



Proper Ripening – Tool for Farmer in Fruits Post Harvest Management

K. Prasad*¹, Nirmal Kumar¹ and Pallavi Neha²

¹Division of Postharvest Technology

Indian Agricultural Research Institute, Pusa campus, New Delhi-110012

²Division of Postharvest Technology

Indian Institute of Horticultural Research, Hesaraghatta, Bengaluru, Karnataka-560089

*Email of corresponding author: kprasadiari@gmail.com

Natural ripening is always time dependent and thus farmer can't manage his produce according to the market demand. The natural ripening is dependent on the endogenous release of ethylene; therefore on the same time external management of ethylene and conditions that causes ripening to the selected fruits are required by the farmers to make ripe the fruit in time of peak demand thus can earn maximum benefits.

Introduction

Ripening is nowadays not only a physiological process but it is becoming a tool for farmer to manage and sell their produce at a proper stage and quality of the fruit. Physiologically it is defined as the process by which fruits attain their desirable flavour, colour, palatable nature and other textural properties which ultimately make it more attractive and edible. Ripening is not only associated with the change in internal composition i.e. sugar, TSS, acids, but also external appearance like colour, flavour, texture. Thus, ripening is the process which affect horticulture commodity from the point of view of farmer, wholesaler, trader and consumer. As we know that horticulture produce is exported to the extent of 1436487.85 lakhs rupees worth (A.P.E.D.A. Database 2014-15) and 3694860.51 metric ton in quantity annually (N.H.B. Database 2014), it becomes more important to know the phenomenon like ripening, whose management can even increase it to further extent. It is obvious that one should know which fruit crop is to be ripened on tree, ripened under storage, and ripened under transit, this will be more clear by knowing the ripening behaviour of fruit crops which were classified in two groups i.e. climacteric and non-climacteric fruits.

Climacteric fruits: These fruits emit ethylene along with increased rate of respiration on the onset of ripening on and off tree. In general these fruits become soft and delicate and care should be taken during their transit and handling. These fruits are generally harvested at green stage and can be ripened by the use of small dose of ethylene under controlled conditions which can be maintained during storage or transit. Examples of Climacteric fruits are: Apple, Apricot, Banana, Fig, Guava, Kiwi, Mango, Passion fruit, Papaya, Pear, Plum, Sapota, etc.

Non-Climacteric fruits: Non-climacteric fruits are very peculiar in nature as if they once harvested unripe will not ripen further. They produce very small amount of ethylene and also don't respond well or significantly to ethylene treatment. There is no significant increase in respiration rate and of carbon dioxide production. Examples of Non-climacteric fruits are:

Blackberry, Carambola, Cashew, Cherry, Grapefruit, Grapes, Kinnow, Litchi, Mousambi, Orange, Pomegranate, Rambutan, Raspberry, Strawberry, Watermelon, etc.

Need of Proper Fruit Ripening

Proper ripening of fruits is always a major concern to the farmers; lack of easier and rapid methods of ripening is a cause which results in non-uniform ripening and acts as a major problem of postharvest management in fruit industry.

Natural ripening is always time dependent and thus farmer can't manage his produce according to the market demand, for example freshly harvested mangoes take about 5 to 6 days and sapotas take about 6 to 7 days to ripe. This natural ripening is dependent on the endogenous release of ethylene which stimulated from inside of fruit to carry out ripening. External management of ethylene and conditions that cause ripening to the selected fruits; are therefore, required by majority of farmers to sell and manage their horticultural produce according to market demand.

Methods of Proper Ripening

1) A simplest technology like in case of mango fruits, keeping the fruits in heap or group packaging after desaping i.e. removal of sap exudate from the pedicel end and packing it in group of fruits altogether either in gunny bag or in CFB boxes so that they themselves evolve ethylene and ripe properly and at same time .



Fig. 1: Desaping of mango fruits followed by storage by C.F.B. and ripening chamber at IARI, New Delhi

2) At house hold level methods like keeping un-ripened and ripened fruits together inside an air tight container. Since the already ripened fruits release ethylene, ripening will be faster



Fig. 2: Grouping of fruits as one of the simple method to attain hastened ripening

- 3) Smoking inside airtight chamber - Smoke emanates acetylene gas is used in this method. Several fruit traders follow this technique to achieve uniform ripening especially in edible fruits like banana and mango. But the major drawback of this method is that the fruits do not attain uniform colour and flavour along with the smoky smell can also be noticed.
- 4) Spreading unripe fruits as layers over paddy husk or wheat straw for a week to ripen is another alternative.



Fig. 3: Mango ripening using paddy straw

Chemical methods

1. Under the group of chemical methods some farmers dip unripe mature climacteric group fruits in 0.1 per cent ethrel solution (1 ml of ethrel solution in 1 litre of water) and wipe it dry. The fruits are then spread over a newspaper without touching each other and a thin cotton cloth is covered over this. In this method, the fruits will ripen within two days.
2. In one of the simple and harmless chemical techniques for ripening of climacteric fruits, 10 ml of ethrel and 2 g of sodium hydroxide pellets are mixed in five litres of water taken in a wide mouthed vessel. This vessel is placed inside the ripening chamber near the fruits and the room is sealed air tight. About a third of the room is filled with fruits leaving the remaining area for air circulation. Ripening of fruits takes place in about 12 to 24 hours. In order to reduce the cost of chemical, some ethylene releasing fruits such as papaya and banana can also be kept in the same room.

Methods of application of ethrel

Trickle method is normally used for ripening which involves trickling ethylene gas into room so as to maintain a concentration of 10 ml per litre, usually for a period of 24 hours. During this time, relative single initial charge of ethylene at a concentration of 20 to 200 ml /litre. A small fan can be used to ensure a uniform continuous flow of ethylene into and through the room. Forced-air ripening provides more uniform temperature and ethylene concentration throughout ripening room.

Method selected for applying ethylene depends on cost, convenience and safety factors. Use of diluted ethylene gas mixtures is safer than using pure ethylene, which is explosive and flammable at concentrations of 3% or higher. Fruits need to be ripened ideally by placing them in ripening room at the conditions of constant temperature of 18-21°C for most of fruits except mango which requires 29-31°C.

Optimum storage and ripening conditions and recommendations for some fruits is given below:

Table 1: Optimum storage and ripening conditions for fruits

Commodity	Ethylene conc. (ppm)	Ethylene exposure time (hr.)	Ripening temp. (°C)	Storage Temp. (°C)
Avocado	10-100	12-48	15-18	4.4-13
Banana	100-150	24	15-18	13-14
Honey dew melon	100-150	18-24	20-25	7-10
Kiwifruit	10-100	12-24	0-20	0.5-0
Mango	100-150	12-24	20-22	13-14
Orange degreening	1-10	24-72	20-22	5-9
Stone fruit	10-100	12-72	13-25	-0.5-0

Table 2: Optimal ripening conditions for fruit ripening

Temperature	18 to 25° C
Relative humidity	90 to 95%
Ethylene concentration	10 to 100 ppm
Duration of treatment	24 to 74 hours depending on fruit type
Air circulation	Sufficient to ensure distribution of ethylene within ripening room

Banned method of artificial ripening- calcium carbide method

Farmers should know that the method of ripening using calcium carbide in which the calcium carbide is dissolved in water and result leads to the production of acetylene which acts as an artificial ripening gas. This method is banned under the law PoFA (Prevention of Food Adulteration) Act [Section 44AA] and using this method is a punishable offence. Acetylene contains arsenic and phosphorus which ultimately affect central nervous system by altering the oxygen supply and thereby resulting in the severe health hazards of the workers and farmers.



Fig: 4: Calcium carbide to ripen raw mangoes used in wrapping in news papers

Conclusion

The only safe and worldwide accepted method is using ethylene, which is a natural hormone for ripening when done under controlled temperature and relative humidity conditions.

References

- Anonymous. 2014. NHB database. National Horticulture Board, Gurgaon, Haryana, India.
 Anonymous. 2015. APEDA database. Agricultural and Processed Food Products Export Development Authority, New Delhi, India.