International Journal of Advanced Technology in Engineering and Science
Vol. No.5, Issue No. 01, January 2017
www.ijates.com
ijates
ISSN 2348 - 7550

ARTIFICIAL RIPENING OF FRUITS AND EFFECTS ON HEALTH

Rajni Gupta

Assistant Professor,Department of Chemistry, S.D. College, BarnalaPunjab

ABSTRACT

Fruits are supposed to provide high nutrition and form a key food commodity in our consumption. These days fruits are ripened using various chemicals to meet their high demand and overcome transportation damage. These chemicals affect our metabolism in one or the other way and cause a number of health problems. So ripening fruits using artificial agents has become a serious health concern. This paper aims at providing an insight to different types of chemical agents used for ripening and their ill-health effects so as to bring them to the notice of the consumers.

I. INTRODUCTION

Fruits are an essential component of our food. They are assumed to protect us from diseases and increase our immunity. Most of the times we consume fruits when they get ripened. Botanists explain fruit as the fleshy part in which seeds grow. Fruits of some plants like cotton are very thin. When seeds grow completely fruit cracks up after drying and open up. Seeds spread with the help of air. On the other hand, fruits of plants like mango, apple, guava, and litchi are flesh and sour when seed is in the process of growth. It keeps the fruit protected from birds, animals and insects. When seed grows up completely fruit gets ripened and is consumed. Seed is thrown away for germination.

1.1 What is Ripening?

Ripening is a natural physiological process that makes the fruit sweeter, more palatable, edible, nutritious, softer and attractive. Ripening is also associated with colour change due to the pigments that are already present or are produced during ripening.

1.2 What happens during Ripening: Chemistry of Ripening

During ripening fruits undergo a number of chemical changes. The starch present in the fruit breaks down to sugars, giving fruit a sweeter taste. Fruit changes its skin colour generally from green to red, yellow etc. due to degradation of chlorophyll, as the other pigments show their visible existence.

The main polysaccharide stored in fruits is starch. As ripening occurs, there is enzymatic breakdown and hydrolysis of water insoluble starch into smaller saccharides like sucrose, glucose, fructose etc. that are water soluble sugars, attributing fruit a sweeter taste. The ripened fruit still has a lot of acid but its sour taste is masked by the large quantities of sugar present.

The cell wall of fruits consists of polysaccharides, mainly pectin. During ripening various enzymes including polygalactourenase convert this insoluble pectin into a soluble form. As a result, the cell wall and hence fruit becomes less firm.

Acids including organic acids like malic acid, citric acid, ascorbic acid, tartaric acid etc. are present in large amounts in raw fruits, giving them a sour taste. As the fruit ripens, acids are also broken down e.g. Ripened guavas have decreased amount of Vitamin C as compared to that in raw fruit.

1.3 History of Fruit Ripening

For a long time man has been adopting many ways to ripen fruits. Among these cutting the fruit, placing the fruit in closed chambers and providing high temperature conditions are the major ones.

An important analysis was given by a Russian scientist Dmitry Nelyubow in 1901. He found that ripening was affected by ethylene, a gas coming out of pipes. The effect was confirmed by other scientists after a long time. It was found that plants themselves produce ethylene and hence if the fruit is injured or is at high temperature, it gets ripened faster than other fruits. This is because the rate of diffusion of ethylene gas produced in the plant becomes higher in the injured or cut area.

II. WHY IS ARTIFICIAL RIPENING NEEDED?

Artificial Ripening is done mainly to fulfil customers' demand to get high profits and to minimise other losses. E.g. Sale and demand of mangoes shoots very high during the summer season, much higher than the supply. To overcome this gap, artificial ripening (AR) is preferred.

Transportation and distribution are other factors responsible for AR. It takes several days to reach the fruit to consumer's hand from the farmer's orchards as it has to pass through a number of hands. During this time the naturally ripened fruit can overripe and will not be edible. Some fruits if already ripened naturally, cannot withstand harsh transportation conditions. So there are money losses. Hence fruit vendors prefer collecting the fruit before it gets fully ripened and then artificially ripen it before selling to the customers.

Fruits are classified into two categories:

Climacteric fruits are those that continue to ripen after being harvested like mangoes, bananas, guavas, peach, pear, plum, date, papaya, apple, melon etc. ; whereas non - climacteric fruits like grapes, strawberry, blackberry, citrus fruits, fig, olive, pineapple etc. do not ripe after being harvested. They ripen only on plants. They have short shelf life.

2.1 Artificial Ripening Agents

As ethylene is the main natural ripening agent, artificial ripening agents are used to produce ethylene. These agents accelerate the process of ripening. Fruits are placed in wooden boxes lined with hay. The crates are placed one over the other and wood fire is lit below it. The smoke produced so contains ethylene which inducing ripening.

In some cases generators are used to produce ethylene gas. The sensors help in regulating the gas supply. 1 ppm of ethylene in air is sufficient to induce ripening.

A number of fruits can be ripened by placing them in plastic bags.

Sometimes fruits and vegetables are placed in big rooms, in which ethylene or acetylene gas is introduced. For example: bananas are picked up when they are hard and green. They are transported in this stage to avoid damage during shipping and transportation. After reaching the destination they are exposed to ethylene gas to ripen.

Calcium Carbide (CaC_2) is the most common and widely used artificial ripening agent in various parts of the country especially South Asia including India. It is commonly known as 'Masala'. It is produced on an industrial scale for the production of acetylene used for various purposes.

The commonly available grade in market is grey or brown and contains 80-85% calcium carbide. It produces garlic smell in the presence of moisture. When sprayed with water, it reacts chemically to produce acetylene (C_2H_2)

$$\mathbf{CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2} \quad \mathbf{(1)}$$

Acetylene acts like ethylene and ripens the fruits and vegetables by the similar process. Industrial grade calcium carbide generally contains impurities of arsenic and phosphorus that pose a number of health problems. This is the reason its use is banned in most of the countries. But because of cheap prices and easy availability, it is still in use.

Although mainly used as an insecticide, Ethephon is another commonly used artificial agent and is assumed as better than calcium carbide. Fruits and vegetables ripened with Ethephon need less time to ripen, have stronger shelf life and are more attractive on decomposition; it also releases ethylene that fastens the ripening process.

In addition to these, ethanol, methanol, ethylene glycol are also used for the same purpose. Sometimes fruit vendors use burning kerosene stoves and incense sticks to fasten ripening.

Although these agents increase the rate of ripening and impart attractive and colourful look/ appearance to fruits, but organoleptic properties are lost considerably. It does not give the natural aroma and flavour to the fruits. Artificially ripened mangoes are less juicy. These fruits have uniform colour than when ripened naturally. Artificially ripened fruits are not very tasty and are difficult to cut, have recorded weight loss and have comparatively short shelf life. One can easily distinguish artificially ripened mangoes by careful examination.

III. HEALTH HAZARDS OF RIPENING AGENTS

As Calcium Carbide is an industrial grade product, it contains traces of arsenic, lead particles and phosphorus hydride as impurities. These impurities may cause serious health hazards when workers come in direct contact with these chemicals while applying the ripening agents. They may cause frequent thirst, irritation in mouth and nose, weakness, permanent skin damage, difficulty in swallowing, vomiting, skin ulcer and so forth. Higher exposure may cause undesired fluid build-up in lungs (pulmonary oedema).

The acetylene released by Calcium Carbide has been found to be detrimental as it affects the neurological system and reduces oxygen supply to the brain and further induces prolonged hypoxia. It is hazardous to

pregnant woman and child and may lead to headache, dizziness, mood disturbances, mental confusion, memory loss, cerebral oedema (swelling in the brain caused by excessive fluids), sleepiness, seizure etc.

Calcium Carbide is alkaline in nature and erodes the mucosal tissue in the abdominal region and disrupts intestinal functions. Cases of stomach upset after eating carbide ripened mangoes have been reported recently. Consuming such artificially ripened mangoes could result in sleeping disorders, mouth ulcers, skin rashes, renal problems and possibly even cancer.

Apart from this symptoms of poisoning include diarrhoea (with or without blood), burning or tingling sensation in abdomen and chest difficulty in swallowing, irritation in eyes/skin, sore throat, cough, shortness in breathing, numbness etc.

IV. DISCUSSION

Ethylene is the main chemical used to speed up the ripening process. However chemicals like Ethephon and calcium carbide are being regularly used for ripening due to easy availability and low cost. Working with such chemical agents without appropriate precautions can be hazardous for workers. The regular intake of such artificially ripened fruits can cause serious health problems like liver and kidney diseases, gastrointestinal irritation with nausea, cardiac disturbances, central nervous system depression etc.

The Food and Safety Standards Act, 2006 (Rules 2011) totally bans the practice of ripening fruits in India. Firstly the government or local authorities can help fruit sellers and farmers facilitating convenient transportation and adequate cold storage especially for the seasoned fruits to compensate the transportation and distribution issues in developing countries. Secondly efforts should be made to develop safer and economically feasible guidelines for fruit ripening. Thirdly the consumers should also examine the fruit carefully to select the right fruit by observing the variation of colour. They should buy fruits only according to the season and wash the fruit thoroughly under running water before consumption.

V. CONCLUSION

In recent years different ripening agents are used to ripen the fruits artificially. These ripening agents when used in high concentration and in their impure form can be hazardous to health. To understand their health effect better it is essential to analyse their effects on fruit quality and nutrition value. This critical issue must be solved by involving the government agencies, policymakers, farmers, fruit vendors, scientists and consumers.

REFERENCES

[1]. Brady, C.J., Fruit Ripening. **Annual Review of Plant Physiology and Plant Molecular Biology**, 1987. 38:p. 155-178.

[2]. Fattah, S.A. and M.Y. Ali, **Carbide Ripened Fruits – A Recent Health Hazard.** Faridpur Medical College Journal, 2010. 5(2):p. 37

[3]. Jayan, T.V., **Beware of These Fruits**, in The Telegraph, Calcutta.2011, The Telegraph India: Calcutta, India. Homepage: www.telegraphindia.com, Retrived: 2 June 2012.

[4]. Chace, E.M., **Health Problems Connected with the Ethylene Treatment of Fruits**. American Journal of Public Health and the Nation's Health, 1934. 24(11):p. 1152-1156.

[5]. Ur-Rahman, A., F.R. Chowdhury, and M.B. Alam, **Artificial Ripening: What We Are Eating**. Jornal of medicine, 2008. 9(1):p. 42-44.

[6]. Medlicott, A.P., Sigrist, J.M., Reynolds, S.B. and Thompson, K., **Effects of Ethylene and Acetylene on Mango fruit ripening**. Annals of Applied Biology, 1987, 111, 439-444.