and equipment, and artistic aspects which make the difference between just filming and producing a quality production. Covered will be basics of lighting, audio, camera use, and editing--the real key to a professional quality production.

HORT 2001: INTERACTIVE VIDEO COURSEWARE
John White,* David Beattie, and Yvonne Clark*, Penn State University Horticulture Department, 101 Tyson, University Park, PA 16802

Information storage technologies are changing, so this project is focused on the future and the use of new videodisc technology. A model plant science inquiry-learning tool was developed for vocational agriculture students using advanced video and computer technology. The interactive videodisc lesson, which focuses on plant identification, was designed to increase learning and allow teachers to spend more time with students.

SOME THOUGHTS ON PROFESSIONAL HORTICULTURAL PUBLICATIONS
Richard Klein*, Department of Botany, University of Vermont, Burlington, VT 05405

A discussion of the need for and roles of scientific publications in horticultural sciences. Rules for the preparation of manuscripts are outlined, types of material to be included in various sections of a manuscript are discussed and some bases for manuscript rejection or acceptance are noted. Emphasis is placed on the need for correct grammar, clarity and precision in writing, the preparation of illustrative materials and the necessity of checking all data and literature citations.