INDISCRIMINATE USE OF CHEMICAL IN FRUITS AND THEIR HEALTH EFFECTS

M. A. Rahim
Dept of Horticulture, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

ABSTRACT

Fruits are highly nutritious and form as key food commodity in the human consumption. They are highly perishable due to their low shelf life. These food commodities are reported to be contaminated with toxic and health hazardous chemicals. Chemicals like calcium carbide, higher doses of ethylene are reportedly being used in fruit for artificial ripening of fruits and for increasing the size of fruits etc. Moreover, formalin also used for extending the shelf life of fruits which causes several health problems. Calcium carbide more commonly known as 'Masala' is a carcinogenic agent and banned under PFA Rules. Recently Bangladeshi peoples are consuming toxic fruits which are ripened by a hazardous chemical mainly calcium carbide. This poses great health risks to consumers. Calcium carbide has cancer-causing properties and causing neurological disorders, it can result in tingling sensation and peripheral neuropathy. A significant number of pregnant women consume fruit ripened with carbide, resulting the children born with abnormalities. Moreover, the widespread use of formalin, in preservation of fruit is posing a threat to public health. The chemical used as a solution in water makes fruits attractive and colorful. Use of non-edible coloring materials and toxic coating materials in fruits for extending shelf life and attractiveness also causes serious health hazard in Bangladesh. This paper is mainly focuses on the indiscriminate use of chemicals and their effects on health hazard.. Moreover, research results conducted by the MS, PhD students here in BAU-GPC (the largest fruit repository in Bangladesh) also addressed e.g. how to produce attractive, chemical free safe fruits for the consumers. Use of edible coating like Chitosan, Aloe Vera gel, non-chemical ripening processes, non-chemical process of extending shelf life of different fruits has also been suggested. Consumer's awareness for these toxic chemicals also suggested.

KEYWORDS: FRUITS, CHEMICAL, CALCIUM CARBIDE, FORMALIN, INDISCRIMINATE USE, HEALTH HAZARD.

Corresponding authors e-mail: marahim1956@yahoo.com

INTRODUCTION

There are about 70 types of fruits are grown in Bangladesh. The most widely cultivated fruits are mango, jackfruit, black berry, jujube, pineapple, litchi, guava, papaya, coconut, custard apple, wood apple, elephant apple, Indian blackberry, tamarind, cashew nut, pomegranate, Palmyra palm, rose apple, and Indian olive. There are many minor edible fruits too, which are locally available such as Burmease grape (latkan), monkey jack, rattan, river ebony, velvet apple, cowa, wild date palm etc[1,2] .

There are near about 24 Million household are involve in fruit production and total land area is 0.45 million hectare, from where about 80% fruits comes from and rest 20% comes from commercial orchard. The total fruit production per year is 1.8 million ton but we need 43.44 lac ton i.e. deficiency is 25.68 lac ton. In homestead, woman are playing vital role in fruit cultivation. Among the produced fruits near about 83% land are occupied by mango, banana, papaya, jujube, jackfruit, litchi, pineapple **(Fig-1**). But the fruit growers are not getting optimum yield due to insufficient knowledge of production techniques, inadequate supply of quality planting materials, post harvest losses etc.

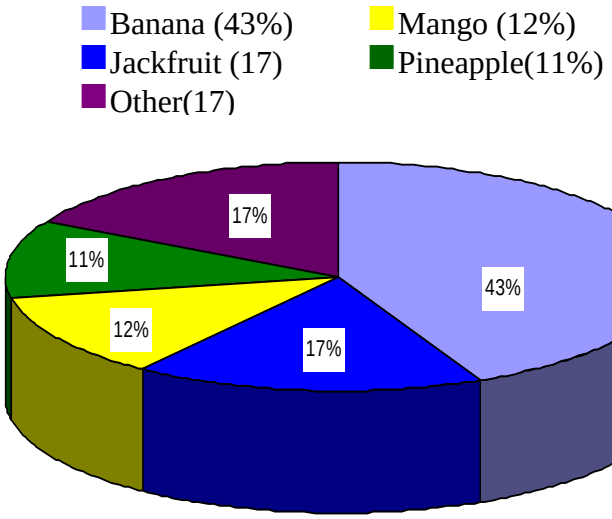

Fig. 1: Percentage (%) land cover by different fruits

We need 85 gram fruit/day/head but we are now consuming about 70 gram/day/head. Hence 70% people are suffering malnutrition especially anemia disease severely found in children and woman of poor and extreme poor household. In Bangladesh major fruits are available (54% of total production) in May, June, July, August and these four months are treated as fruit festival months (Madhu mash) in Bangladesh. The rest 46% is grown in the rest 8 months. A small number of fruits (papaya, sapodilla, coconut and banana) are available throughout the year. Hence it indicates people are not getting nutrient from fruits round the year. To reduce malnutrition, it needs to use homestead space planning for year round fruit production. For this, mango, jujube and papaya were selected for poor and extreme poor household. Mango will give fruits in May-July, Jujube for February-March and papaya for round the year. These are also comparatively high value crop compare to field crops **(Table - 1).**

Table 1: Economic return from Mango, Papaya and Jujube

Name of fruits	Yield(t/h)	Income(US$/ha)	BCR	Income ration compare to rice
Mango	5.00	691	5.2	2.6
Papaya	24.95	779	2.1	2.8
Jujube	3.5	500	5.2	2.6

Source: Rahim, 2014[3].

Fruit growing has no negative influence on the society and environment; rather it is socially and environmentally accepted. Farmers used frequent number of pesticide and fungicide (20-25 spray/season) spray for mango and litchi production which is harmful for both human body and the environment. Mostly male workers are engaged in fruit sub-sector; but female workers are engaged in homestead fruit production.

OBSERVATIONS:

HARMFUL CHEMICALS USED IN FRUITS

- Calcium carbide is reportedly being used in fruit for artificial ripening of fruits. Calcium carbide is a carcinogenic agent and banned under PFA Rules, 1955(USA).
- Formalin is used for extending the shelf life of fruits also causes several health problems.
- Industrial color for coloring the foods
- Different non-edible coating materials
- Ethrel in excess (more than 100pmm)
- Industrial coloring materials also used for coloring the fruits to get high market price
- Indiscriminate use of pesticides

INDISCRIMINATE USE OF CALCIUM CARBIDE:

Recently in Asian countries peoples are consuming toxic fruits which are ripened by a hazardous chemical, calcium carbide. This poses great health risks to consumers. Calcium carbide has cancer-causing properties and is capable of causing neurological disorders. It can result in tingling sensation and peripheral neuropathy. If pregnant women consume fruit ripened with carbide, the children born could develop abnormalities.

"Free radicals from carbide play a major role in the ageing process as well as in the onset of cancer, heart disease, stroke, arthritis and allergies

The use of calcium carbide is not only toxic to consumers, it may also be harmful to those who handle it. It affects the neurological system, resulting in headache, dizziness, mood disturbances, sleepiness, mental confusion and seizures on a short-term basis, while in the

long-term it can cause memory loss and cerebral oedema.

The use of carbide gas from calcium carbide to ripen fruits is extremely hazardous to the human body as calcium carbide also contains traces of arsenic and phosphorus. The practice of ripening fruits using carbide is banned in many other countries but it is freely used in many Asian countries.

In natural conditions, fruits get ripened by the action of a ripening hormone in the fruit which produces ethylene naturally. The use of calcium carbide is dangerous as it produces acetylene gas which is flammable and explosive even at a low concentration as compared to ethylene.

When calcium carbide is used for artificial ripening, a chemical reaction takes place because of the moisture content in the fruit. Heat and acetylene gas are produced and the ripening process is hastened. However, fruits ripened with calcium carbide are soft and have good peel/skin colour but poor in flavour. They also have a shorter shelf-life. An artificially ripened banana would present a yellow outer skin, but the flesh inside may not be ripe and remains green and raw. During natural ripening, a wide spectrum of biochemical changes takes place such chlorophyll degradation, biosynthesis of carotenoids (antioxidants, immune system booster, anti-cancer agent), anthocyanins (powerful antioxidants), essential oils, and flavor and aroma components. But all these healthy chemical changes which enhance the quality of the fruit are lost with artificial ripening. Besides being toxic, artificially-ripened fruits are less nutritious.

Fig.1. Health hazard: Workers at a fruit market using calcium carbide to ripen raw mangoes

In **Malaysia** peoples are shocked that the Ministry of Agriculture and Primary Industries and the Ministry of Health had not curbed this widespread health problem despite CAP raising this commonly-known problem since 1975 -- over 36 years ago! The Ministry of Agriculture and Primary Industries should not be just promoting agricultural productivity, but it should more importantly, ensure the production of healthy agricultural produce. What is the point of producing more agricultural products that is unsafe to be eaten? The encouragement of the use of pesticides, chemical fertilizers and other chemical inputs by the Ministry of Agriculture and Primary Industries must be stopped. In a survey by the CAP in Malaysia, found fruit farmers and wholesalers rampantly using carbide gas to ripen a variety of fruits such as bananas, mangoes, pineapples and papayas. Calcium carbide is also easily available in rural shops at US$ 1.5 per kilogram. The packaging showed pictures of various fruits that can be ripened by the calcium carbide. According to a farmer, they uses about 200 grams of calcium carbide to ripen 30 kilograms of mangoes. The calcium carbide is wrapped in newspaper and placed in an enclosed box filled with the mangoes. A banana seller says he

buys cheap immature bananas from damaged trees and then placed the banana in a box together with some calcium blocks. Within 24 hours all the bananas will be ripened at the same time.

In **India** the use of calcium carbide to induce ripening is banned under the Prevention of Food Adulteration Act, and offenders are liable to face a six-month imprisonment and fines.

In USA, Rule 44-AA of the PFA Prevention of food Adulterating Rules, 1955 prohibits the use of carbide gas for ripening of fruits.

"Rule 44-AA Prohibition of use of carbide gas in ripening of fruits:- No person shall sell or offer of expose for sale of 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."

Ministry of Agriculture has clarified that the fruits are exposed to ethylene gas (fruit ripening plant hormone) in low concentration of 10-100 ppm exogenously to trigger their ripening. It is considered safe in the concentration varying from 0.001-0.01% depending upon the crop, variety and maturity. There is no specific provision in PFA for ripening agents.

Many instances have been reported that some unscrupulous elements are following the practice of dipping green fruits and vegetables in artificial colours to give them a fresh, attractive and pleasant appearance. PFA prohibits use of colours in fruits and vegetables.

As per rule 48-E of the PFA Rules. 1955 fresh fruits and vegetables shall be free from rotting and also from coating of waxes, mineral oils and colours. However, there is provision for coating fries fruits with food additive viz. bee wax (white/yellow) carnauba wax or shellac wax as glazing agent is accordance with the Good Manufacturing Practice for use of food additive under proper label declaration as defined in sub-rule (ZZZ) (24) of Rule 42.

In India, ALLAHABAD: Summer is the season to enjoy fruits like mango, papaya, banana, watermelon and others. These fruits loaded with vitamins, may also result in one rushing to the doctor because of carcinogenic chemicals.

Fig. 2. Showing the effect of calcium carbide but products are all treated with Calcium carbide

Be it spraying of wax on apples and pears and using of calcium carbide to ripen fruits like mango, banana and papaya, all this takes place. Most of hawkers and wholesalers of fruits start using calcium carbide to ripen the raw fruits to earn fast bucks.

In India, the low price of calcium carbide, US$ 1.0/kg, results in its indiscriminate use, added a middlemen at Mundra Mandi, the main hub of fruits in the city Ahamedabad. Around 100 gm of carbide is used per 50kg of fruit. When asked how to identify the fruit which has been ripen by carbide he said: "When mangoes and papayas are uniformly orange, one could easily make out that carbide may have been used. Also try to identify if the stem is dark green while the fruits are all yellow."

Once dissolved in water, it produces acetylene gas. This gas may affect the neurological system, cause headache, dizziness, mood disturbances, sleepiness, mental confusion, memory loss, cerebral oedema and seizures, said head, department of gastroenterology, MLN Medical College, Allahabad, Dr Manisha Dwivedi. When mixed with oxygen, calcium carbide acts as a sedative and used in anaesthesia. **The use of artificial ripening agent can be fatal. Excessive consumption of calcium carbide-laced fruit can cause intoxication. Regular intakes of the chemical may cause irritation of digestive system, diarrhoea, jaundice and liver failure, she added.** "Free radicals from carbide play a major role in the ageing process as well as in the onset of **cancer**, **heart** disease, **stroke**, **arthritis** and allergies. The authorities should realize the gravity of the problem and ban **the practice** of ripening fruit with chemicals and also the use of toxic colours in food products," SI Rizvi, associate professor, biochemistry, Allahabad University, said.

INDISCRIMINATE USE OF FORMALIN

Formalin is a colorless strong-smelling chemical substance usually used in industry of textiles, plastics, papers, paint, construction, and well known to preserve human corpse. It is derived from formaldehyde gas dissolved in water. The widespread use of formalin, in preservation of fish, fruit and other food items is posing a threat to public health. The chemical used as a solution in water keeps fish fresh and makes fruits like mangoes attractive.

This chemical, usually used to stop dead bodies from rotting, is now being used to preserve edible items.

Exposure from its gas or vapor can cause irritation to the eyes, nose and respiratory tract, causing sneezing, sore throat, larynx constriction, bronchitis and pneumonia. Multiple exposures can lead to asthma. It can also affect the skin, causing dermatitis or allergic reaction. Serious inhalation or ingestion can cause severe pain with inflammation ulceration and necrosis of the mucous membranes, which line almost every internal organ. This may show as symptoms of nausea, vomiting blood, diarrhea with bloody stool, blood from the urine, acidosis, vertigo, and circulation failure, then death. 30mL is suggested the lethal dose of formalin. The limit allowed in air that is still safe for human is less than 2 ppm.

Formalin that was recently found in food, might not give such obvious reactions. However, this substance is known to be a carcinogenic substance, can precipitate cancer. A study showed mice exposed to formalin with concentration of 6 to 15 ppm for 2 years developed squamous-cell carcinoma in the nostril. Some other studies also show formalin will cause kidney, liver, and lung problems.

Fig. 3. All fruits are treated by formalin for long shelf life

USE OF ETHREL/ETHYLENE

- Excess ethrel are used to artificially ripen fruits. AS per PFA up to 100ppm ethylene is permissible, but condition that its must be applied on physiologically mature fruits.
- The other popular method is to ripen fruits specially bananas through heating in a closed environment lead to poor quality

- Ministry of Agriculture (USA, India, Canada and others) has clarified that the fruits are exposed to ethylene gas (fruit ripening plant hormone) in low concentration of 10-100 ppm exogenously to trigger their ripening. It is considered safe in the concentration varying from 0.001-0.01% depending upon the crop, variety and maturity (USDA -ARS). There is no specific provision in PFA for ripening agents.

DISADVANTAGES OF ETHYLENE RIPENED FRUITS

- Normally, fruits ripened by application of external ethylene lack that characteristic flavour and aroma of naturally ripened fruit. But they are in no way inferior in terms of nutrients.

- Ethylene is good but can accelerate aging and eventual spoilage of many fruits and vegetables. Therefore it is advisable not to store ethylene-sensitive fruits and vegetables together with ethylene releasing fruits

During the growth and development period of bananas, mangoes, papayas etc, there are many chemical and physical changes that occur. These have an impact on the fruit quality after harvesting. Normally, ripening is the final stage in fruit maturation. During ripening, the fruit changes colour, flavour, texture and aroma to optimal eating sensorial and textural properties. The agent that triggers these changes during maturation of bananas is a chemical called Ethylene. Ethylene is a gas naturally produced by plants e.g to trigger leaves to turn yellow and fall off during certain seasons like winter. Ethylene is a ripening hormone – a chemical substance produced by fruits with the specific biological action of accelerating the normal process of fruit maturation and senescence (dying or going into dormancy). Ethylene can promote ripening in tomatoes, bananas, citrus, pineapples, dates, pears, apples, melons, mangoes, avocados and papayas.

FACTORS THAT TRIGGER PRODUCTION OF ETHYLENE IN FRUITS
-Natural process such as maturation and weather
-Injury-Injured fruits ripen or go bad quickly than injury free ones.
-Attack by insects and birds- fruits eaten by birds ripen faster.

Why do supermarket bananas turn bright yellow by the time you get home: Bananas in the supermarket which are slightly yellow (sometimes green). When I get home, I am shocked to see them turn bright yellow within few hours. This is an effect of ethylene. Probably, they were applied with ethylene immediately prior to shelving.

*Advantages of using controlled Ethylene to ripen bananas***:** Ethylene helps to regulate the ripening process. Therefore without ethylene the ripening process in uncontrolled. This has many disadvantages:
-Presence of uneven ripened fruits.
-Requirements for regular sorting to separate ripe and unripe.
-Ripe bananas would go bad within a very short period if exposed to uncontrolled ethylene.

*Disadvantages of Ethylene ripened fruits***:**Normally, fruits ripened by application of external ethylene lack that characteristic flavour and aroma of naturally ripened fruit. But they are in no way inferior in terms of nutrients.
Fruits and vegetables that are sensitive to Ethylene

Ethylene is good but can accelerate aging and eventual spoilage of many fruits and vegetables. Therefore it is advisable not to store ethylene-sensitive fruits and vegetables together with ethylene releasing fruits.

COLORING MATERIALS

- Dyes: Eating foods containing industrial dyes and colours causes violent allergic reactions, respiratory problems, asthma, liver disorders and kidney dysfunction and bone marrow disorders. Nowadays, coal tar dyes are being used in sweetmeats.
- Asthma Caused by toxic dyes used in most of the fruits
- The Canadian Food Inspection Agency (CFIA) is now warning the public not to consume the Heritage brand Palm Oil which contain a non-permitted colour. This cause cancer in laboratory animals and also be significant for human health specially mental disorder, headache, allergy etc

Fig. 3. Use coloring materials in fruits causes headache lead to fighting

COATING MATERIALS

- As per rule 48-E of the PFA Rules. 1955 fresh fruits and vegetables shall be free from rotting and also from coating of waxes, mineral oils and colours.
- However, there is provision for coating fruits with food additive viz. bee wax (white/yellow) carnauba wax or shellac wax as glazing agent is accordance with the Good Manufacturing Practice for use of food additive under proper label declaration as defined in sub-rule (ZZZ) (24) of Rule 42.
- Recently we are using Chitosun and Aloe vera gel which are edible coating materials and safe from health hazards[(4)] .

The coating of foods especially fruits is a very old practice. Different fruits have been coated for many years and the practice will continue in the foreseeable future. Coating of fruits are carried out by applying a thin layer of wax on the surface. The coating process can be carried out by either dipping, brushing or spraying with wax. This coating is normally referred to as edible coating. An edible coating is a thin layer that is applied on the surface of a fruit or vegetables which is consumed together with the fruit. Edible coatings are considered to be safe for human consumption. Therefore, these coatings are expected to be consumed together with the fruits.

Why coat fruits: There are several reasons for coating fruits. The main reasons are either for preservation, aesthetic (appearance) or the obvious one of replacing the natural wax. The fruits, naturally have a natural wax coating on their surface. This natural wax coating helps to protect the fruit from shriveling and weight loss. However, prior to packaging of the fruits, they are washed by scrubbing the surface to remove dirt and chemical residues (if they are not organic). This scrubbing removes approximately 50% of the natural wax coating. To replace the natural wax coating, processors apply other recommended waxes on the surface of fruits. The waxes applied on fruits can either be animal wax, vegetable wax or mineral and synthetic wax. After applying wax, the fruits assumes glossy and firm appearance which is considered as an important quality in apples. The distributors and sellers of fruits can apply wax to improve appearance and increase visual freshness. This is very common practice especially in supermarkets. The most common wax used on fruits is a vegetable wax called canauba wax or shellac.

Other reasons for waxing/coating fruits: The fruits are waxed to reduce loss of water hence ameliorating weight loss. Preventing the loss of water in apples also helps to maintain firmness and juiciness. If fruits lose water through respiration and transpiration they lose the desirable characteristic crispy texture, shrink and become hard.

Disadvantages of waxing fruits: Sometimes, fruits have to be transported over long distances to the intended markets. During transport it is important to slow ripening. Wax coat can be applied on the fruits surface to slow the ripening process.

Waxing fruits apples can have some negative effects on the fruit. One of the effect is anaerobic respiration that can occur in the fruits since the wax may act as oxygen barrier. The wax can be used to disguise the quality of fruit. Waxed fruit may look glossy, sleek, shiny, firm and appealing , but they could be soggy and lacking the desirable crispy texture.

Ways to know if fruits are coated with wax: Normally if you pick an fruit from a tree and rub it with your hands, it leaves whitish kind of powder on your palms. This is the natural wax on the surface. Similarly waxed fruits if scratched slightly it is possible to notice a very thin layer peeling off. Most likely this is added wax. If an fruit looks very glossy and shiny it should be a suspect.

Ways to minimize likely-hood of buying waxed fruits: The natural waxes applied on fruits are not known to have any negative effect on health. However, for some personal reasons you may feel it is good to eat unwaxed fruits. I would suggest simple ways to reduce the chances of buying waxed fruits.

1.Grow your own (and after harvesting do not wax them).

2.Buy fruits from markets in locality where that fruits are grown. There are high chances that the farmers have not waxed their fruits after harvesting.

3.Buy the dull fruits. However, this is not a guarantee that they are not waxed.

4. Check the label and buy unwaxed fruits.

Ways of cleaning waxed fruits: Obviously, it is a good practice to clean fruits before eating. I would suggest cleaning with lukewarm water. Just clean them thoroughly to remove any surface wax. This would also help remove any dirt and chemical residues on the surface. It is not advisable to use detergents even food grade types on porous fruits like apples. Vinegar (acetic acid) can also do. Use a paper towel with a bit of vinegar to wipe the fruit before washing. Using vinegar wipes away the wax. The other obvious way to ensure you do not consume the wax on the surface of apples is to remove the entire peel . This can be done by using either a fruit peeler or a knife. This comes at a cost since many people like the tartness and crispiness of the peel.

CONCLUSION: Waxes used on fruits are at the moment considered as safe for human consumption. However, governments are supposed to enforce strict measures to ensure some petroleum-based waxes are not used. The producers are also required to indicate on the label if additional wax has been used to coat the fruit.
To be on the safe side as a consumer, thoroughly clean the fruit before enjoying the tartness and crispiness of the fruit.

WAXES:
Animal waxes: Bees wax, Spermaceti wax, Shellac wax and Chinese insect wax
Vegetable Waxes: Carnauba wax, Candelilla wax,. Sugarcane wax,. Palm wax, Esparto wax
Mineral and synthetic waxes: Ozocerite and Montan wax,
Fruits that may be waxed: Mango, Avocadoes, Lemons, Grapes, Bananas, Cucumbers, Tomatoes, Melons,Oranges, Lime, Passion fruits and Peaches

OTHER CONTAMINANTS THEIR SOURCE IN FRUIT AND VEGETABLES AND ILL HEALTH EFFECTS?

Pesticide residues, crop contaminants (aflatoxins, patulin, ochratoxin, etc.) naturally occurring toxic substances and heavy metals are the major contaminants found in fruit and vegetables. Pesticides are used in management of pests and diseases in Agricultural and Horticultureal crops. Heavy metals are present in the irrigation water and other manures. Infested seeds, irrigation water and soil act as the source of the fungal toxins. Pesticides can leave adverse effects on the nervous system. Some harmful pesticides can cause several hazardous diseases like cancer, liver, kidney, and lung damage. Certain pesticides can also cause loss of weight and appetite, irritability, insomnia, behavioural disorder and dermatological problems. The pesticide residue found in fruit and vegetables include residues of both banned (Aldrin, Chlordane, Endrin, Heptachlor, Ethyl Paration, etc.) and restricted pesticides for use in India/Bangladesh (DDT, Endosulfan, etc.).

Heavy metals also causes adverse effect in human metabolic system, skin diseases, heart problems, etc.

WHAT IS THE RESIDUE LIMITS OF DIFFERENT CHEMICALS?

- Bee wax (white and yellow) or carnauba wax or shellac wax are permitted to be used in accordance with the Good Manufacturing Practice for use of food additives.

- Since use of carbide gas is prohibited in ripening of fruits under PFA, no tolerance limit for its residue is permitted.

- No tolerance limit for colour and mineral oil on fruits and vegetables has been allowed.

- The Maximum Residual Limit (MRL) of pesticide residues are given under PFA Rules, 1955 (Rule 65).

- The presence of heavy metal in the food item (fruit and vegetables) shall not exceed the value given under PFA Rules, 1955 (Rule 57).

- The presence of crop contaminants and naturally occurring toxic substances in fruit and vegetables shall not exceed the maximum limit prescribed under PFA Rules, 1955 (Rule 57A and 57B)

ADVICE TO CONSUMER:-

- Select fruits and vegetable without spots or necrosis (lesions) and any abnormality.

- Wash fruits and vegetables thoroughly with water (preferably) running potable water before eating and cooking.

- Purchase fruits and vegetables from known dealers.

- Peeling of fruits before consumption and vegetables before cooking will reduce exposure to pesticide.

- Do not buy and consume cut fruits from open market.

- Throw away fruits and vegetables infected by mould/fungus.

- To minimize the hazards of pesticide residues, discard the outer leaves of leafy vegetables such as lettuce and cabbage.

- Do not wash fruits and vegetables with detergents as they may get absorbed inside.

- Ensure the quality of fruits and vegetables by sending them to voluntary testing laboratories.

- Wash your hands with soap and potable water, use clean utensil and clean cutting board with stainless steel knives

- Do not choose fruits that are attractive on the outside as they may not be good for health. Fruits that have a uniform colour, for example, a bunch of bananas having a uniform colour, are more likely to have been artificially ripened.

- Wash the fruits thoroughly before consuming. Keep them under running water for a few minutes, so that the chemicals are washed away.

- Do not buy fruits sold during their off season, as they are more likely to be artificially ripened.

- While eating mangoes and papayas, always remove the peel before cutting fruits into pieces.

HOW TO IDENTIFY CHEMICALLY TREATED ARTIFICIALLY RIPENED MANGOES? Artificially ripened mangoes pose a major health risk. Most of the mangoes which come in the month of March or first weeks of April are artificially ripened using harmful chemical treatment like using calcium carbide. Greedy traders and fruit vendors want to make quick money by bringing in artificially ripened mangoes before the naturally ripened mangoes enter the market. Since natural ripening process takes time, the artificially ripened mangoes enter the market quickly much before and the prices will be high since demand is more, people are eager to taste the season's mangoes and hence prices would be more too.
The question is how to identify such artificially ripened mangoes in the market which are ripened using harmful chemicals like carbides?
These mangoes are plucked before reaching the physiological maturity and are not allowed to ripen naturally. Mangoes and other fruits usually produce ethylene gas which fastens ripening. But these prematurely plucked mangoes can't produce ethylene, so vendors use calcium carbide to ripen them which makes the mangoes look ripe within 12 hours. Calcium carbide is allowed to react with moisture which produces acetylene gas which causes the artificial ripening of the mango fruits. Acetylene is dangerous to the neurological system.
Such chemically ripened mangoes are a major health risk. Consumers who eat artificially ripened mangoes are can develop mouth ulcers, gastric problems and skin rashes. It can also cause diarrhoea and in the longer run can lead to renal problems, infertility, and also cancer. They can also result in head aches, sleep disorders, mood disturbances, memory loss and even seizures.
Besides this, the artificially ripened mangoes will not have the benefits of Vitamin A available in naturally ripened mangoes.
The best way to avoid artificially ripened mangoes is not to buy mangoes till the end of April which is when the actual mango season kicks in. If there are mangoes in the month of March or first weeks of April then there are good chances of they being artificially ripened fruits.
An artificially ripened mango will not smell right unlike a naturally ripened mango which will have a good aroma !
An artificially ripened mango will have an yellow outer skin like a naturally ripened mango but the tissue/flesh inside will not be ripe.
An artificially ripened mango will be dry and less juicy compared to a naturally ripened mango which would have sucked enough water in the tree.
If there are green patches here and there no the yellow skin then it is most probably artificially ripened.
In artificially ripened mangoes, the tip of the fruit(that end which is attached to the tree) would still be raw, greenish in colour, very hard and no juice oozes from the tip. This can be noticed just by sheer look at the tip. However, in a naturally ripened fruit, the tip will be golden yellow in colour, soft and juicy when you touch it and shows signs of ripening. A close observation will do the job for you.

Food safety and sanitation are considered to be a key issue to ensure overall food security in Bangladesh[5] .

Food is the major source of human exposure to pathogenic agents, both chemical and biological (viruses, parasites, bacteria), from which no individual is spared. The importance of food safety stems from: (i) food being the primary mode of transmission of infectious disease; (ii) the intricate linkage with development- governs individual and community health, national productivity, and promotes export potential & thus earn foreign exchange; (iii) emerged as prominent sources of conflict in international agricultural trade[6,7] .

*Biotechnology has raised some food safety concerns as n*ew scientific methods to assess the safety of food derived from biotechnology have yet to be developed and agreed upon internationally.

REGULATION OF FOOD LAW:

Implementation of Prevention of Food Adulteration Act and Rules[5-9] rests with State/U.T. Governments. The Commissioner Food Safety/Food (Health) Authority of States/U.Ts. have been advised to keep strict vigil to check the use of carbide gas and other hazardous chemicals for ripening of fruits and colouring of fruits and vegetables and to take legal action for violation of the provisions of the Act/Rule.

SOME RECOMMENDATIONS FOR ACTION PLAN FOR FOOD SAFETY

- Review of laws/infrastructure/coordinating mechanism and provide technical assistance to update those towards regional harmonization.
- Review of standards and certification systems in purview of international requirements.
- Review of research and study programmes and help conducting research and study projects.
- Technical assistance in 10 years' training/awareness building programmes.
- Assist in developing risk analysis infrastructure and making risk limits for adulterants/contaminants.
- Provide support for publishing a regional food safety bulletin containing news and views on food safety data/events/information/development.
- Assist in establishing food safety cell or commission or council at the SAARC secretariat.
- **All of the Asian countries should prioritize their efforts in establishing and evaluating priorities in food borne disease prevention & control.**
- **Establish a Regional epidemiological network among the SAARC countries on all possible ways to combat FB-disease outbreaks, particularly the possible risks of being contaminated with a used range of FB-diseases in all countries of SAARC.**
- Chalk out long term & sustainable resources, means & ways to fight back FB-illnesses from respective countries.

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