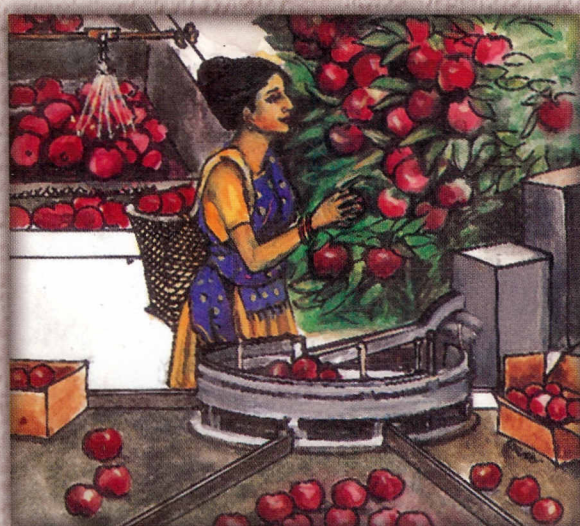




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Postharvest Management in Agriculture

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Postharvest Management in Agriculture **SAARC Bibliographical Database**

A S Chandel and R M Kamal



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998 SINGH, K; MANN, SS; BAJWA, MS. 1985. Effect of auxins, sodium benzoate and calcium chloride on post-harvest berry drop in Himrod grapes. *Acta Horticulturae*, No.158, 413-418; 17 ref.

Of the chemicals tested, all applied 14 or 28 days before harvest, Planofix [NAA] at 100 or 150 p.p.m. applied 14 days before harvest gave the greatest reduction in berry drop. The treatments generally increased TSS but had little effect on percentage acidity.

999 TULASI RAMAN; SUSHEELA SANKARAN; RAMAN, T; SANKARAN, S. 1989. Biochemical changes during fruit rot of grapes caused by *Curvularia lunata* var. *aeria* Ellis. *Indian Journal of Mycology and Plant Pathology*, 19: 2, 211-212; 5 ref.

Postharvest infection by *C. lunata* [*Cochliobolus lunatus*] var. *aeria* caused twice as much decline in ascorbic acid content after 12 d as that in healthy grapes. Total sugars declined from the 2nd day of incubation and the decline was more pronounced in diseased fruits.

1000 ULLASA, BA; RAWAL, RD. 1986. Studies on American rot of grapes due to *Greeneria uvicola* from Bangalore, India. *Indian Journal of Plant Pathology*, 4: 2, 154-161; 13 ref.

Details are given of the occurrence, symptomatology, post-harvest losses, control and cultural characters of *G. uvicola*, which causes berry rot, and leaf and twig blight, resulting in die-back symptoms. All the common grapevine cultivars (e.g. Bangalore Blue, Thompson Seedless, and Anab-e-Shahi) were very susceptible. Storage decay was controlled best by captan and Difolatan [captafol].

1001 WADIA, KDR; MANOHARACHARY, C; JANAKI, CH. 1983. Fruit surface mycoflora of *Vitis vinifera* L. and *Capsicum annum* L. in relation to their fruit rot diseases. *Proceedings of the Indian National Science Academy, Pt. B. Biological Sciences*, 49: 4, 371-376; 20 ref.

A relationship was demonstrated between the fungi associated with the fruit surface of ripened grapes and green chillies (*C. annum*) and fungi responsible for storage decay. Infection follows mech. injury during usual handling practices.

VEGETABLES

Postharvest handling

1002 CHADHA, ML. 1971. Techniques of handling

and storing vegetable seeds. *Germplasm collection, evaluation, documentation, and conservation*. Asian Vegetable Research and Development Center, P.O. Box. 205, Taipei 10099. p. 62-68.

1003 VILLAREAL, RL; SHANMUGASUNDARAM, S; CHADHA, ML. 1993. Harvesting and postharvest management. *A Primer on Vegetable Gardening*. Taipei, Taiwan: Asian Vegetable Research and Development Center, P.O. Box. 205, Taipei 10099, p. 169-188.

Preservation

1004 HASAN, AKJ; CHOUDHURY, N; BEGUM, A; NAHAR, N. 1993. Preservation of vegetables by microbial activity and radiation. *World Journal of Microbiology & Biotechnology*, 9: 1, 73-76.

Two locally-produced seasonal vegetables, carrot and patol, were preserved in brine, with and without radiation, with marked changes in their properties as foods and their microbiology. The treated vegetables could be preserved, at optimum salt and irradiation levels, for up to 60 days without becoming unacceptable in terms of appearance, texture, flavour and taste. The optimum salt concentrations for preservation of carrot and patol were 2% (w/v) and 3% (w/v), respectively. The microbial load initially showed an upward trend and then declined after 5 to 10 days of storage. Lactic acid bacteria predominated in treated vegetables.

1005 VIJAY, S; ANAND, JC. 1982. Chemical preservation of vegetables at room and low temperature. *Ind. J. Agric. Sci.*, 53: 3, 536.

Storage

1006 DEORE, BP; BHARUD, RW. 1990. Growth, yield and storability of fenugreek as influenced by foliar spray of growth substances. *Journal of Maharashtra Agricultural Universities*, 15: 2, 208-210; 13 ref.

A field trial was carried out on fenugreek (*Trigonella foenum-graecum*) cv. Pusa Early Branching during 1985. The treatments were foliar sprays of 20 p.p.m. GA3, 0.5% ascorbic acid, 20 p.p.m. IAA, 0.25% urea, water and no spray. Leafy vegetable fenugreek (methi) was stored in bamboo baskets and sprinkled with water, in perforated plastic bags, in a wet cloth covering or in open bamboo baskets. Physicochemical analysis of fenugreek was carried out after 24, 48 and 72 h of storage. All growth regulators produced higher yields compared with the control; highest yield being obtained with 20 p.p.m. GA3 (203.33 q/ha). This treatment also

resulted in the greatest plant height (22.07 cm), leaf area (75.43 dm²/plant), leaf:stem ratio (2.77) and fresh weight (15.07 g/plant). Applying 20 p.p.m. IAA resulted in the highest internode length (4.07 cm) and dry weight (1.23 g/plant). Percentage moisture loss increased with increased length of storage period whereas ascorbic acid, chlorophyll and total acid contents decreased. The wet cloth covering was the most effective storage method for increasing the shelf-life of fenugreek. Preharvest foliar application of growth regulators increased the shelf-life of fenugreek compared with the controls.

1007 JAYARAJ, T; VADIVELU, KK; DHARMA-LINGAM, C; VIJAYAKUMAR, A; IRULAPPAN, I. 1988. **Effect of seed treatments and containers on vegetable seed storage under different agro-climatic conditions.** *South Indian Horticulture*, 36: 4, 183-187.

Seeds of the tomato cultivar Co.3, capsicum cv. Co.2, aubergine cv. PKM1 and okra cv. Pusa Sawani were dried to 7% moisture content, treated with captan or thiram (each at 2 g/kg seeds), packed into cloth bags or aluminium foil pouches and stored in ambient conditions for up to 12, 15 and 18 months at 3 locations representing tropical, sub-tropical and temperate conditions. Generally seeds treated with captan and stored in the aluminium foil pouches showed the highest % germination at the end of storage.

1008 KHANAL, R. 1990. **A literature review on vegetable seed storage and packing.** *PAC Occasional Paper - Pakhribas Agricultural Centre*, No. 6, 41 pp.; 92 ref.

This review consists of 18 sections entitled: introduction (with particular reference to seed storage problems in Nepal); reason for storage; pre-storage history of seed and its influence on seed; seed deterioration and ageing; seed vigour; orthodox and recalcitrant seed; environmental factors that affect seed longevity in storage; seed moisture content and its relationship with relative humidity; relationship between temperature, moisture and RH; seed viability; storage fungi; insects, pests and mites; seed treatment; seed storage structures; packaging; storage containers and packaging; discussion and recommendations; conclusion. The appendices include a list of species with recalcitrant seeds, data on the storage behaviour of some recalcitrant seeds, an onion seed viability nomograph, survival curves for stored broccoli and cauliflowers seeds.

1009 MOLEYAR, V; NARASIMHAM, P. 1994. **Modified atmosphere packaging of vegetables - an**

appraisal. *Journal of Food Science and Technology - Mysore*, 31: 4, 267-278.

Modified atmosphere packaging (MAP) is becoming increasingly popular as an effective supplement to refrigeration, especially in the present era of consumer awareness of residues of pesticides, additives and preservatives in foods and of the economic need to sufficiently extend the storage life of fresh fruits and vegetables. MAP is known to extend the storage life of fresh produce, either in whole or lightly processed form, by 1.5-4.0 fold and also help largely in the retention of the quality of the product. For fruits and vegetables which are respiring, the optimum modified atmosphere (MA) involves lowering of oxygen level to about 2% and elevating carbon dioxide level in the storage atmosphere to 3-5%. However, it is of paramount importance that the gases be maintained at the optimum for the particular commodity, in order to avoid adverse physiological effects on the commodity and also the risk of the growth of microbial pathogens, which cause health hazards. Polymeric films with different gas permeabilities are presently employed for MAP. However, an efficient, safe and cost-effective MAP system to deliver safe and wholesome products of good quality is yet to be developed. The present review critically analyses these aspects to establish the state of the art of this vitally important mode of extending the storage life of fruits and vegetables.

1010 ROY, SK; KHURDIYA, DS. 1981. **Keep your vegetables fresh in summer.** *Indian Horticulture*, 27: 1, 56.

1011 ROY, SK; KHURDIYA, DS. 1982. **Low cost storage of vegetables for the tropical developing world.** *The 21st international horticultural congress.* Hamburg, West Germany:

1012 ROY, SK. 1979. **Storage ways for vegetables.** *Home Science.*

Storage decay

1013 BHATTACHARYA, I; MUKHERJEE, N. 1986. **Soft rot of storage tissues due to some uncommon bacteria: some epidemiological aspects.** *Indian Agriculturist*, 30: 1, 75-82; 20 ref.

Genera such as *Bacillus* and *Pseudomonas* as well as *Erwinia* were associated with soft rots of vegetables, fruits and other storage tissues. The bacteria caused rotting at high temp. (c. 40°C) and 100% RH or under water-soaked conditions. Some showed preference for

different tissues although all caused equally extensive rotting of potato, carrot, pineapple and onion.

1014 GARG, N; CHUREY, JJ; SPLITTSTOESSER, DF. 1993. **Microflora of fresh cut vegetables stored at refrigerated and abuse temperatures.** *Journal of Food Science and Technology - Mysore*, 30: 5, 385-386. The microflora of commercially packaged spinach, cauliflower and carrots was compared after storage for 7 days at 3.3 and 15°C. Storage at 15°C produced significantly high aerobic counts in spinach, cauliflower florets and carrot sticks. but not in cauliflower heads and whole carrot. Psychrotrophic species made up a significant proportion of the microflora at both the temperatures. Little growth of coliform and lactic acid bacteria was observed at either temperature.

1015 MISHRA, D; RATH, GC. 1986. **Factors affecting conidial germination of four species of *Fusarium* inciting postharvest decay of vegetables.** *Indian Journal of Mycology and Plant Pathology*, 16: 2, 205-206; 9 ref.

Details are given of the requirements for spore germination of *F. oxysporum*, *F. solani*, *F. moniliforme* [*Gibberella fujikuroi*] and *F. equiseti*, isolated from rotting vegetables in local markets. Opt. conditions included 30°C, 100% RH, darkness and pH 6-7.

1016 MISHRA, D; RATH, GC. 1989. **Rotting of some vegetables caused by *Fusarium equiseti*.** *Orissa Journal of Agricultural Research*, 2: 2, 138; 5 ref.

Postharvest rotting in 25 vegetables inoculated with *F. equiseti* was classified in 4 groups. Rotting was most severe in Dolichos bean [*Lablab purpureus*], moderate in 6 vegetables, mild in 7 and insignificant in 11. Some of these are newly reported hosts for the fungus.

1017 MISHRA, D; RATH, GC. 1986. **Survey of post-harvest decay of vegetables caused by *Fusarium*.** *Indian Phytopathology*, 39: 2, 273-274; 12 ref.

Samples of 15 vegetables collected from local markets in Bhubaneswar during 1973-75 yielded *Fusarium oxysporum* (potato, *Capsicum*, cucumber, *Lablab purpureus*, *Cyamopsis tetragonoloba*, cowpea and carrot); *F. solani* (potato, *Colocasia*, *Luffa acutangula*, *Capsicum*, *Lagenaria siceraria*, yam and *Trichosanthes dioica*); *F. moniliforme* [*Gibberella fujikuroi*] (aubergine, onion, sweet potato and cowpea); and *F. equiseti* (aubergine).

1018 WAHEED, A; IQBAL, MZ; SHAH, FH. 1986. **Post harvest losses in vegetables.** *Pakistan Journal of*

Scientific and Industrial Research, 29: 4, 268-273; 25 ref.

Values are tabulated for separate losses, incurred in harvesting, storage in the field, loading and transportation, wholesale market and in the retail shop, for vegetables. Total losses were cabbage 17-25, salad (*Pisonia alba*) 31-37, spinach 44-52, beetroot 23-31, carrot 26-36, onion 15-22, radish 12-18, potato 13-20, bitter melon (*Momordica charantia*) 23-32, cauliflower 21-28, cucumber 22-31, okra (*Hibiscus esculentus*) 29-39, peas 24-28 and tomato 44-52%. The proximate, mineral and vitamin composition of immature, mature and overripe vegetables is also tabulated. Losses after storage for 3 days at 20°-31°C and relative humidity 50-79% were vitamin A 20-52, thiamin 10-35, riboflavin 13-38 and vitamin C 44-75%.

Marketing

1019 DAYANANDA, KAS. 1993. **Structural analysis of market information flow in the vegetable sector of Sri Lanka.** Philippines Univ., Los Banos, College, Laguna (Philippines).

1020 ELIAS, SM 1992. **Marketing and credit policy for increased vegetable production.** *Vegetable production and marketing*. (BARC, Dhaka: 1992: 26-29 January). Bangladesh Agricultural Research Council, Dhaka. p. 165-169.

1021 RAJESH, KUMAR. 1991. **Marketing of vegetables in Solan district of Himachal Pradesh.** Himachal Pradesh Krishi Vishvavidyalaya, Palampur. 128 Pages.

An attempt has been made to study post-harvest losses and other marketing aspects particularly channels, returns and costs of major vegetables in Solan district of Himachal Pradesh. On the basis of highest area under vegetable crops, two blocks, viz. solan and Kandaghat were selected. Seven villages from the former block and four villages from the latter block were randomly selected. Finally a sample of 60 vegetable growers (37 small and 23 large) was selected randomly. The primary data were collected by survey method while the secondary information was collected from relevant government offices. The extent of post-harvest losses was higher in tomato and capsicum. The harvesting and assembling was an important stage for losses. The losses were mainly due to insect-post and diseases. It was found that the wholesalers, commission agents, village traders and retailers were the main marketing functionaries operating in the study area. The produce through commission agents was sold in the distant markets, whereas whole-

salers collected the produce from local markets. Of the four marketing channels studied, i.e. channel-I (producer-forwarding agent-commission agent-wholesaler-retailer-consumer), Channel-II (Producer-primary wholesaler secondary wholesaler retailer consumer) Channel-III (Producer-village trader wholesaler retailer consumer) and Channel-IV (producer retailer consumer), Channels-I and II were the most common. Channel-I was followed in case of tomato and capsicum, while bean and peas were disposed of through Channel-II. Moreover, channel-II was found more efficient in case of tomato and capsicum, whereas in case of beans and peas channel-I was better. Among the various factors influencing marketed surplus of vegetables, total production and per cent losses to total production were found main determinants. Lack of standard grades, scarcity of wooden boxes, cheap and quick transportation, malpractices by traders and lack of market information were the main constraints in marketing of vegetables.

Processing

1022 AMIRUZZAMAN, MD.; CHAUDHURY, JCS. 1994. **Improved technologies for vegetable processing.** *Proceedings of a symposium on recent advances in vegetable development of Bangladesh/Comp.* by ML Chadha and others (Gazipur: 1994: 24-25 April). BARI, Gazipur, Postharvest Technology Division. Taiwan: Asian Vegetable Research and Development Center (AVRDC) p. 167-170.

Most vegetables grown in the country are highly perishable and postharvest losses reach 25-30%. Some methods of preservation are of particular significance in terms of economic importance. They are efficient, comparatively simple in operation, have universal application and are of commercial importance. Preservation by application of heat is perhaps the earliest and the most common method next to drying or dehydration method. Sun-drying may be extensively employed to dry vegetables. Dehydration or artificial drying is an improvement over ordinary sun-drying. Low-temperature drying, freeze-drying, accelerated freeze-drying foam-mat drying, etc., are refinements in the technique of dehydration. Freeze preservation is a modification of the well-known cold storage method of increasing the storage life of fresh vegetables. With the introduction of deep-freeze cabinets at home and facilities for transporting in the frozen state, this preservation method is likely to develop rapidly in the near future. Preservation by addition of sugar and application of heat are other important methods in vegetable processing. Finally, fermentation and pickling are easy-to-use and inexpensive techniques in preserving vegetables. A harvested

vegetable is a living entity that actively carries on its physiological functions like transpiration, respiration, etc. which deplete the metabolites and moisture without being replenished. Moreover, sufficient heat is produced to allow microbial growth and to accelerate the physiological functions. Due to loss of metabolites, weight and nutritional losses occur while moisture loss causes loss of turgidity, gloss, and freshness. Vegetables are extremely perishable items and are subject to huge postharvest losses both in quantity and quality. Intensive research efforts are underway all over the world to prolong the shelf life of these highly perishable products but with partial success until now. An alternative way of preserving these nutritious crops is by processing. Setting up of small, simple, and inexpensive processing facilities at the rural level is expected to alleviate the financial loss of vegetable growers who are compelled to dispose off their produce at reduced prices during production season.

1023 ANAND, JC; MAINI, SB; SETHI, V. 1993. **Processing of vegetables.** *Advances in Horticulture Vol. VI*/edited by KL Chadha and G Kaloo. New Delhi: Malhotra Publishing, p. 1107-1144.

1024 AZIZI, A; RANGANNA, S. 1993. **Thermal processing of acidified vegetables.** *Jrl. of Food Science and Tech.- Mysore*, 30: 6, 422-428.

1025 ROY, SK. 1985. **What to do with vegetables after harvest.** *Delhi Gargen Magazine*, p. 27.

1026 VIJAY, S. 1990. **Evaluation of different vegetables for lactic fermentation.** *Indian Journal of Agricultural Science*, 60: 9, 638.

CARROTS

Postharvest handling

1027 CHAKKARAVARTHI, A; MATH, RG; WALDE, SG; RAO, DG. 1993. **Grinding characteristics of carrots (*Daucus carota* L.).** *Journal of Food Engineering*, 20: 4, 381-389.

The grinding characteristics of carrots (*Daucus carota* L.) in the form of grits were studied in a hammer mill. The grits were first dried to different moisture contents, before being ground to a powder; the energy required for grinding was noted. Kick's law, Rittenger's law, and Bond's law were applied to the grinding process, and the constants of these various laws were found. The moisture content of the dried grits had a significant