IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Artificially Ripened Fruits – A Potential Danger

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Abstract

Fruits are delicious food having lots of nutrients. Most of the fruits become edible after ripening. Appearance, colour, flavour, texture, pulp to peel ratio is changed during ripening. For commercial reasons artificial ripening is employed rather than depending on natural ripening process in plants. Not only the flavour, texture, nutritional value of artificially ripened fruits is inferior than naturally ripened fruits but also the former have harmful effects on human health if consumed. There are many artificial ripening agents which are used widely as ethylene, acetylene, calcium carbide, ethephon, smoke etc. The toxic effects of artificially ripening agents may be minimised by washing the fruits with water and peeling them before consumption. A lot of experiments have been carried out by scientists on banana, mango, apple, wood apple, orange, tomato, pineapple, grapes, lime, tangerine, lemon etc. Artificially ripened fruits are harmful for humans, as most of them cause diseases of heart, lungs, skin and kidneys.

Keywords – Artificial fruit ripening, calcium carbide, ethephon, ethylene, toxicity from fruits.

Introduction

Fruits are very good source of vitamins (A, C and E) and minerals (Ca, Mg, K, Zn, P), fibre, antioxidants (beta carotene, lycopene and ascorbic acid) and phytonutrients [1]. Consumption of fruits prevents cancer, inflammatory diseases, heart diseases and constipation. They have beneficial effects on skin and hair. Ripening of fruits commonly makes them soft, palatable [2-4], nutritious, colourful and their flavour is improved after ripening. In other words, ripening makes the fruit more attractive and tastier. The ripe fruits become sweeter compared to unripe fruits as the starch is hydrolysed by the enzyme amylase and sugars are produced during ripening. Several physical and chemical changes occur during this process. The softening of fruits is found as depolymerisation and solubilisation of cell wall takes place and cell structure is degraded. Pectin is converted into pectic acid by the enzyme pectinase. Some fruits produce aroma and flavour during ripening. These flavour compounds (mainly ester, alcohols, aldehydes, ketones and terpenes) are produced from the metabolism of fatty acids and branched amino acids [5]. Colour of

fruits are changed during ripening. Chlorophyll is degraded and colourful anthocyanins and carotenoids are formed [6]. Some fruits have astringent taste in the unripe stage. Tannins are dissolved in saliva and give the astringent taste. During ripening astringency is reduced as the tannins are polymerised and molecular weight is increased and becomes less soluble in saliva [7]. Several organic acids such as citric acid, ascorbic acid, tartaric acid, malic acid is present in unripe fruits and for this reason unripe fruits are sour in taste. During ripening, the acids are converted to sugars that make the fruits sweet [8]. Pulp to peel ratio is increased during ripening [1] as carbohydrates present in pulp is hydrolysed and quantity of moisture is increased in pulp and hence weight of pulp is increased. Ripening may be natural or artificial. Natural ripening occurs when properly matured fruits are on the plant or after harvesting. Artificial ripening is employed (after harvesting) by using ripening agents, when the fruits are not sufficiently matured. The role of ripening agents is to accelerate the ripening process. Artificially ripened fruits have uniform colour, attractive brightness, less aroma and flavour. The naturally ripened fruits are not uniformly coloured (patchy coloured) having pleasant aroma and flavour. Many fruit merchants ripen fruits using artificial ripening agents, such as calcium carbide, ethylene, ethephon (a source of ethylene gas for artificial ripening of fruits), ethylene glycol and smoke. Most of the chemicals used as ripening agents speed up fruit ripening, change the nutritional quality of fruits and make the fruit harmful for human consumption. Heart diseases, lungs diseases, kidney failure, skin problems, weakness, dizziness may occur due to consumption of artificially ripened fruits [9-20].

The fruits are artificially ripened by the merchants for the following reasons:

1. The fruits are harvested before maturity and then they have firm texture. Hence those are suitable for handling and transportation. Mechanical damage, may be avoided.

2. Problems of over ripening and loss due to spoilage is minimised.

3. Ripening process can be controlled. It is ripened against demand.

Application of Different Artificial Ripening Agents to different Fruits:

Ethylene gas is used for ripening of unripe fruits in ripening rooms [21]. The ripening rooms are so designed that there are facilities for specific conditions required for different fruits. It was found by Brady *et al* [7], that a very small concentration (1 ppm) of ethylene in air is sufficient to promote the fruit ripening process. Optimal ripening conditions for fruits by ethylene gas are as follows [1]. Optimum Temperature - 18 °C to 25 °C. RH - 90 to 95%. Ethylene concentration - 10 to 100 ppm. Duration of treatment - 24 to 72 hours, depending on the fruit type and maturity stage. Acetylene is produced from Calcium carbide in presence of water and acts like ethylene. Burg *et al* [22] reported that acetylene is less effective than ethylene as a ripening agent. Calcium carbide produces acetylene in presence of water which triggers off the ripening process. Traces of arsenic and phosphorus hydride present in industrial grade calcium carbide have harmful effect to humans. Ethephon is an organophosphorus compound and is easily absorbed in intestine when consumed with fruits. It is hepatotoxic. Goontalike [23] reported the effectiveness of Ethylene glycol diluted

with water on ripening of the fruits. Stahler *et al* [24] found that bananas can also be ripened by using alkyl alcohols having 6 to 14 carbon atoms. Among them lauryl alcohol is the most effective. Wood apples are treated with ethrel solution of concentration 5 mg/L water for 20 minutes and kept for 1 to 2 weeks for ripening. Wood apples are also ripened using smoke (changes the colour of the outer surface of wood apples) followed by calcium carbide (changes the texture of pulp). The effect of natural and artificial ripening agents on the pH of orange, tomato, lime, pineapple, grapes, banana, tangerine and lemon were studied by Gbarakoro *et al*. [25] using calcium carbide as ripening agent. The pH tests were carried out of all the fruit categories (unripe, artificially, and naturally ripened) showed that the pH of the various fruits increased when they are ripened, thereby decreasing the acid level of the various fruits. It was found that in some cases there were no difference of pH between the naturally and artificially ripened fruits, in some cases pH is slightly higher in the naturally ripened fruits compared to artificially ripened fruits, in some cases pH is slightly lower in the naturally ripened fruits compared to artificially ripened fruits. It completely depends on the variety of fruits. The results of pH values of the unripe, naturally, and artificially ripened fruits are shown in the following Table 1.

Table 1 - Average pH values of fruits

Fruits	pH		
	Unripe fruits	Naturally ripened fruits	Artificially ripened fruits
Tomato	3.0	4.0	4.0
Lime	2.0	3.0	2.7
Pineapple	3.0	3.7	4.3
Orange	3.0	3.7	4.7
Banana	3.3	3.7	4.3
Lemon	2.0	3.0	3.0
Grape	2.3	3.0	3.7
Tangerine	3.0	4.0	3.7

Conclusion and Remedy

Washing and peeling before eating the fruit minimise the harmful effect associated with the use of Calcium Carbide. Another precaution is not to consume fruits in early of the season and in offseason.

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