



Postharvest Handling and Value Addition in Vegetable Crops

(*Vinit Tomar, Dr. Vijay Bahadur and Sameer Topnoz)

Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, UP

*Corresponding Author's email: vinittomar1999@gmail.com

Horticulture plays a significant role in Indian Agriculture. It contributes 30% GDP from 11.73 % of its arable land area. India is the second largest producer of both fruits and vegetables in the world (52.85 Mt and 108.20 Mt respectively). Fruits and vegetables are of immense significance to man.. Being rich source of carbohydrates , minerals, vitamins and dietary fibres these constitute an important part of our daily diet. The dietary fibres have several direct and indirect advantages. Not only this, vegetables provide a variety in taste, interest and aesthetic appeal. The inclusion of vegetables , which are very important for human nutrition and health in daily diets, along with exercise and weight control, have been found to have a remarkable ability in the prevention of most diseases. The highly perishable nature of fresh horticultural produce (especially with its high water content), makes them susceptible to postharvest losses ranging from 30 – 50% in fruits and vegetables. Causes of postharvest losses in vegetable production arise from metabolic, developmental and mechanical factors; environmental factors like temperature, relative humidity and atmospheric composition; biotic factors like diseases, insects and social-economic factors like transportation and marketing. The essence of storage is to retain the fresh state of the product. Strategies aimed at achieving value addition in fruits and vegetables include fermentation, drying, blanching, storage in containers (buckets and clay pots) and storage in a fruit shed. This review highlights various causes of postharvest losses in vegetable production and strategies to successfully combat this trend.

Keywords Postharvest, handling, vegetables, production, value-addition

Vegetables

Vegetables and fruits vegetables are very important for human nutrition and health. Diseases of the heart and some types of cancer can be prevented with diets low in fat and rich in fruits and vegetables; along with exercise and weight control. Many phytochemicals found in fruits and vegetables have a remarkable ability to disrupt the formation of tumors and in the prevention of other diseases (FAO, 2008a). Phytochemicals have several modes of actions, but many of them act as antioxidants. The antioxidant action of most fruits and vegetables, which has a positive health effect on man stems from its phytochemical content. Vitamins C and E are potent antioxidants. They can inhibit the synthesis and action of free radicals. About 90% of the sources of vitamin C in the human diet are from fruits and vegetables. Several polyphenols, found in many plants are very important for health and several of them are antioxidants. Fruits and vegetables are important sources of vitamins. Table 3, shows some of the vitamins present in different types of vegetables and examples of plants where they are found. Vitamins C and B are not stored in the human body and must be replenished daily. However, Vitamins A, E and D can be stored in the human body. Some of the postharvest factors that can cause losses in vitamins include high temperature, high oxygen content and mechanical injury. Fruits and vegetables contain several pigments that have

positive health effects. They may be classified into four groups namely - chlorophylls, carotenoids, flavonoids and betalaines. According to FAO (2008a), several carotenoids have been shown to act as antioxidants, and some of them are pro-vitamin A. For instance, lycopene (a carotenoid found in tomato) is linked with several positive effects including the reduction of the risk of prostate cancer. Betacarotenes, found in many plants such as carrots, are pro-vitamin A. Several flavonoids have been associated with the reduction and/or prevention of several diseases, including some types of cancer.

Postharvest Losses in Fresh Horticultural Produce

In horticultural commodities, the stages at which post harvest losses occur can be divided into five such as production/harvest, post harvest handling and storage, processing, distribution and consumption. Post harvest losses represent a waste of resources used in production such as land, water, energy and inputs. Fresh horticultural produce are highly perishable with some estimates suggesting a postharvest loss of 30 – 50% in fruits and vegetables. The losses occur due to poor pre-production and postharvest management as well as lack of appropriate processing and marketing facilities. According to Atanda et al., (2011), these losses have several adverse impacts on farmers' income, consumer prices and nutritional quality of the produce. The problems of postharvest food losses in developing countries was given a focus by the United States National Academy of Science in 1978, who stated the need to give consideration to losses in food products other than cereals; particularly roots and tubers, fruits and vegetables (Atanda et al., 2011). Typical postharvest losses in vegetable and fruits, roots and tubers range from 10 – 25%, but it is estimate at least 5%.

Causes of Postharvest Losses in Vegetable Production

Causes of Postharvest Losses in Vegetable Production According to FAO, (2008), there are many causes for postharvest losses during vegetable production. These are highlighted as follows:

- **Metabolic factors:** All fresh horticultural crops are made up of living tissues. They are highly active and undergo high metabolic activities such as tissue respiration. The natural process of respiration involves the breakdown of food reserves, and the aging of these organs, and thus to food losses.
- **Developmental factors:** These may include undesirable activities like sprouting, rooting, seed germination, which may lead to deterioration in quality and in nutritional value.
- **Mechanical factors:** Major losses in fresh horticultural crops are due to mechanical damage and rough handling. Inappropriate packages and packaging materials; overfilling and lack of good lining materials may increase mechanical damage.
- **Diseases:** As a result of physical injuries, mechanical bruises and compression, many decay organisms gain entrance into horticultural crops leading to deterioration and losses.
- **Insects:** Insects can infest horticultural crops, especially before harvest resulting in significant losses.
- **Temperature:** Temperature management is very important when handling fragile produce like vegetables. High temperatures in the tropics and the lack of refrigeration can lead to significant quantitative and qualitative losses. Low temperatures (0-10°C) can cause chilling injury and losses to several chilling sensitive commodities. Exposure of produce to sun may however enhance wilting and decay.

Reduction of Postharvest Losses

Postharvest losses can be reduced through the following processes:

- Harvest products at optimum maturity, and adequate (cool) time
- Protect the product from exposure to the sun after harvest.
- Avoid mechanical injury during harvesting

- Use of pre-cooling and refrigeration.
- Use of appropriate high relative humidity during storage and transport.
- Avoid infestation with diseases and insects, and use adequate control measures.

Factors Affecting Storage of Vegetables Loss of water

The commercial and physiological deterioration of vegetables after harvest is mostly affected by loss of water through transpiration. This loss of moisture adversely affects the appearance, texture, flavour and weight of the products. The softening of the tissues caused by loss of turgidity is the most noticeable effect of moisture loss.

Respiration and Metabolism: Long after harvest, vegetables continue to respire because they are living commodities. The act of respiration requires the use of the stored food, leading to its depletion and consequently the loss of quality. Hence, storage life of vegetables is influenced by rate of respiration and is associated with biochemical activity.

Storage of Vegetables for Value Addition

According to Ofor (2011), the main objective of storage is to retain the fresh state of the product. Deterioration following harvest is caused by a number of factors but the principal physiological factors are transpiration and respiration. Most fresh vegetables retain their top quality for only a few days. All green vegetables of high water content are best consumed when fresh. When allowed to stand long after gathering, the vegetables become wilted and tough through loss of moisture. The flavour is also impaired due to enzymatic action and the conversion of sugar to starch (TNAU, 2008). Fresh immature vegetable deteriorate faster in storage than mature vegetables particularly roots and tubers and bulbs. The rapid rate of respiration of most vegetables may be one of the reasons for their short storage life. According to James (1985), storage may serve one or all of the following roles: i. Slow down the biological activity of product by maintaining the lowest temperature that will not cause freezing or chilling injury and by controlling atmosphere composition. ii. Slow growth of microorganism by maintaining low temperatures and minimizing surface moisture. iii. Reduce product drying by reducing the difference between product and air temperature and maintaining high humidity in the storage organ. iv. The storage facility may also be used to apply special treatments, for example, potatoes and sweet potatoes are held at high temperature and high relative humidity to cure wounds sustained during harvest.

Conclusion

The innumerable benefits of vegetables necessitate making extra efforts to have them in our diet. The vegetables also need to be wholesome for the full benefits to be properly tapped. Some of the constraints which prevents the teeming population of the developing nations from having wholesome vegetables in their diets include lack of awareness; highly perishable nature of the commodity and the high cost of wholesome fruits and vegetables which is a direct result of the high cost of production. Government, Civil Society Organizations (CSOs), corporate bodies and highly placed individuals can engage themselves in the promotion of research ways of reducing the overall cost of production of these highly prized vegetables; thereby making it available to the teeming population of the developing countries.

References

1. Bustrillos, N.R. (1985). Socio-economic dimension of sun-drying technology applied to food. In: Expert Consultation on Planning the Development of Sun-drying Techniques in Africa.
2. Food and Agricultural Organization of the United Nations, Rome, 1985.

3. Fabre, M. and Mihailov, S. (1985). Report of the first preparatory mission on improvement and development of sun-drying techniques in Nigeria. In: Expert Consultation on Planning the Development of Sun-drying Techniques in Africa.
4. Food and Agricultural Organization of the United Nations, Rome, 1985.
5. FAO (Food and Agriculture Organization), (2003a). The role of post-harvest management in assuring the quality and safety of horticultural produce.
6. Kader, A. A. and Rolle, R.S. (eds.) Agricultural Services Bulletin 152, Food and Agriculture Organization of the United Nations Rome.
7. FAO (Food and Agriculture Organization), (2003b). Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas.
8. FAO Agricultural Services Bulletin 149, (Barbosa-Canovas et al., eds.), Food and Agriculture Organization of the United Nations, Rome.
9. FAO (Food and Agriculture Organization), (2008a). Training Manual on Postharvest handling and Marketing of horticultural Commodities, (Yahia, E.M., El Tamzini, M.I., El Saied, A.A. and S. Yateem – eds.)
10. Food and Agriculture Organization of the United Nations, Cairo.
11. FAO (Food and Agriculture Organization), (2008b). Home-based Fruit and Vegetable Processing in Afghanistan: A manual for field workers and Trainers, Book 1: Principles of postharvest handling, storage and processing of fruits and vegetables.
12. Ali, A. S. (Dufuor, C. ed.), Food and Agricultural Organization of the United Nations, Rome.