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**Md. Ramjan**  
 College of Horticulture and  
 Forestry, Central Agricultural  
 University, Pasighat,  
 Arunachal Pradesh, India

**Mohd Talha Ansari**  
 College of Horticulture and  
 Forestry, Central Agricultural  
 University, Pasighat,  
 Arunachal Pradesh, India

## Factors affecting of fruits, vegetables and its quality

**Md. Ramjan and Mohd Talha Ansari**

### Abstract

Fruits and vegetables are very important food commodities not only in India but all over the world. Fresh fruits and vegetables are perishable and highly prone to these losses because they are composed of living tissues. These tissues must be kept alive and healthy throughout the process of marketing. These are composed of thousands of living cells which require care and maintenance. There are many factors involved in selecting fruits and vegetables varieties for processing. Although high visual quality is desirable for most processing methods, the composition of fruit in relation to flavors, texture, color and nutritional value is of paramount importance. In addition, these quality should be impaired as little as possible during the specified process, e.g., some vegetables cannot be dehydrated or frozen because of their chemical composition or physical structure. Some kind have a bitter taste when dried, others lose color and flavor.

**Keywords:** Factors, affecting, Fruits, Vegetables and Quality

### 1. Introduction

Not all varieties of fruits and vegetables are satisfactory for processing. There are many factors involved in selecting fruits and vegetables varieties for processing. Although high visual quality is desirable for most processing methods, the composition of fruit in relation to flavors, texture, color and nutritional value is of paramount importance. In addition, these quality should be impaired as little as possible during the specified process, e.g., some vegetables cannot be dehydrated or frozen because of their chemical composition or physical structure. Some kind have a bitter taste when dried, others lose color and flavor. Varieties suitable for processing must have satisfactory quality both at harvest time and after storage at low temperatures. The factors affecting quality of fruits and vegetables can be classified largely into two groups, i.e. (a) Pre-harvest factors, and (b) Harvest factors (c) Post-harvest factors.

**1.1 PRE-Harvest Factors:** classified into environmental factors and cultural factors.

**Table 1:** Environmental factors

| Sl. No. | Environmental factors | Quality affected  |
|---------|-----------------------|---|
| 1       | Temperature           | High temperature affects maturity, color, sugar, acidity, etc. reduce the quality for e.g. in citrus, reddish, spinach, cauliflower etc. and increased the quality in grapes, melons, tomato etc. Low temperature cause chilling and freezing injury which reduced the quality.   |
| 2       | Light                 | Essential for anthocyanin formation. Exposed fruit to sun light develop lighter weight, thinner peel, lower juice and acids and higher TSS than shaded fruits, e.g. citrus, mango etc. exposed of potato to light causes greening (solanine formation) which has toxic properties. High sun light intensity cause sun scald in citrus and tomato and reduce the poor white color in cauliflower. Low light intensity cause thin and large leaves in leafy vegetables. |
| 3       | Rains                 | Causes cracking in grapes, dates, litchi, limes, lemon, tomato, sweet potato etc. It reduces appearance and sweetness.  |
| 4       | Winds                 | Causes brushing, scratching and corky scar (citrus fruits) the fruit and damage leafy vegetables.   |
| 5       | Humidity              | High humidity reduces the color and TSS and increases acidity in citrus, grapes, tomato, etc. but it is needed for better quality of banana, litchi, and pineapple.   |

**Sources:** (Srivastava, 2002) [3]

**Correspondence**  
**Md. Ramjan**  
 College of Horticulture and  
 Forestry, Central Agricultural  
 University, Pasighat,  
 Arunachal Pradesh, India

**Table 2:** Cultural factors

| Sl. No. | Cultural factors  | Quality affected  |
|---------|-------------------|---|
| 1.      | Mineral nutrition |   |
| (I)     | Nitrogen          | High N reduces ascorbic acid content; TSS/acid and keeping quality but increase thiamine, riboflavin carotene e.g. citrus and spinach its deficiency reduce size of fruits.   |
| (ii)    | Phosphorus        | High phosphorus decrease in size, weight and vit. C in various fruits its deficiency cause poor appearance of fruit such as citrus fruits.  |
| (iii)   | Potassium         | Increase size weight vitamin C and sugars. Its deficiency cause uneven ripening.  |
| (iv)    | Calcium           | Increase firmness of many fruits e.g. apple, mango, guava, tomato etc. and check physiological disorders in many fruits   |
| (V)     | Magnesium         | Increase size, weight and vitamin C in citrus.  |
| (Vi)    | Zinc              | Deficiency causes straggled cluster in grape.   |
| (Vii)   | Boron             | Flesh browning (e.g. aonla) and gummy discoloration of albedo in citrus. Fruits and vegetables become misshapen. Cabbage, turnip and cauliflower are sensitive to boron deficiency.   |
| (viii)  | Copper            | Deficiency causes irregular blotch on citrus fruits and spoils the appearance   |
| 2.      | Growth Regulators |   |
| (i)     | Auxins            | Increase size in loquate (2, 4, 5- TP), grapes (IAA), Mandarins (NAA) and TSS in mango (2, 4-D).  |
| (ii)    | Gibberelic acid   | Pre-harvest application increase size and weight of grape, apricot, strawberry and fig. causes parthenocarpic in and fig guava, grape, tomato etc.  |
| (iii)   | Cytokinin         | BA and PBA maintain green color of leafy vegetables.  |
| (iv)    | Ethylene          | Ethaphone increase anthocynine in (grapes, plum, apple, chilies and brinjal) Carotenoids (mango, guava, papaya, citrus, tomato etc.), ascorbic acid and TSS and reduces tannin (dates, grapes etc.) and acidity (grape, mango, tomato, etc.) per-harvest treatment with ethaphone reduces internal browning of pineapple. |
| (v)     | Growth retardant  | Pre-harvest application of Alar (B9) increase in color in apple, cherry, apricot etc. and MH inhibits sprouting in onion bulb. Foliar application of CCC before harvest resulted higher content of total sugars and TSS in banana.  |
| 3.      | Root stock        | In citrus, troyer and citrange rootstock produce the fruit of excellent quality of oranges, mandarins and lemons. In guava <i>Psidium pumilum</i> rootstock increase sugar and <i>Psidium cjavillis</i> ascorbic acid content in fruits.  |
| 4.      | Irrigation        | Excess irrigation cause high acidity and deficiency because moisture reduces fruits size, juice content and increase thickness of peel.   |
| 5.      | Pruning           | It affects the size, color, acidity, and sugar content in grape, Phlasma, ber, peach, apple etc.  |
| 6.      | Thinning          | Increase in size, color acidity and sugar content of fruits.  |
| 7.      | Girdling          | It increase in size, color and sugar in grape berries   |
| 8.      | Bunching covering | Pre-harvest bunch covering with plastic bags produced banana fruits of better color and quality.  |
|         | Variety           | Varieties differ in size, shape color and chemical composition, productiveness, bright appearance and good keeping qualities.   |
| 9.      | Disease/pests     | Pre-harvest application of systemic fungicides prevents quiescence like anthracnose of mango, papaya, crown rot of banana stem end rot in citrus, etc. pre-harvest application of chitosan reduced the post-harvest fungal rot and maintains the keeping quality of strawberry.   |
| 10.     | Maturity          | Fruits when ripe are of higher quality an account of full size, bright color, sweetness and less acid. In general vegetables with exception of potato and onion are of higher quality when less matures because of their being more tender, succulent, less fibrous or starchy.   |
| 11.     | Mechanical injury | Fruits and vegetables should be in no injured and damaged otherwise injury will reduced appearance and made by source f infection for fungus diseases   |

Sources: (Singh, 2009) [2]

## 1.2 Harvest factors

- **Maturity at harvest:** Maturity at harvest is the most important determinant of storage life and final produced quality. Immature produced are high susceptible to shriveling and mechanical damage are of inferior quality. Hence, fruits and vegetables are harvest at proper stage of maturity. Many leafy vegetables and immature fruits-vegetables (such as cucumbers, sweet corn, green beans peas and okras), attain optimum eating-quality prior to reaching to full maturity. This often results in delayed harvest and consequently in producer of low quality.
- **Harvest time:** Quality is depends on timing the harvest correctly for most vegetables. Size, flavor, tenderness, texture and color can all be influenced by harvest timing. snap bean must reach a certain sieve size, summer squash and cucumbers must be harvested within a narrow size range melon must be reach an acceptable sugar content tomatoes to be shipped must be harvested at “mature green” or as “breaker” but usually no post the “pink stages” tomatoes for direct sales can be harvested when ripe. Cabbage winter squash pumpkin peppers have a wider harvest window. (Selvakumar, 2014) [1]
- **Harvest methods:** The methods of harvesting (hand vs.

mechanical) can be significantly impact up on the composition and post-harvest quality of fruits and vegetables. Mechanical injuries (such as brushing, surface abrasions and cuts) can accelerate loss of water and vitamin C resulting in all increased susceptibility to decay-causing pathogens. Most fresh fruits and vegetables an all flowers are harvested by hand. Root crops (such as carrot, onion, potato and sweet potato) and some commodities destined for processing (such as processing tomatoes, European plums and tree nut crops) are mechanically harvested.

## 1.3 Post-Harvest Factors

- **Washing:** Almost all the fruits and vegetables require special preparation before they are packed. Vegetables such as root and tuber crops are often washed to remove the soils adhering over them. Washing of fruits before packing is also very important, especially of those which have been treated with poisonous chemicals. Besides cleanliness, water used for washing improves the appearance of fruits and vegetables and prevents their wilting. Many vegetables need to be trimmed before they are: ready for the market. Rotten, diseased, insect

damaged and discolored leaves of vegetables such as cabbage, spinach, lettuce and several others are trimmed off. Leafy greens such as green onion, spinach and fenugreek are tied in bundles. During washing, the organisms present on the fruits and vegetables are removed.

- **Pre-cooling:** It is desirable to remove field heat of the harvested vegetables, particularly when harvested during hot weather. This prevents the ripening and ageing of the produce. Prompt cooling conserves weight which gives an added advantage during the extended period of storage. In tomato, for eg. Physiological loss in weight during storage can be reduced from 6 to 2.9 per cent. Vegetables such as artichokes and okra which deteriorate fast, need prompt cooling and their storage losses can be reduced by pre-cooling. Cooling is equally useful in case of fruits. It reduces their respiration rate especially, climatic fruits such as banana, papaya and mango, thereby preventing over-ripening. Sometimes, stages of ripening and the level of field heat also determine the need of pre-cooling. For eg. Unless tomato fruits are kept above 26.7°C and ripening is to be delayed, there is no need for pre-cooling.
- **Grading:** Grading is an important practice for successful marketing of fruits and vegetables. The produce is generally sorted out into different grades and attractive forms to fetch a good price from them. Fruits and vegetables are graded according to shape, size and color. Some fruits and vegetables are graded according to their maturity (okra, cucumber, ridge gourd etc.), ripeness (mango, tomato, etc.) and general appearance as well. In sorting the fruits and vegetables, all the characters that influence "their appearance and quality should be considered.
- **Packaging:** Packaging of fresh fruits and vegetables has a great significance in reducing the wastage. Packaging also provides protection from mechanical damage, undesirable physiological changes and pathological deterioration during storage, transportation and marketing. Through proper packaging, freshness, succulence and flavours of fruits and vegetables can be maintained for a longer period. A wide variety of containers such as wooden boxes, bamboo baskets, jute bags, earthen pots and corrugated fibre board boxes are the important packaging materials used in most of the developing countries including India. Cheap packaging technique and materials such as polythene films, paper board boxes lined with polyethylene and other materials can effectively prolong the storage-life of fruits and vegetables.
- **Transportation:** Transportation and distribution of the fruits and vegetables are the most important areas of post-harvest loss. In India, the transportation of perishable commodities is in the most precarious stage. For local market, the produce is brought either by bullock cart or tractor trolleys. The long distance transportation is mainly by rails and trucks, which is very costly. The basic reason for preference to road transportation is because it takes short transit period.
- **Cold storage:** In cold store, the temperature control is very important. An ideal environment condition for fresh fruits and vegetables in storage is the lowest temperature, which does not cause chilling injury to the produce. Any variation from the desired condition is detrimental. Relative humidity of the store rooms also has a considerable bearing on the keeping quality of the horticultural produce. It is very difficult to control the

moisture in air. A small temperature difference between the cooling coil and the stored products is required to maintain an adequate control of RH in storage room. In order to increase the RH, water may be sprayed into the controlled storage chamber.

- **Marketing:** It is very important that horticultural produce reaches the market as soon as it is possible and at a time when the market needs it the most. A perfect and efficient marketing system is essential to avoid the losses of fruits and vegetables, and also to get a good return from the same. Marketing of perishable horticultural products presents more problems compared to other durable agricultural products. It is not efficiently managed in most of the developing countries. The interests of producers as well as consumers are poorly served, the grower gets less return and the consumer pays more than what is necessary.

## 2. Conclusion

Post-harvest loss of fruits and vegetables occur due to improper harvesting, transportation, storage and distribution. Post-harvest life of fruits and vegetables is governed by water content, respiratory rate, ethylene production, endogenous plant hormones, and exogenous factors such as microbial growth, temperature, relative humidity and atmospheric compositions. The loss can be minimized by adopting necessary cultural operations, careful handling and packaging. The use of appropriate chemicals at pre and post-harvest stage may extend the availability of fruits and vegetables over a long period by protecting them from microbial as well as environmental agencies of damage. The fruits and vegetables can also be stored under controlled atmosphere, modified atmosphere at low temperature with appropriate chemical treatment to delay senescence and inhibit microbial decay. Therefore, steps as already mentioned should be adopted, according to the suitability, and post-harvest loss of fruits and vegetables should be kept at minimum.

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