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CORRELATION OF ARTIFICIAL RIPENING OF FRUITS AND GARAVISHA WITH SPECIAL REFERENCE TO VIRUDDHAHARA

Dr. Akshay Satish Patil*[1] and Dr. Rajendra D. Lambat[2]

[1]PG Scholar, Department of Agadatantra, Government Ayurved College Nagpur.

[2]Associate Professor, Department of Agadatantra, Government Ayurved College Nagpur.

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***Corresponding Author**
Dr. Akshay Patil
PG Scholar, Department of Agadatantra, Government Ayurved College Nagpur.

ABSTRACT

Fruits are an important part of diet. Most nutritional and global recommendations include consumption of at least 2 servings of fruits per day for adults. They contain vitamin, mineral, dietary fiber, and, more recently, dietary bioactive content. Regular consumption of fruit is associated with reduced risks of cancer, cardiovascular disease, stroke, Alzheimer disease, cataracts and some of the functional declines associated with aging. Ripening is the process in the fruits by which they attain their desirable flavour, quality, colour, palatable nature and other textural properties. Due to increasing urbanisation and rapid development of fruit trade, there has been an increase in the artificial ripening to facilitate rapid production. The commonly used ripening agents are calcium carbide, acetylene, ethylene, propylene, ethephon (ethrel), glycol, ethanol and some other agents. Calcium carbide related ocular burn injuries are reported during mango ripening season of West Bengal in India. *Garvisha* is the toxic combination of poisonous or non-poisonous substances which is also called as *Kritrimvisha* by Acharya Vagbhat. *Garvisha* are not to digested but they take long time to digest hence they are not fatal. Certain diet and its combinations, which interrupts the metabolism of tissue, which inhibits the process of formation of tissue and which have the opposite property to the tissue are called as *Viruddhanna* or incompatible diet. The present study correlates the use of the artificial ripening agents with the *Garavisha* and *Sampadviruddha* (richness of quality) topic under *Viruddhahara* of Ayurveda.

KEYWORDS: Fruits, Incompatible diet, artificial ripening, calcium carbide, *Garavisha*, *Sampadviruddha.*

INTRODUCTION

Fruits are an essential part of human diet. Most global and nutritional recommendations include consumption of at least 2 servings of fruits per day for adults.[1] They contain vitamins, minerals, dietary fibres and dietary bioactive contents. The entire body of fruits is rich in bioactive compounds, such as phenolic constituents, carotenoids, vitamins and dietary fiber.[2] Fruits contain organic acids like malic acid, citric acid, asorbic acid, etc. essential for human health. These organic acids are present in fruits at their unripe stage (premature stage) and as they get matured, they form polymers that contain sugars. The sugar in the fruits are released when the fruit produces enzymes such as hydrolase, pectinase, amylase that breakdown the sugar and neutralizes the acid content which then display ripeness.[3] Regular consumption of fruit is associated with reduced risks of cancer, cardiovascular disease, stroke, Alzheimer disease, cataracts and some of the functional declines associated with aging.[4] Fruits are categorized into climacteric, depending on their ability to continue to ripen after being harvested and non-climacteric based on their inability to ripen further after being harvested on the basis of ripening behaviour. Due to increasing urbanisation and rapid development of fruit trade, there has been an increase in the artificial ripening to facilitate rapid production. Thus, consumption of off season processed fruits is on increase due to urbanisation and advancement in technologies, marketing strategies, preservation techniques, transportation and health benefits.

Ripening is the process in the fruits by which they attain their desirable flavour, quality, colour, palatable nature and other textural properties. It is the process of converting starch to sugar which leads to increase in acidity values. Fruits are naturally ripened on trees but some chemical agents are used by traders for artificial ripening process. The commonly used ripening agents are calcium carbide, acetylene, ethylene, propylene, ethephon (ethrel), glycol, ethanol and some other agents.[4] These ripening agents can cause hazardous health effects. They stimulate artificial ripening of fruits and induce colour changes. Farmers use ethylene to induce ripening under controlled temperature and humid conditions. Ethylene being a natural hormone, doesn’t pose threat to human health. However, calcium carbide is the most commonly used artificial ripening agent due to its cheapness and easy availability. But such artificial ripening agents when consumed for a long period of time cause potential threat to health.

Garvisha is the toxic combination of poisonous or non-poisonous substances which is also called as *Kritrimvisha* by Acharya Vagbhat. *Garvisha* are not to digested but they take long time to digest hence they are not fatal. Certain diet and its combinations, which interrupts the metabolism of tissue, which inhibits the process of formation of tissue and which have the opposite property to the tissue are called as *Viruddhahara* or incompatible diet. The use of artificial ripening agents act in a similar way to *Garavisha* and *Viruddhahara* by getting accumulated in body thus acting like a slow poison. The present study correlates the use of the artificial ripening agents with the *Garavisha* and *Sampadviruddha* (richness of quality) topic under *Viruddhahara* of Ayurveda.

HEALTH HAZARDS OF ARTIFICIAL RIPENING AGENTS

In a recent study, it was observed that most fruit sellers use a deadly chemical, calcium carbide for ripening the fruits.[5] Calcium carbide is a carcinogenic agent and is banned in India under Prevention of Food Adulteration Act-1955.[6]

When calcium carbide is dissolved in water, it produces acetylene gas which acts as an artificial ripening agent.[7]

$$CaC2(s) + 2H2O(l) \rightarrow Ca\ (OH)2(aq) + C2H2(g)$$

Acetylene is believed to affect the nervous system by reducing oxygen supply to the brain.[7] Calcium carbide is extremely hazardous because it contains traces of arsenic and phosphorus which are toxic and their exposure may cause severe health hazards.[5] Although, it is banned in many countries across the world, it is freely used as a ripening agent for fruits such as bananas, mangoes, oranges, papayas, etc. in countries like India, Pakistan, Nepal, etc. countries. According to the survey of Directorate of Marketing and Inspection (Ministry of Agriculture, Government of India), 99% of the mangoes in India are ripened by using calcium carbide, as it is the most economical way for ripening process of mango.[8] In a related study, Abdullahi et al., (2018) investigated the effect of artificial ripening of banana (Musa spp.) using calcium carbide and noted that the pH contents decrease with increase in CaC2 concentration.[9] The temperature at which the banana was stored influenced the ripening changes, as increase in storage temperatures between 140C and 300C enhanced the rate of ripening and the fruit softened at a faster rate.[9] According to a study, Colonic and prostatic cancer were triggered from the CaC2 exposure.[10] Similarly, calcium carbide related ocular burn injuries are reported during mango ripening season of West Bengal in India.[11] In 2014, the National Human Rights Commission of India has sought an action taken report

from Indian Health Ministry over use of calcium carbide to ripen fruits despite a nationwide ban.[12] Calcium carbide contains chemical impurities such as arsenic hydride and phosphorus hydride that are highly carcinogenic compounds while the acetylene released is highly inflammable. Ethephon is an organophosphate pesticide, so it is not recommended as a ripening enhancer which contain heavy metal traces of lead and arsenic. Oxytocin is a mammalian hormone, used as a drug in veterinary medicine which is not advised for use in fresh fruits and vegetables.[13]

The Food Safety and Standard Authority of India (FSSAI) has advised to use only the ethylene in gaseous form for artificial ripening of fruits. The other major contaminants found in fruits are pesticide residues, crop contaminants, mycotoxins (aflatoxin, patulin, ochratoxin), naturally occurring toxic substances and heavy metals. Heavy metals are harmful and become toxic for health if they are taken above the limit of daily dietary allowance recommended.

GARAVISHA

Poison is a substance which when administrated, inhaled or ingested incapable of acting deleteriously on human body and hazardous damage to vital organs and *Garavisha* is one of them. *Gara* is a toxic combination of poisonous or non-poisonous substance and which exerts toxic effect after interval of sometime and as such does not kill the patient instantly.[14] In addition to *Sthavar* and *Jangamvisha* there is one another type of poisons *Samyogajavisha* which is called *Garvisha*.[15] Vagbhatta classified poison into two types. One is the *Akritrimvisha* [natural poison] and this subdivided into two i.e. *Sthavaram* and *Jangam*. The other one is the *Kritrim Visha* which is called as *Garvisha* [unnatural or chemically prepared poison].[16]

According to Yogratnakar the appearance of symptoms after the intake of *Garvisha* within 15 days to 1 month which include laziness, heaviness, cough, dyspnoea, loss of strength, haemorrhage, oedema, yellow discoloration of eyes.[17] Diseases - *Pandurog*, *Kushta*, *Mandagni*, pain in *Marmsthan*, *Adhman*, *Grahani*, *Yakshma*, *Gulm*, fever.[18] *Garvisha* is mostly eaten unknowingly hence the patient does not feel anything amiss, immediately and can be treated after the onset of symptoms. Treatment – *Vaman* for *Hrudayshuddhi*, *Suvarnaprash*, *Agadpana*. Milk and ghee is supposed to be the best diet in *Garvisha*.

VIRUDDHAHARA

The food which is wrong in combination, which has undergone wrong processing, which is consumed in incorrect dose, which is consumed in incorrect time of day and in wrong season can lead to *Viruddhahara* (Incompatible diet). *Viruddhahara* causes various types of diseases. According to Acharya Charaka all kinds of foods which aggravate (increase) the *Doshas* but do not expel them out of the body and all of them become unsuitable or unhealthy for body is called as *Viruddha.*[19]

Types of *Virddhahara*

1. *Desha Viruddha*
2. *Kala Viruddha*
3. *Agni Viruddha*
4. *Matra Viruddha*
5. *Satmya Viruddha*
6. *Dosha Viruddha*
7. *Sanskar Viruddha*
8. *Veerya Viruddha*
9. *Koshtha Viruddha*
10. *Avastha Viruddha*
11. *Kram Viruddha*
12. *Parihar Viruddha*
13. *Upachar Viruddha*
14. *Paaka Viruddha*
15. *Sanyoga Viruddha*
16. *Hriday Viruddha*
17. *Sampad Viruddha*
18. *Vidhi Viruddha*

Sampad Viruddha (Richness of Quality)– Consumption of those substances which are not having their proper qualities. For example – Intake of substance those are not mature, over matured or putrefied.[20] Due to heavy use of chemical fertilizers we consume very poor quality food, which has many adverse effects on our body.

Agnimandya is the root cause of all diseases. *Viruddhahara* causes vitiation of *Agni* by the consumption of *Abhojana*, *Ajirnatibhojana*, *Vishamashana*, *Asatmya*, *Ati Ruksha* and *Sheeta*,

Sansrusta Bhojana. The use of chemical fertilizers can be included in the *Asatmya* category which get accumulated in the body. This vitiates the *Jatharagni* which is not even able to digest the lightest of food substances, resulting in indigestion (*Ajirna*). This undigested food material turns sour and acts like a poison, which is called *Amavisha*. This leads to various diseases like infertility, fistula, fainting, anaemia, acid eructation malabsorption syndrome, fever, genetic disturbances and even death. Treatment is *Nidana Parivarjana* which is the main line of treatment followed by *Vamana*, *Virechana* and *Shamana Chikitsa* and by the prior use of beneficial substances.[21]

DISCUSSION

Probable mode of action

Garavisha is a toxic combination of poisonous and non-poisonous substances which gets accumulated in body and takes long time to digest which exerts the toxic effect after long interval hence not fatal but causes various diseases as per the place accumulated. *Viruddhahara* taken regularly could induce inflammation at a molecular level, disturbing the eicosanoid pathway creating more arachidonic acid leading to increased prostaglandin-2 and thromboxane.[22] Theory of autoimmune mechanism and free radical have an important role in the etiopathology of the diseases caused by *Viruddhahara*. *Ama* which is accrued at the level of intestine may lead to the gastroenteritis; a part of *Ama* penetrates intestinal mucosa, circulates all over the body and performs the role of antigen, consequently vitiating the humors to cause different disorders. *Ama* can also be compared to unstable reactive free radicals, which are the main cause of many diseases and degenerative changes in the body and it may be produced due to *Viruddhahara*. According to a study, the industrial grade CaC2 and Ethylene Glycol (EG) induce systemic toxicity to rats and the liver is the most susceptible organ. The CaC2 and EG toxicity is mediated through the upset of redox balance and subsequent inflammatory responses. Histological details revealed microvesicular fatty change in liver, corpuscles degeneration in kidney and lymphocytes infiltration in various tissues.[23] Since these chemical agents get accumulated in the body and induce systemic toxicity, it can be correlated with *Garavisha* and *Viruddhahara.*

CONCLUSION

Hence, it can be concluded that the use of artificial ripening agents can be correlated to *Garavisha* with special reference to *Viruddhahara*. More studies and research needs to be conducted to find the alternative ecofriendly ripening methods.

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