

Punjab Horticultural Postharvest Technology Centre Punjab Agricultural University, Ludhiana

PHPTC Newsletter

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Message from Chairman

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Additional Chief Secretary (Development) Punjab

The predominant rice-wheat system in Punjab contributed greatly towards food security of the country, but created a number of serious problems such as depletion in water table, poor soil health, aggravation of insect pest, overuse of pesticides and environmental pollution etc. Evidently, diversification from mono cropping of wheat and rice to horticultural crops for conservation of both soil and water is essential.

Growing of fruits, vegetables and flowers has received an impetus in Punjab under the programme of the National Horticulture Mission. In Punjab, horticultural crops particularly fruits and vegetables occupy an area of 3.25 lakh hectare with production of 65 lakh MT.

The postharvest management of fruits and vegetables is a highly specialized area and needs focused attention in terms of creation of infrastructure at farm and market level for the overall development of horticulture. Among various postharvest management issues, fruit ripening is an emerging area and pose a great health concern among the consumers now-a-days, because of illegal practices being followed by traders for ripening of fruits.

I am delighted to learn that PHPTC has standardized a health safe technique for ripening of banana and other fruits which has been commercially adopted by traders of Punjab. Based on technology generated by PHPTC, Punjab Mandi Board has established state-of-the-art ripening chambers for the benefit of farmers, traders and consumers.

I hope that third issue of Newsletter exclusively on "Health Safe Ripening Technology of Fruits" will further update the farmers and traders with latest ripening techniques. I convey sincere good wishes for the success of this Newsletter and welcome the feedback and ideas of the farmers and other stakeholders.

Ripening of fruits - Safe Technology

Ripening is a dramatic event in the life of a fruit, in which structure and composition of unripe fruit is so altered that it becomes acceptable to eat. Ripening marks the completion of development of a fruit and the commencement of senescence and it is normally an irreversible event. However, the ability of a fruit to become ripe is closely related to action of endogenous hormones. Ethylene, a gas at physiological temperature, is a natural hormones involved in fruit ripening. The autocatalytic production of endogenous ethylene is considered to immediately trigger off the ripening process in fruits like banana, mango, papaya and tomato etc. These fruits produce large amount of ethylene once ripening is underway.

Need for artificial ripening: No doubt that the natural ripened fruits are good in taste and flavour, but these fruits take longer time to ripe and at the same time ripening is not uniform and the chances of spoilage are also more. In order to regulate the supply chain in the markets, the artificial ripening of fruits is a necessity during their commercial handling and this is a standard practice all over the world.

Methods of ripening: The various traditional as well as modern safe methods used for commercial ripening are discussed below.

1. Traditional method

Ripening with Calcium carbide: Bananas, mango, papaya, chiku etc are commercially ripened by traders with calcium carbide popularly known as *Masala*. Calcium carbide is usually kept in small paper packet in the piles of bananas, papaya or inside the boxes or crates of mango fruits. The chemical, when hydrolyzed, produces heat and acetylene gas along with traces of ethylene which hastens the ripening process. In case of banana the ripening starts within 24-48 hours, depending on ambient temperature and when fruits yield to slight finger pressure, they are kept under ice slabs for lowering temperature and to develop colour. However, the fruits ripened with calcium carbide are overly soft with a short shelf life. In addition, it is very dangerous to handle calcium carbide because of its explosive properties. The chemical is so reactive that it causes blisters if touched unknowingly with wet hands. The low price of carbide results in its indiscriminate use in artificial ripening of banana. This practice



Calcium Carbide

is banned U/S 44-AA of Prevention of Food Adulteration (PFA) Act, 1954 with PFA rules, 1955, due to health reasons.

Prohibition of use of carbide gas in ripening of fruits

Regulation 7.3.5 of Food Safety and Standards: No person shall sell or offer or expose for sale or have in his premises for the purpose of sale under any description, fruits which have been artificially ripened by use of acetylene gas, commonly known as carbide gas.



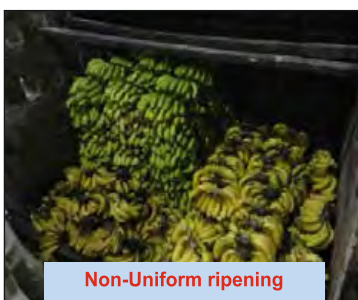
Heap of banana with masala



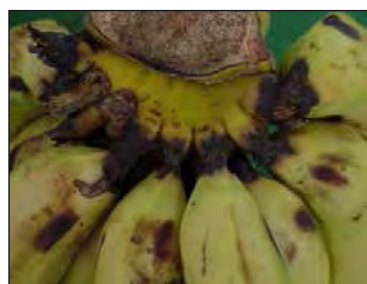
Traditional ripening conditions



Cooling with ice



Non-Uniform ripening



Ripened with calcium carbide

2. Safe methods

Ripening with Ethylene gas (Internationally acceptable technique):

Ethylene is a plant hormone which acts physiologically and stimulate ripening of fruits. Although fruits contained natural ethylene, but its concentration is not enough to regulate the ripening. Therefore, fruits are required to expose to desired level of ethylene for developing uniform ripening and acceptable quality. This technique is very useful during commercial handling of fruits in pack house. In this technique, the fruits are exposed to low level of ethylene gas (100-150 ppm) in a air-tight ripening chamber for 24 hours to induce the fruits to ripen. The most important thing in this technique is temperature and relative humidity control inside the ripening chamber, which should range between 16 -25°C and 90-95% RH, depending upon the fruit type. The ethylene is produced inside the ripening chamber with the help of ethylene generator which is placed inside the ripening room. A liquid (ethyl alcohol) is filled into the tank fitted with ethylene generator and it is connected to an electric power source. The ethyl alcohol gets heated in a controlled manner in the presence of a catalyst and produces ethylene gas. By introducing ethylene gas into the ripening room under controlled temperature conditions, the ripening time can be considerably reduced. This process facilitates adequate ripening of

banana and other fruits which can be utilized for systematic marketing strategies. This technology can meet the increased consumer demand for properly ripened fruits and also enable the high volume retailers, especially supermarkets to better supply their customers and control the postharvest losses. It guarantees uniform ripening with development of good flavour and colour. Although, initially, the cost of infrastructure is high, but it will compensate with quality of fruits. The technology can be used by fruit whole sellers at wholesale markets prior to distribution to retailers. It is important to recognize that though ethylene gas can promote the ripening and colour changes, the quality of such artificially ripened fruits depends mostly on the maturity level of the fruit at the time of harvest. This technique provides a safe and effective method of ripening of fruits compared to normal technique of using calcium carbide.

One such ripening chamber of two ton capacity with controlled temperature and relative humidity range and portable ethylene generator has been installed at Punjab Horticultural Postharvest Technology Centre (PHPTC), Punjab Agricultural University Ludhiana. This facility has been used to standardize the techniques for ripening of banana with ethylene gas and to recommend for commercial use. In the past, series of experiments were conducted in ripening of banana and it was observed that banana harvested at green mature stage can be successfully ripened in 4 days by exposing to ethylene gas 100 ppm for 24 hours in a ripening chamber maintained at 16-18°C and 90-95% RH. The fruits attained uniform colour excellent quality during shelf life.

Approval of ethylene gas for ripening of fruits

Food Safety and Standards - Second Amendment Regulation, 2016, the FSSAI has permitted the use of Ethylene gas in the artificial ripening of fruits with a provision which reads as; that ethylene gas



Commercial ripening chamber at fruit & vegetable market, Ludhiana



Ripened with Ethylene gas

may be used “Provided that fruits may be artificially ripened by use of Ethylene gas at a concentration up to 100 ppm (100µl/L) depending upon the crop, variety and maturity”.

Status of ethylene based ripening infrastructure in Punjab:

Keeping in view the technology generated by our Centre, Punjab Mandi Board has established 46 commercial ripening chambers (460MT capacity) in 12 fruit and vegetable markets of Punjab. Similarly, a reasonably good capacity of 12 units of ripening chambers with 825 MT capacity has been established in different parts of Punjab with financial assistance from National Horticulture Mission. It is hoped that this new safe technique of banana ripening will eventually replace the harmful and banned method of ripening with calcium carbide thus providing the consumers with healthy and safe fruits

Ripening Chambers established by Punjab Mandi Board

Sr. No.	Name of APMC	No. of Ripening Chambers	Total Capacity
1.	Ludhiana	6	60 MT
2.	Moga	4	20 MT
3.	Jalandhar	8	80 MT
4.	Nawanshahar	4	40 MT
5.	Batala	2	20 MT
6.	Ferozepur	2	20 MT
7.	Abohar	2	20 MT
8.	Patiala	2	20 MT
9.	Hoshiarpur	6	60 MT
10.	Bathinda	6	60 MT
11.	Kapurthala	2	20 MT
12.	Phagwara	2	20 MT
13.	Sangrur	2	20 MT
Total		48	460 MT

Ripening Chambers established in Punjab under NHM financial assistance

Sr. No.	Detail of Ripening Chamber	No. of Ripening Chambers	Total Capacity
1	Khan Fruit Ripening Chamber, Bathinda	4	36
2	Balaji Cold Store Ripening Chamber,Vill. Safirpur Patiala	12	300
3	Veena Kumari Ripening Chamber, Vill. Dinanagar,Gurdaspur	6	54
4	K K Lamba Ripening Chamber, Gurdaspur	4	60
5	A K Ripening Chamber,New Sabji Mandi, Faridkot	7	62
6	Ashok Fruit Company,E-48, Focal point, SBS Nagar	5	80
7	Shri Ganesh Ripening Chamber,Vill. Kotkupra, Faridkot	5	64
8	Fateh Ripening Chamber, Bathinda	5	60
9	M/s M R & Sons Ripening Chamber Unit New Sabji Mandi, Moga	6	45
10	M/s K. Paris Foods Ripening Chamber Unit Muktsar Road, Faridkot	4	60
11	M/s Saraswati Agro Foods Ripening Chamber Unit Plot No. 7 Gill Farm, Majitha Road Disstt. Amritsar	4	72
12	M/s Rajashree Cold Store Ripening Unit (55.14 MT Bahadur K Road, Opp. New Sabji Mandi, Near Kara Bara Chowk, Ludhiana	5	55
13	Ashok Fruit Company, SAS Nagar	3	39
14	Vaishno Ripening Chamber, Zira, Ferozepur	5	25
15	Ganesh Kela Cold Store, Patiala	6	72
16	Best Fruit Ripening Chamber, Patiala	7	116
17	AGS Ripening Chamber, Bathinda	4	55.24
Total		92	1255.24

PHPTC Activities

- Training programme for farmers: The centre conducted 12 training programmes for farmers on postharvest management and marketing of horticultural crops in collaboration with Directorate of Horticulture, Punjab. These trainings were funded by National Horticulture Mission programmes.



- Training programme for Farmers Producers Organization (FPO): This Centre organized training programme on packaging and storage of fresh horticultural produce for farmers producers organization (FPO) namely Fatehgarh Sahib vegetable producer company Ltd and Dholewal grain producer company Ltd sponsored by NABARD.

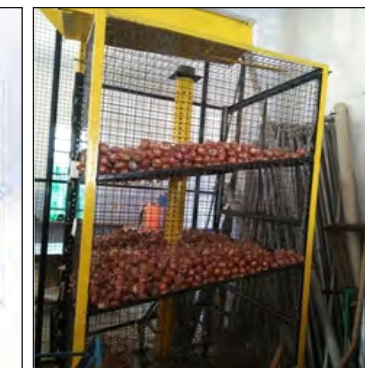


- Training programme for mandi supervisors/auction recorder: The centre organized training programme for Mandi supervisor and auction recorder on handling and operation of moisture meters.



New Recommendations

Low cost onion storage structure : Onion crop can be stored in mechanically ventilated onion storage structure (1.2mx 1.2mx1.2m with 35° bottom inclination and 0.75 -1.0m/s air ventilation) upto 5 months with a loss of 8 % due to rotting and 6% due to sprouting. It was advised that the rotted onions should be removed regularly to reduce the damage.





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