

FOOD PROCESSING TECHNOLOGY OF RICE IN ASSAM

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Abstract :

Assam is traditionally a rice growing area. Rice plays a pivotal role in the socio-cultural life of the people of the state. The crop has enormous diversity in the region, which has resulted due to highly variable rice growing ecosystems. Besides, the region is inhabited by a large number of ethnic groups whose preference also varies from one another. All these factors are responsible for evolution of a large number of varieties in the region. Most of these have been in use from time immemorial with traditional method of preparation. Unknowingly people have selected many useful cultivars, which have commercial value in the present day world in which people prefer to have varieties of tastes.

The science of food processing and preparation technique is based on the understanding of physical and chemical change that occur during processing. The knowledge can be used to combine food ingredient in diverse ways to prepare innumerable products with delicate flavours and colour which delight the senses. Food preparation technique is very much a part and parcel of the culture of the region. Each region has its own method of blending flavors to bring about acceptable combination. It is necessary to retain or produce desirable appearance, colour, flavour and moisture in the course of preparation. To achieve the ends, it is necessary to understand the method used in the preparation of food.

The paper deals with indigenous and improved processing techniques and method of rice practiced by the Assamese community.

Key Words : Rice, Food processing , Assam

INTRODUCTION

Assam is traditionally a rice growing area. Rice plays a pivotal role in the socio-cultural life of the people of the state. The crop has enormous diversity in the region, which has resulted due to highly variable rice growing ecosystems. Besides, the region is inhabited by a large number of ethnic groups whose preference also varies from one another. All these factors are responsible for evolution of a large number of varieties in the region. Most of these have been in use from time immemorial with traditional method of preparation. The science of food processing and preparation technique is based on the understanding of physical and chemical change that occur during processing. The knowledge can be used to combine food ingredient in diverse ways to prepare innumerable products with delicate flavours and colour which delight the senses. Food preparation technique is very much a part and parcel of the culture of the region. Each region has its own method of blending flavors to bring about acceptable combination. It is necessary to retain or produce desirable appearance, colour, flavour and moisture in the course of preparation. To achieve the ends, it is necessary to understand the method used in the preparation of food. Unknowingly people have selected many useful cultivars, which have commercial value in the present day world in which people prefer to have varieties of tastes. Some of the special classes of rice in the state include *joha* or aromatic rice, *bora* or waxy rice and *chokuwa* or soft rice.

Joha (aromatic rice): *Joha* rice in the state are medium bold to medium slender grained unlike Basmati rice which are long slender grains. This indigenous cultivars cook sticky and tasty while cooked Basmati grains remain separated. The elongation ratio of Basmati is 1.8 times as compared to 1.4 times in *joha* cultivars. However, aroma of this class of rice is as high as Basmati. The price of this class of rice is high as compared to any other rice in the domestic market. *Joha* rice is used in the preparation of *Kheer (payas)* and other vegetarian and non-vegetarian items. Similar aromatic varieties are also found in many S.E. Asian countries. Assam Agricultural University has developed *Ketekijoha*, a high yielding variety with twice the yield potential of traditional *joha*.

Bora or waxy rice: The waxy rice or glutinous rice known as *bora* in vernacular, is grown by the farmers of the state to meet up their domestic consumptions. This class of rice is required to prepare a number of food items during any festival, religious occasions and ceremonies. Many communities in the region also prepare high class rice beer out of *bora* rice.

Glutinous rice also has an enormous diversity in the region. The grain of the glutinous rice are opaque due to its chemical constituent known as amylopectin, a component of the starch. They also cook easy and preparations can be preserved for long time. Traditionally many items are prepared. Mention may be made about *pithas* (biscuit like confectionaries) *chira* (flaked rice), *hurum* (expanded waxy rice), *Sunga chaol* (roasted rice inside bamboo internode), *Sandohguri* (fried rice powder) and rice beers.

Chokowa or soft rice : This is another class of rice used for instant preparations. Similar class of rice is also not known in other parts of the world. Its preparations are very popular in community feasts and festivals in Assam. *Komolchaol* (soft rice) are prepared from this class of rice by boiling paddy followed by one drying and then dehusking them is very common and popular in rural Assam. This preparation can be preserved for quite long time and can be consumed instantly by soaking the rice either in cold or hot water for a brief period of time and then consumed with sugar or molasses, milk or curd and even with salts and oils and pickles. These preparations seem to be useful for sailors, travelers, mountaineers, defense personal etc. However, not much have been done so far either in research or popularising them elsewhere in the country. Rice

powders and flake rice prepared from *chokowarice* are very tasty and preferred by the local people of the area.

All the three unique classes of rice have great commercial potentiality provided they get proper exposure in the domestic and/or world markets. Food items prepared out of these rice can be popularised through food *melas* held in various places of the country. Research effort should be made regarding processing and preserving the products. Nutritive value should also be evaluated to attract the traders and consumers of the products.

The paper deals with indigenous and improved processing techniques and method of rice practiced by the Assamese community.

Parboiling

Parboiling is an age old technique carried out to improve rice quality. Different grain parboiling techniques have been traditionally followed and scientifically developed for preparation and industrialization of rice. Parboiled rice is widely consumed in India, Sri Lanka, Nepal, Bangladesh, Pakistan and also by Indian immigrants in many parts of the world. An estimated one-fifth of the world paddy production and more than half of the annual production in India undergo parboiling.

The state of Assam, India produces a large number of rice varieties, some of which are traditionally processed into typical parboiled rice products like Hurum, Komal chaul, Bhojachaul and Sandahguri, which are of both ethnic and possible commercial importance. *Hurum*, an unbelievable variety of puffed rice, that is two or three times larger, transparent, lighter and tastier than puffed rice (muri). Parboiling of rice increases its nutritional and milling quality. Improvement in colour and texture are needed to make parboiled rice more preferred. The rice kernel undergoes significant material change during parboiling process.

This post-harvest processing technique for paddy was developed for quality enhancement. Parboiling brings about major changes in the grain and it can be said that parboiled rice is distinct from normal raw rice. Raw rice loses its capacity and becomes glassy and translucent on parboiling. The hydration and cooking behaviour, the eating quality, and the product making quality are profoundly altered on parboiling. Parboiling gives stable bran and the oil content in the bran is increased.

Parboiling techniques and practice

Parboiling is an age-old traditional post-harvest processing technique for paddy for quality enhancement. The general parboiling process involves basically three steps- soaking paddy in water followed by steaming and drying. The traditional parboiling process involves soaking rough rice overnight or longer in water at ambient temperature to sufficiently moisten the paddy, followed by boiling it while the grains expand. The grains are then air or sun dried and milled. The modern pressure parboiling process, however involves soaking of the paddy at elevated temperatures (typically 70°C) for a few hours which results in sufficient saturation, followed by pressure steaming for a brief period and drying by both traditional and mechanized ways. Another parboiling process, called as dry heat parboiling involves only partial soaking of the paddy (18-20% moisture) followed by brief conduction heating using very hot sand or air instead of steam). The third process is however employed only for making some speciality rice products. Cook by open steaming,

boiling. Paddy Soak in water for 4-5 days .Cook by pressure steaming . The three basic parboiling processes (Source: Bhattacharya, 1985). Many variations in terms of parboiling conditions and techniques under these three basic processes have been practiced and studied. Newer tools like modern dryers, microwaves, fluidized hot beds etc have reportedly made the drying step easier and efficient.

Parboiled rice products of Assam

Bhattacharya et al (1980) classified hundred Indian rice varieties collected from different parts of the country into eight groups . It was observed that only Assam produced varieties from all the eight groups. Glutinous rice varieties of Assam and its adjoining states are unique in India. While the high and intermediate amylose rice varieties are consumed as staple foods, the low amylose and waxy varieties are processed to make speciality products. The low amylose rices are called chokua rice and the waxy rices are called bora rice. Unique taste and texture are attained when the dry-heat parboiled rice products like moori (puffed rice) and chira (flaked/beaten rice) etc are prepared using the waxy varieties which are commonly eaten in Assam whereas moori and chira made from non-glutinous rice are popular throughout the Indian subcontinent. Further, there are certain speciality rice products which despite of having possible ethno-economic importance have not been studied and extensively researched on. Dry heat parboiled rice products are speciality products which are not generally consumed as staple food. Dry heat parboiling has however never been considered or studied as a replacement of steam parboiling. Puffed rice and flaked rice are the most popular dry heat parboiled products but have been given limited scientific attention till date.

Properties of parboiled rice

The most important property for commercial importance of parboiled rice is higher head rice yield and less broken kernels on milling, which gives higher economic return and better consumer acceptance. Parboiling influences the physical characteristics of the rice grains to a marked extent. Length to breadth ratio of rice grains is an important commercial parameter. Parboiling is reported to change the Length to breadth ratio. With change in the dimensional ratio, other parameters like bulk density, true density, porosity, flowability, packing properties etc also change. Milled parboiled rice kernels are glassy and translucent while raw kernels are opaque. An insufficient soaking leads to formation of "white belly", which is a characteristic opaque core in the parboiled rice kernel. The cooking properties of rice are highly altered upon parboiling. Cooked parboiled rice has a bold structure and firm texture. It exhibits lower water uptake during cooking and hence needs a longer time to cook to a soft consistency. However, the kernel shape is better retained; the rice becomes fluffier and less sticky during cooking as compared to the raw rice. The choice of cooked rice texture however varies from region to region depending upon consumer's acceptability. For evaluating texture profile of cooked rice, modern texture analyser is extensively used. The change in starch properties relate to the changed properties of the rice kernel. From the nutritional point, the reason for acceptance and recommendation of parboiled rice is mainly because of its nutritional quality. Parboiled rice is rich in B vitamins. The developed kernel hardness makes the polishing step less effective and the nutritive epidermal layers of the rice kernel are retained even after milling. Starch digestibility is another important nutritional parameter. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties in humans. Although

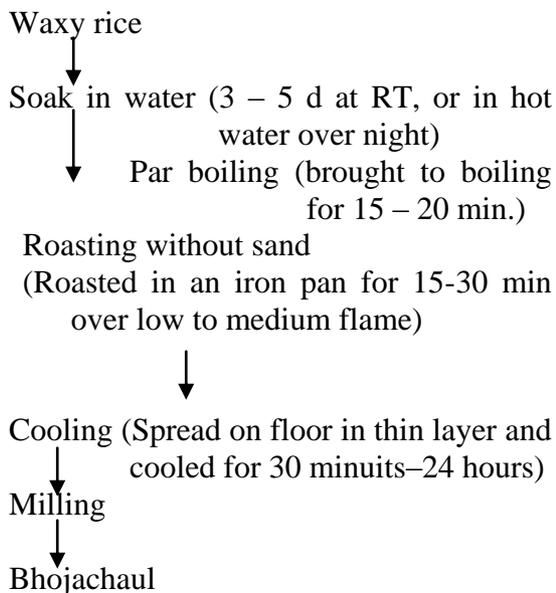
fruits and vegetables are considered to be rich in phytochemicals, cereals and cereal products are also reported to possess these compounds in abundance. The phytochemicals have antioxidant activities and hence are nowadays popularly utilized for health enhancement and cancer treatment etc. Polyphenols constitute a large population of phytochemical compounds. While quantitative estimation of these compounds are measured as total phenolic content and total flavonoid content. In rice, most of the phytochemicals are located in the husk and bran layers and hence are removed during milling. Rice bran oil has hence been popularly used in health promoting formulations. High temperature treatments like parboiling results in loss of their chemical structures and thereby lower their antioxidant capacities. Parboiling also results in migration of surface compounds into the starchy endosperm of the rice kernel. Estimation of these compounds in the different milling fractions is hence necessary to understand their health benefits. Though Assam is a reservoir of rice germplasms and rice varieties varying in amylose content are processed into different rice products, very limited studies have been carried out till date on the physicochemical and functional properties of the rice grains and their flours and the effect of processing on these properties have not been evaluated.

Bhojachaul

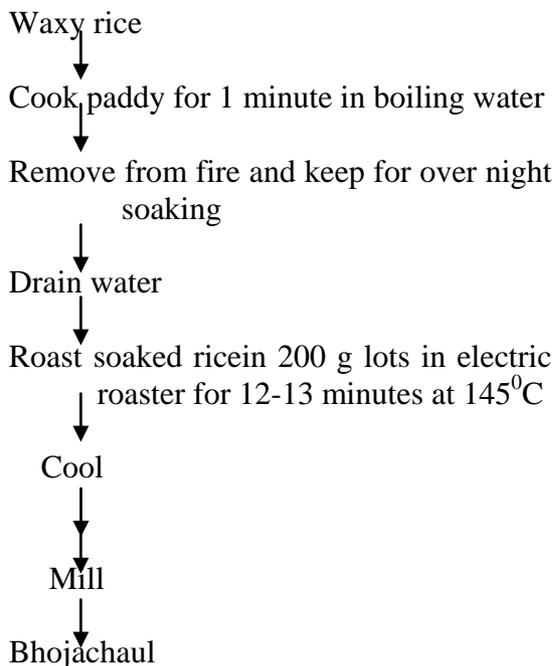
Bhojachaul in simple terms is a dry heat parboiled rice product. Bhojachaul grain does not undergo excessive structural and morphological disorganization during the process. Waxy paddy is soaked for 3-4 days at room temperature after which the water is drained out. The moistened paddy is roasted in an iron vessel over wood fire with constant stirring. Roasting is stopped when the grains sufficiently dry up. The roasted paddy is spread over mud floor to cool for about 30 minutes before milling in a dheki (a hand and foot operated pounding and milling device) to get Bhojachaul. However, many variations can be seen in the time and temperature of soaking and roasting in different rural households. Soaking in hot water overnight or boiling the soaked paddy till very fine split in a few husks occur are also practiced by some. The roasting temperature is controlled by the intensity of the wood fire. The prepared Bhojachaul is soaked in water at room temperature prior to consumption to let it hydrate sufficiently to an optimum level. The excess water is squeezed out with hand during which the sticky grains cling to one another forming an oval and flat shaped lump. These lumps are eaten with milk, cream, curd and jaggery. According to the rural household processors, the desirable characteristics of Bhojachaul are the roasted aroma and colour, a sticky and chewy texture and appearance of the rice grains clinging together to form the lump

Bhojachaul

Traditional Method



Improved Method



Instant preparations can be made out of Bhojachaul.

Hurum

Hurum is an expanded rice product made from waxy bora rice of Assam . The product is traditionally relished with milk and sugar or jaggery. It is distinctly different from the more popular moori both in the processing method and the product quality. The extensive expansion and translucency acquired during processing are the distinctive characteristics of Hurum. The basic traditional parboiling method comprises the following steps: full soaking of paddy, parboiling, dehiscing at high moisture, immediate flaking, rubbing fat to the flaked rice and expansion in sand. This product can therefore be called as expanded flaked' rice. Mishra et al (2000) identified the essential steps of Hurum making in the laboratory using paddy processed by normal, dry-heat and pressure parboiling methods. Based on the findings, a process was further optimized for cottage scale production of Hurum. Instead of a longer soaking period and intermediate simmering in water, the authors soaked paddy overnight in freshly boiled water and allowed for self-cooling to room temperature to allow optimum moisture absorption. It was directly followed by vigorous roasting in sand on the bhatti to bring the moisture content down to 21-23 % . The paddy was then simultaneously flaked and dehiscing in an edge runner in a flaked rice mill. The flaked and dehiscing kernels were rubbed with an optimum amount of hydrogenated oil. The oiled flaked rice was then roasted for a short time to obtain expanded Hurum.

Hurum (Expanded waxy rice)

Traditional

Waxy paddy

↓
Soak in water at RT for 3-4 days

↓
Drain water

↓
Bring paddy to simmer in fresh water

↓
Drain water

↓
Cool paddy by pouring water

↓
Drain water

↓
Roast paddy without sand until easy to dehusk

↓
Spread to cool

↓
Dehusk paddy in 'Dheki'

↓
Rub fat or oil to flake kernels

↓
Expand in heated pan

↓
Hurum

Hurum is an instant preparation can be consumed with milk or curd as breakfast food or light food.

Improved

Waxy rice

↓
Soak in water at boiling temperature cover and leave over night

↓
Drain water

↓
Dry heat par boil

↓
Cool the par boil rice

↓
Flake 2 kg par boil rice in an edge runner for 2 minutes

↓
Rub fat in hot sand for 14 second

↓
Hurum

Sandhoguri (Fried rice powder)

Traditional

Bora, chokowa, sali, lahi alone or in mixture

↓
Parboil by double boiling method

↓
Sundry for 2 days

↓
Dehusking in 'Dheki'

↓
Roasting without sand

↓
Immediate powdering

Improved

Chokowa rice

↓
Cook paddy for 1 minute in boiling water

↓
Remove from fire and keep for over night

↓
Drain water

↓
Par boil under pressure

↓
Dry

↓
Mill

↓
Soak par boil rice for 40 min. in cold water

↓
Drain

↓
Surface dry the rice

↓
Roast in 50 g lot

↓
Grind to coarse powder

↓
Sandohguri

Sandohguri can be taken with milk or could and/or sugar/molasses.

Conclusion :

Food preparation technique is very much a part and parcel of the culture of the region. Each region has its own method of blending flavors to bring about acceptable combination. It is necessary to retain or produce desirable appearance, colour, flavour and moisture in the course of preparation. To achieve the ends, it is necessary to understand the method used in the preparation of food.

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