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potatoes by 65, 80 and 51 per cent respectively and produced a land equivalent ratio (LER) of one. The LER increased with decrease in the density of companion crops up to 1.24, indicating that intercropping at lower densities was more beneficial than monocultures. Increasing the density of beans and potatoes reduced corn height, leaf width and size of ears as well as leaf N, P and K. In beans the number of pods per plant was reduced while seeds per plant and seed weight were constant. In potatoes tuber size and numbers per plant declined. The results indicate that the triple crop density which maximizes yield and income should not exceed ⅔ of optimum bean and potato sole crop densities.

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MODIFIED-ATMOSPHERE STORAGE DOES NOT SUBSTITUTE FOR LOW-TEMPERATURE STORAGE OF STRAWBERRY

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'Honeoye' (June-bearing) and 'Tristar' (day-neutral) strawberries were harvested, graded, and then stored for 7 days at 2C or 21C in air (control) or each of these 8 modified atmospheres: 1.5% O_2, 3.5% O_2, 15% CO_2, 25% CO_2, 1.5% O_2 + 15% CO_2, 1.5% O_2 + 25% CO_2, 3.5% O_2 + 15% CO_2, and 3.5% O_2 + 25% CO_2; all balance N_2. When compared with storage at 21C, storage at 2C reduced weight loss and gray mold growth in all corresponding sets of storage atmosphere treatments. The combination of increased CO_2 and decreased O_2 controlled weight loss and gray mold growth more effectively than treatment with reduced O_2 alone. Storage at 2C (versus 21C) reduced respiration of both cultivars. Respiration decreased as the O_2 concentration decreased. 'Tristar' did not produce C_2H_4 at either temperature, whereas 'Honeoye' produced more C_2H_4 at 21C than it did at 2C. Increased CO_2 and/or decreased O_2 concentrations in the storage atmosphere are not satisfactory substitutes for proper low-temperature storage of strawberries.

149 (PS 7)

BOEHMERYL ACETATE (BAc) ACCUMULATION IN SWEETPOTATO STORAGE ROOTS AS INFLUENCED BY PLANT NUTRITION

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BAc is a pentacyclic triterpenoid which has been found to be an ovipositional stimulant for the sweetpotato weevil. It is found on the surface of storage roots (SR) of susceptible cultivars, but it is absent or at very low concentration in cultivars showing moderate resistance to the weevil. A field study was carried on to determine the effects of N (56 or 112 kg/ha) and K (0, 112, and 224 kg/ha) fertilization on the SR concentration of BAc (cv. Centennial). At 56 kg N, no significant K effect was detected, but at 112 kg N there was a significant (0.1 %) K quadratic effect. Significant single correlation coefficients (r) were found between nutrient concentrations in plant parts and SR concentration of BAc. Nutrition may be a significant factor modulating differences in weevil susceptibility over location and time for individual lines, and, in part, explain inconsistencies in published estimates of field resistance to the weevil.

150 (PS 6)

EFFECT OF TEMPERATURE, MODIFIED ATMOSPHERE AND PYRROLNITRIN ON BLACK AND RED RASPBERRY SHELFLIFE

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Two experiments were conducted, one on 'Bristol' black raspberry in 1989, and one on 'Heritage' red raspberry in 1990, to evaluate the effects of pyrrolnitrin (a biologically derived fungicide), modified atmospheres and different temperature regimes on postharvest longevity. For preharvest fungicide treatments, 200 ppm pyrrolnitrin, a standard fungicide treatment (Captan/Benlate in 1989, Rovral in 1990) or a distilled water control was applied one day prior to first harvest. Postharvest temperature treatments were 18 or 0 ±1 C. Modified atmosphere treatments (1989 only) were air, 20% CO_2 in air or 20% CO_2+5% O_2. Both modified atmosphere treatments resulted in extended raspberry shelflife, particularly at the lower temperature. Pyrrolnitrin treated berries consistently had less disease development in storage than the control, but more than the commercially treated berries. Lowering the temperature increased raspberry shelflife the most.

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SPOKE WHEEL FERTILIZER SIDEDRESS INJECTION TO IMPROVE YIELDS OF DIRECT-SEEDED BROCCOLI AND REDUCE RATES/INPUTS

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STABY

Leaf analyses of commercial growers' fields the season preceeding these tests showed nitrogen deficiency at heading. Growers applied in-season nitrogen-potash fertilizers by broadcast methods which proved to be inefficient for recovery by the small broccoli root system. At 32 days after seeding (das) broccoli roots extended only 7" laterally from stems. A one-time spoke wheel sidedress fertilizer injection at 32 das of 1:1 ratio of nitrate nitrogen and potash 6" from stems at 1/3 of broadcast rates significantly increased yields while maintaining leaf nitrogen and potash at or above nutrient sufficiency levels through harvests.

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MODIFIED ATMOSPHERE PACKAGING OF BLUEBERRIES: EFFECTS OF TEMPERATURE AND INTERNAL OXYGEN CONCENTRATION ON RESPIRATION RATE

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Packaged blueberries respond favorably to O_2 partial pressures of 2 to 4 kPa. Low O_2 limits availability of oxygen within the tissue, slows respiration and extends fruit storage life of blueberries. Desirable partial pressures of internal O_2 have not been reported previously. A range of O_2 concentrations was generated in modified atmosphere packages at 0, 5, 10, 15, 20, and 25C. When O_2 and CO_2 levels had reached steady state, fruit internal O_2 was determined by vacuum extraction. Oxygen uptake rates were calculated using package permeability and steady state O_2 concentrations. As the internal partial pressure of O_2 approached zero, the respiratory quotient (RQ) sharply increased. The upwards deflection in RQ was accompanied by a sharp decrease in O_2 uptake, which occurred at internal O_2 partial pressures of approximately 0.5 kPa for all storage temperatures. At each temperature, O_2 gradient across the fruit skin increased with an increase in O_2 uptake. However, for a given rate of O_2 uptake, the O_2 gradient increased as temperature decreased. This temperature sensitivity suggests that most gas diffusion for blueberry fruit occurs through a semi-permeable membrane. Discussion on the effects of internal O_2 concentrations on gas diffusion and anaerobic processes in blueberry fruits will be presented.

153 (PS 7)

INFLUENCE OF ENDOGENOUS CALCIUM ON POST-PROCESSING TEXTURAL QUALITY OF PICKLING CUCUMBER FRUIT

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Sand culture experiments were conducted in controlled environments to determine the effects of endogenous fruit Ca concentration on tissue firmness and the rates of softening following fresh-pack processing of pickling cucumbers. Fruit Ca status was modified by exposing the cucumber plants to 0.01, 0.1, 10, and 20 mM Ca in the nutrient solutions from fruit set to harvest. Ca concentrations were measured in pericarp and endocarp tissue. Spears were 4.5 cm diam. fruit were fresh-pack processed in 0, 5 or 20 mM $CaCl_2$ solutions. Tissue texture during incubation at 46°C was measured at 0, 5 and 20 days using a shear press (TMS-90, Food Tech. Corp.). Pericarp tissue Ca concentrations were positively correlated with tissue firmness immediately following fresh-pack processing. High endogenous Ca levels, however, were correlated with high rates of pericarp softening during accelerated aging. Refrigeration extended the Ca effect on texture for 3 weeks following processing.

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POSTHARVEST FUMIGATION OF TABLE GRAPES WITH DECCODIONE SMOKE TABLETS FOR PROLONGING THE STORAGE LIFE

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Table grape cultivars Thompson Seedless, Red Malaga, and Black Monukka were fumigated with three levels of Deccodione smoke tablets (Pennwalt Decco) for 30 minutes. Grapes were packed in TKV lugs with Botrytis inoculum planted among the clusters and stored at 0 C and high relative humidity up to 12 weeks. Size of the smoke particles were determined. Fruit was evaluated at biweekly intervals for decay and quality parameters. Deccodione residues on fruit were determined and found to be within acceptable limits. It was possible to store grapes up to 10 weeks at 0 C in good condition with the high dose (3X). Low level (1X) was ineffective. There was no perceptible change in taste due to treatments. The smoke tablets have the potential of overcoming the disadvantages of sulfur dioxide fumigation.