45 ORAL SESSION (Abstr. 450–456) CROSS-COMMODITY: POSTHARVEST PHYSIOLOGY I

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POSTHARVEST QUALITY CHANGES IN RADICCHIO

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Radicchio, also known as red-leaved chicory (Cichorium intybus L.), is a high value vegetable crop. Few postharvest characteristics have been described for this crop. Five cultivars of radicchio were held at 1 and 10C in plastic boxes or shrink-wrap bags to determine postharvest quality changes. Weight loss was similar at both temperatures for all cultivars. Major quality losses of radicchio held in shrink-wrap or plastic boxes at 1C were caused by leaf browning. Shrink-wrapping prevented leaf shrinkage and bleaching, but enhanced decay at 10C. The respiration rate of radicchio heads held at 1C was initially 7.4 ml CO_2 $kg^{-1} \cdot h^{-1}$, then fell to 3 ml $CO_2 \cdot kg^{-1} \cdot h^{-1}$ after 7 days of storage at 1C. Respiration at 10C was maintained near 19 ml $\cdot kg^{-1} \cdot h^{-1}$ through the duration of the experiment. Shrink-wrapped radicchio held at 1C had marketable quality for 5 weeks.

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EFFECT OF CA STORAGE ON THE ULTRASTRUCTURE OF CHLOROPLAST AND CHLOROPHYLL CONTENT OF CHINESE MUSTARD

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A study of the ultrastructure of leaf tissues of Chinese mustard shows that there is a progressive degeneration of the membrane structure of the grana of the chloroplast accompanied with the appearance of globules of lipid material and loss of chlorophyll during leaf senescence. A controlled atmosphere of 5% CO_2 plus 3% O_2 maintained chloroplast grana membrane structure for up to 4 weeks storage at 10°C. Both 5% CO_2 (in air) and 5% CO_2 plus 3% O_2 maintained the highest chlorophyll content compared to 3% O_2 alone or in air (control).

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EFFECT OF TIME/TEMPERATURE TREATMENTS ON PHENYLALANINE AMMONIA-LYASE ACTIVITY AND DEVELOPMENT OF RUSSET SPOTTING IN ICEBERG LETTUCE

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Russet spotting (RS) is an important postharvest disorder in iceberg lettuce (Lactuca sativa L.). Previous studies showed that RS is induced by exposure to ~5 ppm (ul/l) ethylene at ~5C for 3 days and is characterized by the appearance of 1 to 2 mm diam. oval, brown sunken spots along the midrib. Increases in phenylalanine ammonia-lyase (PAL) activity and phenolic content are highly correlated with RS development. Ethylene-induced PAL activity is much less at higher (12C) or lower (0C) temperatures. In this study isolated whole leaves were exposed to a log series of ethylene concentrations from 0.1 to 10 ppm at temperatures from 0.0C to 20C for up to 8 days. Tissue was transferred among these various treatments to investigate the kinetics of PAL induction, activity and deactivation, phenolic accumulation, and RS development. A subjective evaluation was then made of RS development using a 1 to 9 scoring system in which 1 was no RS, and then PAL activity and phenolic content were measured. Preliminary results indicate that ethylene-induced PAL activity was decreased more rapidly upon transfer to temperatures above 10C than to 0.0C. Accumulation of phenolic compounds and development of RS paralleled each other, and were positively related to PAL activity. Practical implications of these results will be discussed.

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3-AMINO-1,2,4-TRIAZOLE, A CATALASE INHIBITOR, PROLONGS CARNATION VASE LIFE.

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Sim-type carnation flowers (Dianthus caryophyllus L., cv. Elliot's White) continuously treated with 50 mM or 100 mM 3-amino-1,2,4-triazole (amitrole) and held in the dark at 18°C did not exhibit a respiratory climacteric relative to dH_2O-treated controls. No morphological changes symptomatic of floral senescence appeared in treated flowers until 12-15 days post-harvest. Other triazoles were not effective in prolonging senescence. Amitrole appears to inhibit ethylene biosynthesis by blocking the enzyme-mediated conversion of S-adenosyl-L-methionine to 1-aminocyclopropane-1-carboxylate. Ethylene action appears to be progressively inhibited in that flowers held in treatment solution for 2 d or less responded to application of 10 uL/L exogenous ethylene whereas flowers held 10 d or longer exhibited no response. Electrophoretic resolution of total crude extracts evidenced protein synthesis as well as degradation. Western analysis and total activity assays showed an amitrole concentration-specific inhibition of catalase activity.

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EVIDENCE AND POSSIBLE MECHANISMS FOR MEMBRANE DETERIORATION DURING LONG-TERM STORAGE OF POTATO

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Studies on the mechanisms by which growth potential of potato seed-tubers declines during aging suggest that membrane deterioration may be involved. Malondialdehyde (MDA) content, ethane evolution, solute leakage, and activity of the membrane-bound ethylene forming enzyme (EFE) were measured in tissues from 2, 14 and 26-month-old potato tubers as potential indicators of peroxidative damage and loss in membrane integrity. Solute leakage increased with tissue age, reflecting loss in membrane integrity. MDA content, a measure of lipid peroxidation, also increased with tuber age. Ethane is a product of free-radical-mediated peroxidation of polyunsaturated fatty acids (PUFA), and is therefore a sensitive marker of membrane damage. In the absence of fatty acid substrate, old tissue evolved less ethane than young tissue. However, addition of linoleate to the incubation medium stimulated more ethane from the oldest tissue, indicating a higher potential for ethane production. In vivo conversion of ACC to ethylene by EFE declined with age, possibly due to membrane deterioration. These studies show that peroxidation of PUFA may be influencing membrane integrity during long-term storage of potato.

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EFFECTS OF LOW-TEMPERATURE ON THE QUALITY OF TURNIP ROOTS

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The influence of low-temperature on the starch, sugar and glucosinolate content was studied in the mature roots of field and greenhouse-grown turnip. A decrease in both starch and sugar levels was recorded in roots after storage at 0°C for 4 weeks. On the other hand, when plants were exposed to a series of cold treatments, the starch level remained constant but the level of sugars increased in roots. In our studies, turnip roots exhibited the capacity to synthesize and degrade specific glucosinolates at low temperatures. The implications of these findings on the sensory characteristics of the root will be discussed.

73 ORAL SESSION (Abstr. 457–464) FRUIT CROPS: GROWTH AND DEVELOPMENT II

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CHILLING ENHANCEMENT OF ROOT REGENERATION IN APPLE CAN OCCUR WITHOUT BUDBREAK OR GROWTH OF ROOT SUCKERS

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After receiving 0, 600, 1200, or 1800 hr. of chilling at 5 C, one-year-old Malus domestica Borkh. seedlings were given 10 sec. root dips in either 10,000 ppm K-IBA solution or water control. Following chilling and IBA treatments, 20 seedlings of each combination were placed in forcing conditions of 20 ± 2 C root temperatures and either 20 or 5 ± 1 C shoot temperatures. Five seedlings of each treatment were harvested after 0, 7, 14, and 21 days of forcing. Five C prohibited budbreak and bark slipage for up to 21 days. Under 20 C, budbreak, shoot elongation and root growth all occurred earlier, faster, and reached a higher level with increased chilling. Twenty C root and 5 C shoot temperatures during forcing resulted in large increases in the growth of adventitious shoots on lateral roots, but had little effect on the formation of adventitious shoots on the tap root. K-IBA prohibited development of adventitious shoots on roots,