plants, especially during the fruiting phase, markedly affect firmness of ripe fruit. Results of EM studies on the distribution of PG in pericarp cell walls of ripening fruit will be reported.

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1292

EFFECT OF POSTHARVEST CALCIUM DIPS ON THE STORAGE QUALITY OF RED DELICIOUS APPLE

S.K. Chopra and G.S. Naqash,* Himachal Pradesh Agricultural University, College of Agriculture, Nauni, Solan-173230 India.

Effect of postharvest calcium absorption under differential temperature and with or without surfactant 'Uphar' on the storage quality of Red Delicious apple was studied during 1983 and 1984. Dipping the fruits at ambient temperature in chilled (2.5°C) calcium chloride solution 2%+Uphar 0.03% for 10 minutes resulted in high calcium content (72.7 mg/100 g d.w.), reduced rate of respiration (13 mg CO_2/kg/h), low PME activity (0.49 PE /mg protein), improved fruit quality (TSS 14.02%, total sugars 11.57%), higher concentration of total phenols (89.17 g/g F.W.), ortho-dihydroxyl phenoles (51.17 g/g F.W.) and extended storage life (240 days) at 0°C± 1. The fruits maintained a low (K+Mg)/Ca ratio throughout the stipulated storage period. It was observed that with an increase in (K+Mg)/Ca ratio the fruit quality deteriorated, and fruits with a ratio of 25 or above at any given storage interval were rendered unacceptable.

1293

POSTHARVEST DEVELOPMENT OF SPONGY TISSUE IN CUCUMBERS AND ITS CONTROL

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Spongy tissue was developed in pericarp of cucumbers after harvest, and spoiled the fruit quality. The development was associated with an increase in gas volume, a decrease in specific gravity and a turgid appearance. Between 15° and 30°C, the higher the storage temperature, the earlier the onset, and the faster the speed of the development. It did not develop below 12°C, and pre-shipping cooling delayed the onset but not the speed of the development. The development was delayed by sealed film-wrapping but not by perforated film-wrapping. This indicates that the development is related to respiration but not to water loss per se. The development was also related to the water potential at harvest.

1294

THE ETHYLENE FACTOR IN CONTROLLED ATMOSPHERE STORAGE OF APPLES

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The effects of ethylene at less than 1 and more than 100 ppm on ripening during CA storage of apples at 1.5 and 3.0% O_2 with 1.5 and 3.0% CO_2 were investigated. Cultivars included McIntosh and Empire with or without daminozide treatment and stored at 3°C and Empire, Jonathan, Law Rome and Idared stored at 1°C. Initiation of ethylene production and flesh softening of McIntosh and Empire apples was delayed by storage at 1.5% O_2 at low ethylene levels if CA was established within 7 days of harvest. Results were similar for fruits with or without daminozide treatment. Low ethylene CA storage was only marginally effective in delaying McIntosh and Empire ripening at 3% O_2 and was observed only with daminozide-treated fruits. Beneficial effects of low ethylene CA storage of all cultivars were observed only if fruits were preclimacteric at harvest and the storage regime delayed the onset of autocatalytic ethylene production.

1295

THE BIOCHEMISTRY OF MATURATION AND RIPENING OF APPLE FRUITS

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Time-course changes in starch hydrolysis, 1-aminocyclopropane-1-carboxylic acid (ACC), ethylene forming enzyme (EFE) and ethylene production capacity during maturation, ripening and hypobaric storage were investigated. Hydrolysis of starch was found to bear no time-course relationship with development of the enzyme pathway for ethylene biosynthesis and ripening. Prior to the initiation of ripening with propylene treatment fruits had low levels of ACC, EFE and ethylene. Propylene markedly stimulated EFE activity followed by an increase in ACC and ethylene production without stimulating starch hydrolysis. Starch hydrolysis continued during hypobaric storage at 0.05 atmos. at 0°C while ACC, EFE and ethylene remained at preclimacteric levels and ripening was inhibited.

STABY 10485

1296

CALCIUM LEVELS AND BITTER PIT SYMPTOMS IN GRANNY SPUR AND RED SPUR APPLE CULTIVARS

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Granny Spur and Red Spur apple cultivar fruits were analyzed in different parts of the fruit for distribution and concentation of Ca, Mg, K and their relationship to symptoms of Bitter pit. Only Ca from the calyx end peel tissue could be related to Bitter pit symptoms. The threshold levels of Ca, where no symptoms were shown, were 300 and 600 ppm d.w. for Granny Spur and Red Spur respectivley. A method to detect Bitter pit through calyx end peel tissue analysis before any symptoms develop, to provide a useful tool for apple fruit growers, is being currently evaluated in these two apple cultivars.

1297

CHARACTERIZATION OF TOMATO FRUIT CELL WALLS: THE NATURE OF POLYSACCHARIDES RELEASED DURING AUTOHYDROLYSIS

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An in vitro self hydrolysis system (autolysis) is being used to identify the native polymers released by those cell wall hydrolases which are active during the process of tomato fruit ripening. Autolysis of mature green fruit cell walls releases a significant amount of polysaccharides (9.1 ug total sugars/mg wall dry wt) compared with the 89 ug/mg wall released in autolysis of ripe fruit. The identification of those polymers released by green fruit autolysis is essential if this system is to be used to characterize polymers released from green fruit walls by the addition of isolated enzymes from ripening fruit. Ion exchange chromatography of green fruit autolysis reveals three classes of polysaccharides which are distinct from those released by autolysis of red fruit. None of these polymers contain detectable uronic acid residues. The void fraction contains low MW oligomers (less than 2000 MW) of undetermined composition. Fractions released at low ionic strength contain glucose (67%), galactose (17%) and xylose (15%) residues. Fractions released at high ionic strength are comprised of xylose (45%) and glucose (55%). The implications of green fruit cell wall autolysis and the use of this system for identifying specific polymers released by isolated cell wall hydrolases will be presented.

1298

EFFECT OF CULTAR (PP333) ON THE KEEPING QUALITY OF 'LECONTE' PEAR AND 'ANNA' APPLES

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'Leconte' pear and 'Anna' apple trees were treated three weeks after full bloom with different concentrations of cultar. Fruits were harvested and stored at 0°C. Tests indicated that incidence of Bitter Pit, Cork spot and scaled were reduced by treatments of cultar. Calcium concentration in both flesh and skin was higher in treated fruit than control. Fruit firmness, soluble solids and acidity were also studied.

1299

A MATHEMATICAL MODEL FOR PREDICTING CHANGES IN THE QUALITY OF 'GOLDEN DELICIOUS' APPLES DURING COLD STORAGE

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Experiments were carried out with 'Golden Delicious' apples at 2± 0.5°C and r.h.of 85% in a normal atmosphere. The underlying assumption for the mathematical model was that the integral of respiratory intensity, $\int_0^t RI(t)dt$, could be used to define a level of quality, Q(t), at each time, t, during storage, taking time zero (t=0) to be the beginning of cold storage. An index of quality was defined as a function of total sugars (S), malic acid content (A), and firmness of pulp (F). The experimental data on changes in pulp firmness enabled a critical threshold for $t=t_c$ to be established, i.e., when the value of $(F_0-F)/F_0 \times 100$ is around 40%. This time of $t=t_c$ is the limit for the validity of the func-

tion of quality Q(t), provided that the value of F_0 is close to 6.5 kg penetration (Effegi, 11 mmØ). For these values of t of the integrals of the respiratory intensity curve I_{110}=36.35g CO_2/kg and I_{139}=25.32g CO_2/kg. In view of the fact that the climacteric maximum was reached at 92 and 120 days, respectively, it would appear that maximum quality is obtained 18 and 19 days, respectively, after the said maximum. Consequently, the values of the integrals of respiratory intensity I_{110} and I_{139} may be an inherent constant of Golden Delicious apples for the respective growing regions, and these amounts of CO_2 may be the amounts that should be given off by the fruit to achieve optimum quality, irrespective of the storage conditions.

1300

THE EFFECT OF DIPHENYL-AMINE AND $CACL_2$ ON SCALD CONTROL OF GRANNY SMITH APPLE FRUIT

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The paper deals with results of four years investigation (1981-1984) on the effect of application time (immediately before storage, one, two and three weeks before harvest) of Diphenyl-amine and $CaCl_2$ on fruit scald control of Granny Smith apple cultivar.

It has been noticed that the best results are obtained through the application of Diphenyl-amine (2000 ppm) and $CaCl_2$ (2.3 per cent) on the fruit of Granny Smith used two weeks before harvest. The effect was manifested by the increase of dry matter in fruit amounting up to 16.2 and 15.9 per cent respectively. Total acids decreased slightly (from 0.1 to 0.2 per cent), while total sugars accompanied the increase of dry substances.

Scald occurrence in above combinations manifested the latest on after removing fruit from the cold storehouse (12 to 15 days), but with a small percentage of affected fruit (8 per cent).

1301

AMMONIA PRODUCTION BY SENESCENT BROCCOLI AND ITS EFFECT ON RESPIRATION MEASUREMENT

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Broccoli in terminal stages of senescence produces ammonia in amounts that interfere with the estimation of CO_2 production using the colorimetric method. This has an obvious significance to respiration studies.

1302

EFFECT OF PREHARVEST CALCIUM, ZINC, BORON, ALAR, AND BAVISTIN ON THE STORAGE OF 'RED DELICIOUS' APPLE

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'Red Delicious' apple fruits were given four sprays of $CaCl_2$ 1%, H_3BO_3 0.1%, $ZnCl_2$ 0.1%, $CaCl_2$ 1%+$ZnCl_2$ 0.1% and $CaCl_2$ 1%+ H_3BO_3 0.1%, 30,60,90 days after full bloom (AFB) and 20 days before harvest. Calcium chloride sprays proved the most effective in the retention of flesh firmness (8.55kg), increasing fruit calcium(76.8 mg/100 g d.w.), improving fruit quality(TSS 12.22%, total sugars 9.07%, titratable acids 0.58%), lowering the PME activity(0.30 PE µ/mg protein) slowing down the rate of respiration and extending the shelf life to 240 days at $0^oC \pm 1$ compared to 150 days for untreated control. Combination of $CaCl_2$ plus $ZnCl_2$ resulted in extensive leaf injury and impaired fruit quality probably due to an accumulation of supraoptimal levels of chloride ions.

Two sprays of alar 30 and 60 days AFB improved the fruit colour and storability upto 210 days while a single spray of bavistin 0.2%, 20 days before harvest significantly reduced the incidence of storage rots.

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1303

AUSTRALIAN NATIVE PLANTS AS CUT FLOWERS

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The Australian flora, estimated to exceed 20,000 species is rich and diverse in ornamental plants. Approximately 10% of these are commonly cultivated in Australia for use in garden landscaping. Historically, many species have been harvested from the wild as cut flowers but in recent years there has been increased interest in commercial cultivation. Whilst members of the Proteaceae such as the New South Wales waratah, banksias and hakeas have striking inflorescences, much of the flora is most useful as complementary floral fillers. The majority of suitable species are woody perennial shrubs or small trees. Considerable scope exists for selection with respect to ease of propagation, disease resistance, flower colour and size, flowering season and post harvest life. Moreover little is known of their cultural requirements, regulation of growth and flowering and post harvest handling. Photographs of a range of species are displayed together with notes on their origin and what is known of their cultural requirements.

1304

INFLUENCE OF PROPAGATION, FERTILIZER LEVEL, AND LIGHT ON GROWTH OF Pseuderanthemum spp.

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Three new species of Pseuderanthemum which appear to have potential landscape value were selected from the Acanthus collection for further evaluation. One species, P. sinuatum also shows potential as a new flowering potted plant. All 3 species root readily from terminal cuttings in 3-4 wks and treatments with commercial preparations of IBA did not enhance rooting. High light (30% shade) resulted in significantly greater dry weight production and flowering on all 3 species compared to those grown under 80% shade. Increasing the rate of Osmocote 18-6-12 (3.5, 7.0, and 14.0 oz/cu. ft.) produced a corresponding increase in flowering of all 3 species at the higher light level. This was also true for growth of 2 species (P. sp and P. sinuatum) grown in high light, while P. laxiflorum produced best growth at the medium fertilizer rate. Fertilizer rate had no significant effect on growth at the 80% shade level for 2 species (P. laxiflorum and P. sinuatum) while P. sp resulted in optimum growth at the medium fertilizer level.

1305

EFFECT OF SPACING, EXTENT OF PRUNING, GROWTH HORMONES, AND NUTRIENTS ON FLOWER YIELD OF ESSENTIAL OIL-BEARING ROSE (ROSA DAMASCENA) IN SUB-TROPICAL INDIA

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Data from field trial being conducted from 1982-1985 revealed that normal pruned plants (at 6" height from the ground level) increased the flower yield over medium pruned (from centre) and light pruned plants (6" from the top of plant). The former resulted into 25 and 9 per cent higher flower yield over medium and light pruned plants respectively. 1M^2 plant spacing was found significantly superior than 0.5 M^2 and 2.0 M^2 plant spacings. The magitude of increase by 1M^2 spacing was 17 and 36 per cent over 0.5 M^2 and 2.0 M^2 spacing. The treatment consisted of nitrogen applied at 100 kg/ha, phosphorus at 60 kg P_2O_5/ha, NAA (50 ppm) and spray of agromine (1%) yielded maximum flowers.

1306

OVERCOMING SHOOT DORMANCY IN CYPRIPEDIUM REGINAE PROTOCORMS

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Cypripedium reginae Walt. germinates and develops but fails to produce leafy shoots in vitro on Norstog medium. The objective of this research was to overcome shoot dormancy of C. reginae protocorms produced in vitro by (1) applying GA_3 at varying concentrations to protocorms before potting or (2) by placing protocorms in potting medium of vermiculite, Terra-lite, sphagnum peat moss, or Turface, and exposing them to cold temperatures. Dipping the protocorms into different concentrations of GA_3 did not overcome shoot dormancy. However, shoot dormancy of protocorms was overcome with a chilling period of 4 C for 10 weeks using Turface or vermiculite as the potting media. This method is 50% faster than previous methods of breaking shoot dormancy.