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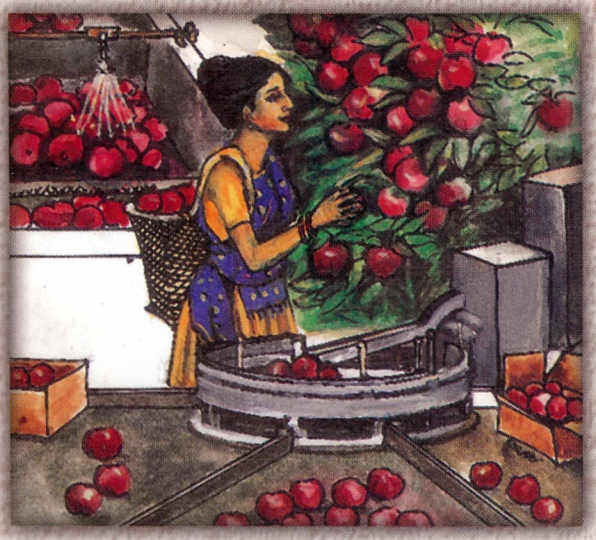

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CONTENTS

ping and exposure to gas) with 1000, 2500 and 5000 p.p.m. of Ethrel [ethephon] after harvest and stored for 10 days in air-tight boxes. Fruits attained edible ripeness on the eighth day after harvest in the control, and on the third day in the 5000 p.p.m. treatment and on the fourth day in the 1000 and 2500 p.p.m. treatments. Ethrel caused significant increases in reducing sugars, total sugars, total soluble solids (TSS), ascorbic acid and total titratable acidity, while a reduction in non-reducing sugars, sugar/acid ratio and TSS/acid ratio was noticed. The effect of Ethrel increased with increase in concentration from 1000 to 5000 p.p.m. Thus, Ethrel (5000 p.p.m.) can be used for quick ripening and for improving the quality of sapota fruits.

Storage decay

797 KARIYANNA; BOJAPPA, KM; REDDY, TV. 1990. **Postharvest treatments to extend the shelf life of sapota fruits**. *Acta Horticulturae*, No. 269, 391.

Sapodilla fruits (cv. Kalipatti) were dipped in 6% Waxol, Bavistin [carbendazim] (250 or 500 p.p.m.) or hot water (50°C for 10 min.) and packed in 150 gauge thick polyethylene bags with 1% ventilation. Storage decay was high in all fruits except those dipped in 500 p.p.m. Bavistin. Waxol treatment delayed ripening, but none of the treatments prevented the deterioration of fruits due to overripening after 9 days' storage. None of the treatments had any effect on fruit TSS and acid contents.

MANGOES

Postharvest handling

798 CHADHA, KL; THAKUR, RS; RAJPUT, MS; SAMRA, JS. 1984. **Leaf nutrient status of three mango cvs at flowering and post-harvest stages**. *Indian Journal of Horticulture*, 41: 1/2, 83-84; 5 ref.

Leaf N, P, K, Ca, Mg and S contents were determined in March and June in the cultivars Dashehari, Chausa and Lucknow Safeda. The data are tabulated. The contents of all nutrients declined post-harvest in all cultivars and this was attributed to earlier translocation into the developing fruits.

799 CHAPLIN, GR. 1989. **Advances in post-harvest physiology of mango**. *Acta Horticulturae*, No. 231, 639-648; 50 ref.

Research on postharvest physiology of mango carried out during the last 15 years is reviewed. Ethylene treatment in storage and CA storage, or bagging or coating of fruit, is not consistently beneficial and can give poor fruit quality due to 'off' flavours. Low pressure storage increases postharvest life but is expensive. Mangoes are susceptible to chilling injuries when stored below 12°C, probably because of physical changes in membrane lipids. There is limited evidence that chilling injuries can be reduced by gradually reducing the storage temperature to allow fruits to adapt to low temperature. Physiological disorders such as spongy-stem, soft-nose, internal breakdown and jelly seed are influenced by pre-harvest climatic and cultural factors. Treatments such as fumigation and irradiation, to increase postharvest life, are discussed. Determination of flavour components by HPLC and GC-MS are being used to supplement the subjective assessment of fruit quality by taste panels.

800 JOSHI, GD; ROY, SK. 1989. **Effect of integrated post harvest handling on quality and shelf life of alphonso mango fruits**. *Maharashtra J. Hort.*, 4: 2, 96-103.

801 KATRODIA, JS; RANE, DA; SALUNKHE, DK. 1989. **Biochemical nature of spongy tissue in Alphonso fruits**. *Acta Horticulturae*, No. 231, 835-839; 16 ref.

Spongy tissue, occurring in fruits ripened indoors at room temperature (35 ± 1°C) and in fruits exposed to intense sunlight (fruit pulp reaching 48°), was analysed. Affected tissues had lower pH, lower ascorbic acid, beta-carotene, reducing and non-reducing sugar contents, lower amylase and invertase activities, and higher acid and starch contents than the unaffected surrounding pulp, which was similar to tissue from healthy ripe fruits. It is concluded that spongy tissue is a localized physiological disorder where ripening is inhibited, and is caused by overheating.

802 KATRODIA, JS; RANE, DA. 1989. **Pattern of distribution of spongy tissue in the affected Alphonso fruits at different locations**. *Acta Horticulturae*, No. 231, 873-877; 6 ref.

Spongy tissue, occurred in 19% of mangoes at harvest, was localized predominantly at the distal end of the fruit, whereas postharvest exposure of fruits to the sun around midday resulted in the greatest occurrence of spongy tissue in the middle part of the fruit. This localization, sometimes on one side of the fruit only, points to convected heat as being the cause of spongy tissue disorder.

803 ROY, SK; JOSHI, GD. 1989. **An approach to integrated post-harvest handling of mango**. *Acta Horticulturae*, No. 231, 649-661; 38 ref.

Alphonso mangoes were harvested when the first fruits started to fall, and were classified by specific gravity (sp.gr.) as to whether they floated in water (sp.gr. <1.00), 2.5% NaCl (sp.gr. <1.02) or 5% NaCl (sp.gr. <1.04). Of the fruits harvested at this time, 17% were immature (sp.gr. <1.00); this compares with 1-2% immature fruit following conventional commercial practice for harvesting. Fruits of sp.gr. 1.02-1.04 had the best flavour and texture. With increasing sp.gr. the fruit colour improved, but the incidence of the disorder spongy tissue also increased. Chilling injury in cold storage at 10°C occurred only in fruits of sp.gr. <1.02. A 5-minute hot (52°C) dip in Bavistin [carbendazim] (1000 p.p.m.) solution gave the best improvement in fruit shelf life. Fruits stored at 10° had longer storage life, higher moisture content and acidity, and higher levels of ascorbic acid and tannins, but lower TSS, sugar and total carotenoid pigment contents than fruits ripened at room temperature. In trials comparing containers for fruit transport, the least fruit weight loss and bruising occurred using partitioned, corrugated fibreboard boxes; the most damage occurred using conventional wooden boxes with dry grass and newspaper as cushioning material.

804 ROY, SK. 1992. **Post-harvest handling of mangoes**. *National Symposium on Mango Export*. (1992: 4th June). APEDA.

805 ROY, SK. 1979. **Some aspects of mango industry in India**. *The 1st Workshop of Post-harvest Technology of Horticultural Crops*. (IARI, New Delhi: 1979: 25-26 April).

Ripening

806 BHULLAR, JS. 1982. **Ripening of Langra mangoes with ethrel and calcium carbide**. *Progressive Horticulture*, 14: 1, 71-72; 4 ref.

Mature green fruits, harvested on 27 June, were treated with calcium carbide at 3 or 6 g/4.5-5 kg of fruits or with Ethrel [ethephon] at 400 or 800 p.p.m. The fruits were held in cardboard boxes lined with newspapers and tightly wrapped. Calcium carbide at 6 g and Ethrel at 800 p.p.m. both gave the best results with regard to ripening (3.8 days for the fruit to ripen compared with 8 in the control) and fruit quality.

807 JOSHI, GD; ROY, SK. 1987. **Studies on spongy tissue. A ripening physiological disorder in mango fruit**. *Progressive Horticulture*, 19:1-2, 38-46.

808 KALRA, SK; TANDON, DK. 1983. **Regulation of ripening of mango cv. Mallika**. *Indian Journal of Horticulture*, 40: 3/4, 155-159; 12 ref.

Fruits harvested 100-105 days after fruit set and dipped in hot water (54°C for 5 min) or in hot water + Ethrel at 500 ppm were stored at 35° and 80-85% RH for up to 7 days. At the end of storage fruits treated with hot water only had the best appearance and lowest fungal spoilage.

809 KUMAR, R; SELVARAJ, Y. 1989. **Studies on ATP: phosphofructokinase in ripening mango (*Mangifera indica L.*) fruit**. *Current Science*, 58: 12, 666-668; 24 ref.

Mango fruits of cultivars Banganapalli, Dashehari, Fazli, Langra and Suvarnarekha, at the harvest maturity stage, were obtained from trees grown at the experimental orchard, Hessaraghatta. Fruits were ripened at ambient temperature (25±2°C) and at 70±5% RH. ATP:phosphofructokinase (PFK) activity was studied at four ripening stages: harvest maturity, half-ripe, 3/4-ripe and eating-ripe. PFK activity, expressed as μmol fructose-6-phosphate phosphorylated min-1 (mg protein)-1, was demonstrated only in the 3/4 ripe stage of cultivars Banganapalli, Dashehari and Langra, and at the eating-ripe stage of all five cultivars. The greatest activity (0.095±0.018) was recorded at the eating-ripe stage of cv. Langra. The partially purified enzyme preparation showed allosteric kinetics; an increasing substrate concentration gave a sigmoidal curve for enzyme activity. ATP at a high concentration acted as a negative allosteric modulator. The enzyme was activated by Pi, and inhibited by citrate and 5'-AMP. It is suggested that PFK plays a crucial role in the regulation of glycolysis in ripening mango fruits.

810 PAL, RK; ROY, SK. 1988. **Effect of precooling on ripening behaviour of mango cv. Neelum**. *2nd International Food Convention*. 1988: 18-23 Feb. Mysore:

811 PALEJWALA, VA; AMIN, B; PARIKH, HR; MODI, VV; BELA AMIN. 1989. **Role of abscisic acid in the ripening of mango**. *Acta Horticulturae*, No. 231, 662-667; 26 ref.

Mature but unripe mangoes (cultivars Alphonso and

Langra) were vacuum-infiltrated with abscisic acid (ABA, 10-6 M) and the fruits incubated for 5 days at 30°C. ABA treatment hastened ripening, as shown by an increase in total sugars, sucrose, fructose (but not glucose) and carotene concentrations, increased activity of amylase, cellulase and invertase, and reduction in total acids. Fruits were also vacuum-infiltrated with cycloheximide (1 mg/ml) or actinomycin-D (20 μg/ml) prior to ABA treatment. Cycloheximide (a protein synthesis inhibitor) delayed ripening and blocked the effect of ABA, while actinomycin-D (an RNA synthesis inhibitor) reduced ripening only slightly and had little effect on the result of the ABA treatment.

812 ROY, SK; PANDEY, RM. 1976. **Preliminary studies on the effect of specific gravity on the post harvest ripening of mango (*Mangifera indica*) in the cultivar Dashehari**. *63rd Session of the Ind. Sci. Cong. Association*. Part III

813 SELVARAJ, Y; PAL, DK. 1989. **Studies on the aroma biogenesis pattern in relation to changes in the physico-chemical and biochemical constituents during ripening in fruits of five mango cultivars**. *Acta Hort.*, No. 231, 461-469; 6 ref.

The mango cultivars Alphonso (very strong aroma), Suvarnarekha, Fazli and Banganapalli (strong aroma) and Totapari (moderate aroma) were analysed at harvest, and at the half-ripe, three-quarters ripe and eating-ripe stages, for carotenoids (juice colour), alcohol insolubles, sucrose, glucose, fructose, titratable acidity, citric acid, malic acid and tannins. Fruit firmness and aroma of fruits and juice were also assessed. Aroma intensity of ripe fruits correlated with juice colour and citric acid:malic acid ratio, and inversely with sugar:acid ratio.

814 SINGH, BP; TANDON, DK; KALRA, SK. 1993. **Changes in postharvest quality of mangoes affected by preharvest application of calcium salts**. *Scientia Horticulturae*, 54: 3, 211-219.

Two consecutive preharvest sprays of water, calcium nitrate (1% or 2% Ca+2) or calcium chloride (0.6% or 1.2% Ca+2), 20 and 10 days before harvest, were made on cultivar 'Dashehari' mango trees. After harvest the fruits were stored under ambient conditions (35±3-°C and 65±5% r.h.). All Ca+2 treatments delayed ripening and had a favourable effect on the quality of the fruits during storage. The Ca+2 treated fruits showed a higher Ca level in the peel and flesh, a lower cumulative physiological loss in weight and a reduced respiration rate. Fruits from the most favourable treatment (0.6% Ca+2 as CaCl2) could be stored for 10 days. For the other Ca+2 treatments this was 8 days, while the control fruits were over-ripe at that time. The 1.2% Ca+2 as CaCl2 treatment caused scorching of the marginal and lamellar portion of the leaves; the control fruits could be stored only for 6 days.

815 TAUQIR ABBAS; JAVAID IQBAL; MUSAHIB UD DIN KHAN. 1989. **Effect of calcium carbide on physical changes in mango fruits (cvs. Desi and Dusehri) during ripening**. *Jrl. of Agricultural Research Lahore*, 27: 2, 121-126; 8 ref.

Mango fruits of both cultivars harvested at the hard green stage were treated with calcium carbide (2 g/kg fruit) or not treated (controls). Both treated and control fruits were wrapped in paper and held in wooden perforated boxes for up to 12 days. After 12 days' storage, pulp and skin colour were more intense in treated than in control fruits. Calcium carbide treatment accelerated ripening and resulted in higher percentage weight loss during storage.

816 VERMA, RA; TRIPATHI, MP; SRIVASTAVA, RK. 1986. **Studies on development of carotenoids during ripening of mangoes (cv. Dasheheri)**. *Progressive Horticulture*, 18: 1/2, 39-44; 15 ref.

During ripening there was a gradual increase in the contents of carotenes in the flesh, resulting in a deep-yellow coloration of the ripe fruits. Changes in carotenes were accompanied by a decrease in pressurometer readings, fruit acidity and ascorbic acid content, and an increase in sugars and TSS.

Storage

817 CHADHA, KL. 1989. **Mango research in India - new developments**. *Indian Journal of Horticulture*, 46: 3, 279-294; 61 ref.

A review and discussion under the following headings (and sub-headings): mango improvement (new varieties and hybrids, hybrids, and selection of superior clones); production technology (propagation, rootstocks, high density planting, pruning, nutrition, irrigation, and intercropping); physiological studies (physiology of flowering, mango malformation, fruit drop, spongy tissue, control of tree vigour, and clustering in mango); disease and pest management; and harvesting and storage.

818 CHATTOPADHYAY, PK. 1989. **Studies on the shelf life of mango following treatment with chemicals and cooling**. *Horticultural Jrl*, 2: 1, 12-15; 8 ref.

Fruits of cv. Himsagar were stored in lined wooden boxes for up to 14 days after treatment with tap water, cold water or an aminoethoxyvinyl glycine (10 p.p.m.) solution. For each treatment, half of the fruits were kept in boxes with KMnO4-soaked paper shavings. Physiological weight loss and decay loss were minimum in fruits with the cold water treatment + KMnO4. Fruit quality characteristics were not appreciably affected.

819 CHAUHAN, KS; SHARMA, RK; KUMAR, J; SINGH, R. 1987. **Effect of some chemicals and cooling on the shelf life of mango**. *Haryana Journal of Hort. Sciences*, 16: 3-4, 218-222.

Fruits of the cv. Deshehari were harvested at the colour break stage and packed in wooden boxes with paper lining as a cushioning material, after dipping in a solution of aminoethoxy vinylglycine at 10 p.p.m., hot water (35°C) or cold water (10°) for 10 minutes. Fruits were stored at room temperature (42 ± 4°). Half of the fruits in each treatment were packed in wooden boxes lined with KMnO4 soaked paper. Fruits dipped in hot or cold water were the best as there was minimum weight and decay loss. Various quality parameters such as TSS and acidity were not significantly affected by these treatments.

820 HASABNIS, SN; D'SOUZA, TF. 1987. **Use of natural plant products in the control of the storage rot in *Alphonso mango* fruits**. *Journal of Maharashtra Agricultural Universities*, 12: 1, 105-106.

The best reduction in post harvest storage rots was obtained by dipping fruits in garlic bulb extract or *Azadirachta indica* leaf extract, or by lining bamboo packing baskets with A. indica leaves as cushioning material.

821 HEMAVATHY, J; PRABHAKAR, JV; SEN, DP. 1988. **Drying and storage behaviour of mango (*Mangifera indica*) seeds and composition of kernel fat**. *ASEAN Food Journal*, 4: 2, 59-63.

The seed content of 8 mango cultivars assessed varied from 8.1 to 22.0% of the fruit, and the kernel constituted between 45.7 and 72.8% of the seed. The fat content in kernels ranged from 8.2 to 14.3% on a DW basis. The following physicochemical characteristics of the fat were determined: softening point (25-34°C), free fatty acids (1.3-3.5 g oleic acid/100 g fat), saponification value (172-206 mg KOH/g fat), iodine value (Wijs 40.1-56.5) and unsaponifiable matter (1.0-1.8%). The fatty acid composition of the kernel fat from seeds of the 8 cultivars is tabulated. Storage of fresh wet seeds of cv. Alphonso (51.2% moisture content) for 16 days under ambient conditions (23-27°, 60-65% RH) resulted in 25.8% kernel spoilage; the free fatty acids of the kernel fat increased from 1.9 to 4.6 g oleic acid/100 g fat during storage. The fresh wet seeds could be dried to a moisture content of 10.8% prior to storage, by sun-drying for 6 to 7 days or by mechanical drying for 24h.

822 HUDDAR, AG; BHARALI, BC; THIMMARAJU, KR. 1989. **Note on extension of storage life of mango fruits by Tal prolong**. *Acta Horticulturae*, No. 231, 668-669.

Dashehari and Mallika mango fruits were dipped in 1% and 1.5% solutions of Tal-prolong, a sugar-based formulation [sucrose esters]. Tal-prolong at 1% gave the best retention of fruit colour, flavour and texture over a period of 15 days' storage.

823 JOSHI, GD; ROY, SK. 1986. **CFB box - an effective alternative to conventional wooden crates for transport and storage of mango cv. Alphonso**. *Indian Food Packer*, 40: 6, 32-47.

824 JOSHI, GD; ROY, SK. 1985. **Effect of integrated post-harvest handling on biochemical changes in *Alphonso mango* fruits**. *Progressive Horticulture*, 17: 1, 56-63; 21 ref.

Whole trees of uniform age and vigour were manually harvested when a few partially ripe fruits fell naturally. The fruits, graded into 4 groups on the basis of specific gravity (<1.0, 1.0-1.02, 1.02-1.04 and >1.04), were packed, transported and then stored at ambient temperature (26.4-32.4°C) for up to 16 days. Data are graphically presented on numerous quality indices including TSS, total sugars, tannins, ascorbic acid and carotenoids. Fruits in groups 2 and 3 (specific gravity 1.0-1.02 and 1.02-1.04) were considered the best for shelf life and nutritional value.

825 KAPSE, BM; RANE, DA; KHEDKAR, DM. 1989. **Correlation between biochemical parameters and organoleptic evaluation in mango varieties**. *Acta Horticulturae*, No. 231, 756-762; 7 ref.

Mature Malgoa and Malda mangoes, stored at both ambient temperature (23-36°C, 43-91% RH) and at low temperature (10°, 60% RH), were assessed for colour, flavour and texture, and these organoleptic properties were related to beta-carotene contents, acidity and total soluble solids in the fruit. At ambient temperature, fruits had the highest quality rating after 10 days. At 10°C, fruit quality increased to a maximum at 37-45 days' storage, but the beta-carotene content and sugar:acid ratio were sub-optimal. Therefore, these fruits were

assessed as inferior to those stored at ambient temperature.

826 KAUSHIK, RAM AVTAR. 1989. **Studies on storage in mango (*Mangifera indica L.*) (M.Sc: thesis)**. Haryana Agricultural University, Hisar.

Storage life of different cultivars of mango and the effect of post-harvest treatments of growth regulators and calcium salt on the storage life of Dashehari mango were studied. Cultivars Dashehari and Langra showed lesser losses and better quality as compared to other varieties. With the increase in storage period , PLW, decay and T.S.S. increased, whereas acidity, ascorbic acid content and firmness decreased in all the cultivars. Post-harvest application of growth regulators (MH and 2,4,5-t) and calcium nitrate reduced the losses in wight and fruit rot in Dashehari mango. The highest reduction in total spoilage was observed with 2,4,5-T (1000 ppm). the total spoilage also increased during storage by post-harvest treatments of 2,4,5-T, MH and calcium nitrate. T.S.S., total sugars and reducing sugars increased and higher ascorbic acid content was retained with most of the treatments during storage. The calcium content in mango fruit markedly increased with calcium nitrate application. However, no change was observed during the storage period.

827 KHADER, SESA; SINGH, BP; KHAN, SA. 1988. **Effect of GA3 as a post-harvest treatment of mango fruit on ripening, amylase and peroxidase activity and quality during storage**. *Scientia Horticulturae*, 36: 3-4, 261-266; 22 ref.

Treatment with GA3 at 100 or 200 mg/litre significantly delayed ripening of fruits of the cv. Mallika stored between 35 ± 2° and 29 ± 1°C. GA3 treatment retarded the total loss in weight, chlorophyll and ascorbic acid content, and reduced amylase and peroxidase activity during ripening.

828 KHADER, SESA. 1991. **Effect of preharvest application of GA3 on postharvest behaviour of mango fruits**. *Scientia Horticulturae*, 47: 3-4, 317-321; 16 ref.

GA3 was applied as a foliar spray to the mango cultivar Dashehari at 100, 200, 300 or 400 mg/litre after fruit set in 1988 and 1989, followed by another spray 10 days later. GA3 retarded the ripening of mango fruits for up to 6 days of storage under ambient temperatures between 36±2 and 40±3°C. With increasing GA3 concentrations, postharvest ripening during the first 6 days was delayed significantly. Fruits that received ≥200 mg GA3/litre, exhibited less total soluble solids (TSS), a lower TSS/acid ratio, less total carotenoids, and lower amylase and peroxidase activity at harvest. Total acidity, ascorbic acid and total chlorophyll in peel were significantly higher in these fruits.

829 KHADER, SESA. 1990. **Orchard application of paclobutrazol on ripening, quality and storage of mango fruits**. *Scientia Horticulturae*, 41: 4, 329-335; 18 ref.

Paclobutrazol was applied to trees of cv. Dashehari as a foliar spray at 250, 500, 1000, 2000 or 3000 mg/litre at fruit bud differentiation on 15 Oct. 1987 followed by another spray 20 days before harvest (13 May 1988). The beneficial effect was more pronounced in fruits from trees that received 2000 or 3000 mg/litre rather than lower doses. These 2 treatments resulted in better quality as judged from the increases in TSS, total acidity, ascorbic acid content, total chlorophyll, total carotenoids, amylase and peroxidase activity from harvest up to 12 days of storage at ambient conditions.

830 KHEDKAR, DN; ROY, SK. 1989. **Storage studies in dried and dehydrated raw mango slices**. *Acta Horticulturae*, No. 231, 721-730; 17 ref.

Sun-dried and cabinet-dried mango slices, treated with SO_2 (0.5-2.5% potassium metabisulphite), and slices preserved using the traditional method in brine, were compared for quality prior to their use for chutney. Vitamin C retention in the slices was proportional to SO_2 retention, whereas non-enzymatic browning was inversely proportional to SO_2 retention. SO_2 retention was slightly higher in cabinet-dried slices than in sun-dried slices. Chutney prepared from dried slices was rated superior to that prepared from brine-preserved slices; the latter more rapidly lost vitamin C, acids and sugars and texture. Cabinet-dried slices treated with 1.5% potassium metabisulphite gave the best chutney.

831 KRISHNAMURTHY, S. 1989. **Effects of Tal-prolong on shelf-life and quality attributes of mango**. *Acta Horticulturae*, No. 231, 675-678.

Coating unripe mature fruits with Tal-prolong (a product containing mainly sucrose esters, glycerides and cellulose) by dipping them for 2 min in a 1% suspension before storage, delayed ripening by 4-5 days when they were stored under ambient conditions (28-32°C) for 18 days. This treatment also reduced weight loss, and resulted in fruits with quality attributes (freshness, texture and taste) comparable to those of untreated control fruits, though they had a duller yellow skin colour. Tal-prolong at 1.5% and 2.0% interfered with ripening and gave soft green fruits of high acidity.

832 KUMAR, OV; KUMAR, G. 1989. **Effect of pre-harvest foliar sprays of zinc on post-harvest changes in the quality of mango cv. Dashehari**. *Acta Horticulturae*, No. 231, 763-770; 18 ref.

Sprays of 1% ZnSO4 were applied either once only on 11 May or for a second time 20 days later to 30-year-old Dashehari trees, and their effect on mangoes harvested on 15 June and stored at room temperature (29-34°C, 85-90% RH) for 10 days was determined. Fruits sprayed with Zn showed less weight loss and spoilage, and higher sugar content and lower acidity, than unsprayed fruit after 10 days' storage. During storage, vitamin C content increased initially and then decreased and was unaffected by Zn sprays. Vitamin A content, which increased throughout the 10-day storage period, was increased slightly by Zn sprays. Two Zn sprays were more beneficial than a single spray.

833 LAD, BL; GUNJATE, RJ; SALVI, MJ. 1985. **Effect of post harvest ethephon dipping of fruits on occurrence of spongy tissue disorder in *Alphonso mango***. *Indian Journal of Plant Physiology*, 28: 1, 85-87; 9 ref.

Dipping fruits in 500, 750 or 1000 p.p.m. ethephon reduced the occurrence of spongy tissue. The treatments also enhanced ripening by 2 to 3 days. However, ethephon at 750 or 1000 p.p.m. slightly reduced keeping quality but the 500 p.p.m. rate was not detrimental.

834 MAINI, SB; DIWAN, B; ANAND, JC. 1984. **Use of high molecular weight high density (HMHD) film pouches for processing and storage of mangoes and tomato pulps**. *Journal of Food Science and Technology*, 21: 410-412.

835 MIR, MA; NATH, N. 1993. **Storage changes in fortified mango bars**. *Journal of Food Science and Technology - Mysore*, 30: 4, 279-282.

Changes in chemical, textural and sensory characteristics of three types of mango bars (plain mango, mango-desiccated coconut powder and mango-soy protein concentrate bars) during 90 days storage at -18°C, 27±3°C (65% RH) and 38±1°C (92% RH) were studied. Moisture, acidity and reducing sugars of the mango bars increased significantly during storage in all the cases. Reduction in total and free SO_2, total carotenoids and beta carotone, and an increase in non-enzymatic browning (NES) were observed. Losses of carotenoids and non-enzymatic browning were found to be more in unsulphited bars than in sulphited bars. Storage decreased the overall acceptability and textural characteristics. The deteriorative changes were minimum in mango stored at -18°C.

836 NARAYANA, CK; PAL, RK; ROY, SK. 1990. **Ripening and storage of mango (cv. Banesan) as influenced by pre-transit wrapping with HM-films**. *23rd International Hort. Congress*. Firenze, Italy:

837 RAO, SATYAPARAKASH; ROY, SK. 1980. **Studies on dehydration of mango pulp. (II) storage studies of the mango sheet/leather**. *Indian Food Packer*, 34: 3, 72-79.

838 ROY, SK; PANDEY, RM. 1983. **Effect of existing methods of harvesting on ripening and storage of mango (*Mangifera indica L.*)**. *Silver Jubilee Celebration Seminar*. (New Delhi: 1983: 20-22 Jan). Indian Society for Palnt Physiology

839 SAGAR, VR; MAINI, SB. 1991. **Studies an drying and storage of raw mango slices**. *Beverage and Food World*, 18: 2, 16-17.

840 SHIVARAMA REDDY, L; THIMMARAJU, KR; REDDY, LS. 1989. **Effects of pre-packaging and post-harvest treatments on the storage behaviour of mango fruits cv. Alphonso**. *Acta Horticulturae*, No. 231, 670-674; 5 ref.

Weight loss and spoilage in storage of *Alphonso mango* were reduced when fruits were stored in perforated polyethylene bags. Coating the fruit with wax emulsion (2, 4, 6 or 8%) reduced weight loss and, in the presence of fungicide (thiabendazole, Benlate [benomyl] and Bavistin at 100, 250 and 500 p.p.m.), the amount of spoilage over 20 days was reduced. The best storage was achieved by treating the fruits with thiabendazole (100 p.p.m.) and 6% wax emulsion.

841 SINGH, BP; KALRA, SK; TANDON, DK. 1989. **Effect of size grading on the storage of mangoes**. *Indian Jrl. of Hort.*, 46: 2, 154-160; 19 ref.

In trials with the cultivar Dashehari, mature green fruits were harvested in late June and the fruits were graded into sizes A, B and C weighing on average 210, 167 and 131 g, respectively. Five kg of fruits of each grade were packed into wooden boxes lined with newspaper and stored at room temperature (28-33°C) with 60-85% RH for up to 11 days. After 5 days, ripening in A, B and C fruits was 38, 57 and 76%, respectively. After 7 days all fruits ripened but their marketability was 100, 80 and 50% in A, B and C, respectively, compared with 100% for all grades after 5 days. After 11 days 50% of A fruits were marketable compared with 40% in B and

nil in C. Data are tabulated on fruit chemical composition.

842 SINGH, RN; GORAKH SINGH; MISHRA, JS; RAO, OP. 1987. **Studies on the effect of pre- and post-harvest treatment of calcium nitrate and calcium chloride on the storage life of Amrapali mango**. *Progressive Horticulture*, 19: 1-2, 1-9; 9 ref.

In one experiment, 3-year-old trees were sprayed with 0.5-2.0% rates of the 2 chemicals a week before harvesting, and in another experiment, mature fruits were dipped for 15 minutes in aqueous solutions containing the 2 chemicals at similar concentrations. All fruits were held in perforated 1.5 kg bags. The fruits from the 1st and 2nd experiment were stored for 12 and 8 days, respectively. The treatments extended edible quality for more than 10 days (experiment 1) and for 8 days (experiment 2) while control fruits remained acceptable for only 4 days.

843 SUDHAKAR, DV; MAINI, SB. 1994. **Stability of carotenoids during storage of mango pulp**. *Journal of Food Science and Technology - Mysore*, 31: 3, 228-230.

Effects of various biochemical components, other additives and different storage conditions on the stability of carotenoids in the sulphited mango pulp have been investigated. Carotenoids were more stable at higher levels of SO_2. Ascorbic acid and antioxidants helped in better retention of carotenoids. Retention of carotenoids was higher in the pulp packed in glass containers and with least surface area exposed to air and stored at low temperatures. Maximum retention of carotenoids was found in the pulps of 'Neelum' followed by 'Totapuri' and 'Chausa'.

844 VIJAY, S. 1987. **Quality characteristics of chausa mango ripened with calcium carbide for pulp. storage**. *Ind. Fd. World*, 41: 3, 14.

845 VIJAY, S; MAINI, SB. 1991. **Studies on storage of mango pulp**. *Ind. J. Hort.*, 48: 3, 228.

Storage decay

846 BADYAL, KUSUM; SUMBALI, GEETA. 1990. **Market diseases of mango**. *Indian Journal of Mycology and Plant Pathology*, 20: 3, 281.

During a survey of fruit markets in Jammu, 3 diseases new to India were reported on mango, the pathogens identified being *Penicillium crustosum*, *Rhizopus oryzae* and *Geotrichum candidum*.

847 CHAUHAN, HL; VALA, DG; JOSHI, HU. 1988. **Remedies for the post-harvest diseases of mango fruits**. *Pesticides*, 22: 10, 15-17; 5 ref.

Postharvest rots of *Alphonso mango*es were controlled by dipping in warm 52 ± 1°C suspensions of carbendazim (300 p.p.m.), captafol (1500 p.p.m.) and benomyl (300 p.p.m.) for 10 min. The shelf life was increased to 3 weeks or longer if the fruits were sun dried after treatment. Similarly stored untreated fruits showed losses of 50% or more. Fungicides persisted in the pericarp for up to 15 d after warm treatment compared with 8 d after cold dipping. No residues were present in the pulp after 8 d with either hot or cold dipping.

848 DIETZ, TH; THIMMARAJU, KR; SUNDAR JOSHI, S; JOSHI, SS. 1989. **Studies on loss of weight of mango fruits as influenced by cuticles and lenticels**. *Acta Hort.*, No. 231, 685-687.

Both the mean weight loss (g/day) in storage and the number of lenticels per fruit of 5 cultivars studied followed the order: Mallika > Totapuri > Pairi > Dashehari > Alphonso ($r = 0.829$, significant at 10%). Weight loss was not significantly correlated with cuticular thickness.

849 HEENKENDA, HMS. 1992. **Present status, problems and protential of mango production in Sri Lanka**. *Sri Lanka Journal of Agriculture Science*, 29: 129-137.

850 JAGDISH CHANDRA; PATHAK, VN. 1989. **Studies on the stem end rot (*Diplodia natalensis Pole Evans*) disease of post harvest mango (*Mangifera indica L.*) fruits**. *Indian Journal of Mycology and Plant Pathology*, 19: 1, 37-43.

Mango fruits from an Udaipur market had 2.2-4.2% infection by *D. natalensis* [*Botryodiplodia theobromae*] during Apr.-Aug. Wounding with a cork borer before inoculation of ripe fruits resulted in 36.24% disease severity. Unripe fruits were unaffected by inoculation. The pathogen synthesized PMG, PG and Cx enzymes and their activity was maximum in vitro after 9 d at pH 6. Waxol was the most effective treatment for controlling post-harvest stem end rot.

851 KRISHNAIAH, J; SATYA PRASAD; THIRUPATHAIAH, V. 1987. **Protection of mangoes from post-harvest fungal decay by using fruit coatings**. *Indian Phytopathology*, 40: 3, 426-428.

The 4 coatings tested, Decco Lustr-DL-202, Fruit and Vegetable Kleen-FVK-241, DL-261 and DL-251, effectively controlled decay at 0.04 ml/100 g fruit.

852 MURTHY, SK; RAO, KPG. 1983. **Post harvest control of spoilage in mango (*Mangifera indica L.*) with hot water and fungicides.** *Journal of Food Science and Technology, India*, 20: 2, 74-77; 7 ref.

Benlate [benomyl], thiabendazole, captan and Rovral [iprodione], each at 500 p.p.m. in cold or hot water, were compared as fruit dips for controlling fungal rots during holding for up to 12 days at 28°C and 40-60% RH. Benlate in cold (28°) water reduced fungal spoilage significantly for 12 days in the cv. Alphonso, and also retarded fruit ripening. A hot-water Benlate dip did not improve the level of control. Captan and thiabendazole had no effect on ripening but reduced spoilage, whereas Rovral was ineffective. With fruits of cv. Totapuri, treated with cold-water dips only, no fungicide affected ripening or spoilage. None of the treatments adversely affected edible quality in either cv.

853 OM PRAKASH; RAOOF, MA; PRAKASH, O. 1988. **Control of mango fruit decay with post harvest application of various chemicals against black rot, stem end rot and anthracnose disease.** *International Journal of Tropical Plant Diseases*, 6: 1, 99-105; 15 ref.

Good control of these diseases, caused by *Aspergillus niger*, *Diplodia natalensis* [*Botryodiplodia theobromae*] and *Colletotrichum gloeosporioides* [*Glomerella cingulata*] was given by various treatments including benomyl, carbendazim, thiabendazole, brine solution and frutox as well as hot water (50°C for 5 min). Fruits treated with mustard oil retained their colour for up to 14 d.

854 PALEJWALA, VA; MODI, VV. 1985. **Post harvest spoilage of mangoes by *Penicillium cyclopium* and its control by gamma-radiation and a fungicide.** *Phytopathologische Zeitschrift*, 112: 1, 63-68; 15 ref.

P. cyclopium was isolated from a spoiled ripe mango cv. Alphonso in India. Spores were found resistant up to 500 krad gamma-radiation; thus the 25 krad treatment normally used to prolong shelf life of mangoes could not protect them against natural or artificial infection. Bavistin [carbendazim] completely inhibited spore germination at 100 mg/litre. A post-harvest dip (1 min) of unripe Langra mangoes in an aqueous solution of this fungicide considerably reduced the degree of spoilage.

855 PALEJWALA, VA; SATTUR, AP; MODI, VV. 1989. **Strategies for the control of post-harvest spoilage of mangoes by *Penicillium cyclopium*.** *Acta Horticulturae*, No. 231, 688-696; 42 ref.

Growth of *Penicillium cyclopium* [*P. aurantiogriseum*], isolated from naturally infected *Alphonso mango*, was inhibited in vitro by Bavistin [carbendazim] more than by Aureofungin. Dipping fruit in a solution of Bavistin (100 mg/litre) before storage was more effective in reducing spoilage of infected stored fruit than dipping in Aureofungin (1-100 mg/litre). Gamma irradiation reduced fungal infection only when the fruits were also treated with Bavistin at the same time. Low temperature (10-20°C) storage prevented the spoilage of artificially inoculated unripe fruit. Unripe fruit were less susceptible to infection by *P. cyclopium* than ripe fruit.

856 PATEL, RB; GOSWAMI, NP. 1984. **Post harvest diseases of mango fruits (*Mangifera indica*) and their control.** *Indian Journal of Microbiology*, 24: 2, 140-141; 9 ref.

Among isolates from rotting fruits in Ahmedabad market, *Aspergillus niger* and *Rhizopus arrhizus* caused the most damage. Storage life was extended by wax coating of fruits and storing at low temp.

857 PRAKASH, O; SRIVASTAVA, KC. 1987. **Mango diseases and their management. A world review.** New Delhi: Today & Tomorrow's Printers and Publishers, 175p.

Following an introduction and brief history, diseases caused by fungi, bacteria, algae and lichens, physiological disorders, nutritional deficiencies, diseases of unknown aetiology, phanerogamic parasites and epiphytes, environmental injuries, postharvest diseases in storage and transit and entomogenous pathogens are treated in separate chapters. A bibliography is appended. This book is supplement 1 of the Review of Tropical Plant Pathology.

858 PRASAD, SS; SINHA, AK. 1983. **Depletion of ascorbic acid in healthy and diseased mango fruits.** *National Academy of Sciences, Science Letters*, 6: 7, 219-220; 8 ref.

Vitamin C was depleted more rapidly during storage of fruits infected by *Botryodiplodia theobromae* and *Macrophoma mangiferae* than in healthy fruits. The loss was more pronounced and at a higher rate in cv. Sukul than in Maldah.

859 RAM KISHUN. 1986. **Preservation of viability and virulence of *Xanthomonas campestris pv. mangiferaeindicae* under different storage conditions.** *Indian Journal of Mycology and Plant Pathology*, 16: 3, 343-347; 7 ref.

This agent of mango bacterial canker remained viable and virulent for up to 60 months when stored in sterile water in screw cap tubes at room temp. and up to 48

months on nutrient agar sealed with mineral oil and kept in a refrigerator. The bacteria survived 24 months in sterilized soil and 4 months in unsterilized soil.

860 RAOOF, MA; OM PRAKASH. 1986. **Effectiveness of pre-harvest field sprays of various chemicals against post-harvest diseases of mango**. *Ind. Jrl. of Plant Path.*, 4: 2, 189-190.

The most effective treatments included Bancop, thiabendazole, Agrimycin and Aureofungin while Bavistin [carbendazim] was ineffective.

861 SRIVASTAVA, VP. 1984. **Efficacy of some fungicides and hot water treatment in control of post harvest decay of mango fruits (1982)**. *Pesticides*, 18: 1, 63-64; 4 ref.

Decay of Dashehari mangoes was reduced by postharvest dip in 0.1% Bavistin or 0.2% captan for 2 or by hot water treatment (50°C) for 5 min.

Packaging

862 ADSULE, PG; ROY, SK. 1974. **Tin pick-up in mango of different varieties**. *Indian Food Packer*, 28: 6, 51-52.

863 JOSHI, GD; ROY, SK. 1984. **Standardisation of packaging of fresh mango fruits for transportation and storage**. *National conference on packaging of fresh and processed foods*. (Calcutta: 1984: 2-3 March). India: Association of Food Scientists and Technologists.

864 ROY, SK; PAL RK. 1991. **Multilocational studies to reduce postharvest losses during harvesting, handling, packaging, transportation and marketing of mango in India**. *Acta Hort.*, 291: 499-507.

Processing

865 ADSULE, PG; ROY, SK. 1978. **Physico-chemical studies of some important commercial varieties of mango of north India with reference to processing**. *1st Indian Convention of Food Scientists and Technologists*. Mosore: AFST, CFTRI.

866 PAL, RK; ROY, SK. 1988. **Studies on biochemical changes in mango as affected by combined effect of precooling and chemicals**. *2nd International Food Convention*. 1988: 18-23 Feb. Mysore:

867 ROY, SK. 1973. **A simple rapid method for estimation of total carotenoid pigments in mango**. *J. Fd. Sci. Technol.*, 10: 1, 45.

868 SINGH, RV; TEWARI, JD; CHAUHAN, BBS. 1993. **Effect of combinations of nitrogen, phosphorus and potassium fertilizers on the quality of fresh and canned mangoes**. *Journal of Food Science and Technology (India)*, 30: 6, 468-470.

NUTS

869 BADYAL, K. 1991. **Post harvest fungal diseases of almond from Jammu**. *Andhra Agricultural Journal (India)*, 38: 2-3, 282-283.

870 BATTCOCK, M. 1990. **A future for solar drying?**. *Appropriate Technology*, 17: 2, 21-24; 12 ref.

Methods and problems of solar drying in developing countries are summarized. Structures for solar drying eliminate some of the problems of product quality, dust contamination, damage from sudden rainstorms, animals or birds, etc. Such structures include the Brace drier for fruit and vegetable drying, chimney driers for rice, tent drier for fish and forced convection drier for red peppers. Reasons cited for the unpopularity of solar driers are lack of capital for construction, loss of valuable ground area while they are operating, extra labour required for loading and unloading, heavy trays that cannot be lifted by women. Further arguments against solar drier use are that higher quality products do not necessarily mean higher prices, and that crop losses are often exaggerated by certain agencies. Although solar driers are successful for cashew nuts in Honduras anddesiccated coconut in Bangladesh, there is little future for driers for high vol., low value crops; only large driers processing 1 t/d are likely to be useful.

871 BOPAIAH, BM. 1984. **Microbial spoilage of cashew apples and its prevention**. *Indian Cashew Journal*, 16: 2, 15, 17; 3 ref.

Five yeast spp. were identified as primary invaders of *Anacardium occidentale* fruits through injuries at harvest and at least 4 fungal spp. as secondary invaders. Microbial spoilage can be checked by careful harvesting, washing the fruits after harvest, dipping them in low concn antibiotics (griseofulvin or cycloheximide) and extracting the juice soon after harvesting.

872 JYOTI SAXENA; MEHROTRA, BS. 1987. **Mould infestation of walnut flowers and fruits in field and storage**. *National Academy Science Letters, India*, 10: 11, 375-377.

The fungi associated with walnut (*Juglans regia*) flowers