



## Study of Rice, its History and Importance, with a review of Nutritional Values and Rice Growing Regions in India

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**Introduction :** *Oryza Sativa*, it is believed, is associated with wet, humid climate, though it is not a tropical plant. It is probably a descendent of wild grass that was most



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likely cultivated in the foothills of the far Eastern Himalayas. Another school of thought believes that the rice plant may have originated in southern India, then spread to the north of the country and then onwards to China. It then arrived in Korea, the Philippines (about 2000 B. C.) and then Japan and Indonesia (about 1000 B. C.). When Alexander the Great invaded India in 327 B. C., it is believed that he took rice back to Greece. Arab travelers took it to Egypt, Morocco and Spain and that is how it travelled all across Europe. Portugal and Netherlands took rice to their colonies in West Africa and then it travelled to America through the 'Columbian Exchange' of natural resources. But as is traditionally known, rice is a slow starter and this is also true to the fact that it took close to two centuries after the voyages of Columbus for rice to take root in the Americas. Thereafter the journey of rice continues with the Moors taking it to Spain in 700 A. D. and then the Spanish brought rice to South America at the beginning of 17th century.

Rice is undoubtedly the most important cereal of the world providing 21% of global human per capita energy and 15% of per capita protein (Maclean et al., 2002). South Asia, one of the major centers for rice domestication, has been described as the "food basket" and "food bowl" of Asia. Among all the Asian countries, India is the prominent rice growing country accounting for about 20% of all world rice production. Apart from the traditional varieties, India is home to wide varieties of rice cultivars, landraces and many lesser known varieties that have been under cultivation since ages by farmers as well as local entrepreneurs. These cultivars were developed through selections, based on desirable characters such as grain yield, aroma, grain length, cooking quality and adaptation to various abiotic stresses. Such process of selection resulted in a wide spectrum of rice varieties adapted to a wide range of agro-ecological conditions. That is why almost all the rice growing provinces of India have their own locally adapted cultivars



suitable for particular agro-climatic conditions as well as local preferences (Singh et al., 2003). Many of these varieties are highly valued in the domestic market and were also patronized by many erstwhile royal families (Pachauri et al., 2010). Since ages, most of the locally grown cultivars have been known by their local/common dialect names and hence no or very few records of the genetic nature and background of such varieties are available. It is believed that some of these varieties may have originally belonged to some other state/region and have travelled a long route of domestication hundreds of years ago (Pratheepa, 2009). Therefore, there molecular and phenotypic characterization could reveal their phylogeny and this information would be quite useful in utilizing these germplasms in genetic improvement of the existing rice varieties.

**History of Rice in India:** India is an important centre of rice cultivation. The rice is cultivated on the largest areas in India. Historians believe that while the indica variety of rice was first domesticated in the area covering the foothills of the Eastern Himalayas (i.e. north-eastern India), stretching through Burma, Thailand, Laos, Vietnam and Southern China, the japonica variety was domesticated from wild rice in southern China which was introduced to India. Perennial wild rice still grow in Assam and Nepal. It seems to have appeared around 1400 BC in southern India after its domestication in the northern plains. It then spread to all the fertilized alluvial plains watered by rivers. Some says that the word rice is derived from the Tamil word arisi.

Rice is first mentioned in the Yajur Veda (c. 1500-800 BC) and then is frequently referred to in Sanskrit texts. In India there is a saying that grains of rice should be like two brothers, close but not stuck together. Rice is often directly associated with prosperity and fertility; hence there is the custom of throwing rice at newlyweds. In India, rice is always the first food offered to the babies when they start eating solids or to husband by his new bride, to ensure they will have children.

### **Importance of Rice:**

Rice has shaped the culture, diets and economic of thousand of millions of peoples. For more than half of the humanity “ rice is life”. Considering its importance position, the United Nation designated year 2004 as the “International Year of rice. Importance of rice are as follows:



- Rice is an important staple food crop for more than 60 per cent of the world people. In 2008, more than 430 million metric tons of rice were consumed worldwide, according to the USDA.
- Ready to eat products eg. popped and puffed rice, instant or rice flakes, canned rice and fermented products are produced
- Rice straw is used as cattle feed, used for thatching roof and in cottage industry for preparation of hats, mats, ropes, sound absorbing , straw board and used as litter material.
- Rice husk is used as animal feed, for paper making and as fuel source.
- Rice bran is used in cattle and poultry feed, defatted bran, which is rich in protein, can be used in the preparation of biscuits and as cattle feed.
- Rice bran oil is used in soap industry. Refined oil can be used as a cooling medium like cotton seed oil / corn oil. Rice bran wax, a byproduct of rice bran oil is used in industries.

#### **Scientific Name:**

The two major rice varieties grown world wide today are *Oryza sativa indica* and *Oryza sativa japonica*. The two cultivated rice species, *Oryza sativa* L. and *O. glaberrima* Steud., belong to a species group called *Oryza sativa* complex together with the five wild taxa, *O. rufipogon* (sensu lato), *O. longistaminata* Chev. et Roehr., *O. barthii* A. Chev., *O. glumaepatula* Steud., and *O. meridionalis* Ng. Among these taxa, only *O. rufipogon* produces fertile F1 hybrids with *O. sativa* and therefore these two species are considered to belong to a single biological species. Together with all circumstantial evidence, this suggests that *O. rufipogon* is the ancestor of *O. sativa*. Similarly, it leaves no doubt that *O. barthii* is the ancestor of African rice *O. glaberrima*.

#### **Botanical Description:**

The rice plant is a member of Poaceae (old Gramineae) family. The common cultivated rice plant is an annual which usually grows to a height of a half meter or two meters but there are certain varieties that grow much taller (6-9 metres). Some deep water rice varieties grow with the gradual rise of the flood water level. Rice plant can be divided into main two parts namely root system and shoot system:

#### **Root system:**

When a rice grain germinates in a well drained, upland soil the sheath (coleorhizae) emerges. If it germinates in submerged low lands, coleoptile emerges ahead of the coleorhizae. The primary,



embryonic roots (radicle) comes out through the coleorhiza shortly after it appears. This is followed by two or more secondary roots, all of which develop lateral roots. The embryonic roots later die and are replaced by secondary adventitious roots produced from the underground nodes of the culm.

### **Shoot System:**

Collectively applies to all plant part visible above the ground level. It is mainly composed of culms, leaves and inflorescence (panicle).

- i. **Culm:** The culm or stem is made up of a series of nodes and internodes. The rice culms are usually hollows except at the nodes. Each node bears a leaf and a bud. Under favorable conditions buds near ground level grow into tillers. The primary tillers give rise to secondary tillers which give rise to tertiary tillers.
- ii. **Leaves:** The leaves of rice are sessile in nature. They are borne at an angle, on the culm in two ranks along the stem, one at each node. The leaf blade is attached to the node by the leaf sheath. The rice leaf is similar to that of wheat, but is usually distinguished from it by the length of the ligule. In the rice, ligule is very prominent, usually more than one centimeter. The leaf number is more on a primary tiller than on the secondary and tertiary tillers.
- iii. **Panicle:** The rice inflorescence known as panicle is a group of spikelets borne on the uppermost node of the culm. The primary panicle branch is divided into secondary and sometimes tertiary branches. These bear the spikelet.
- iv. **Spikelet:** The individual spikelet consists of two outer glumes. All the parts found above the outer glumes are collectively called floret. It consists of a hard covering the two sections of which are known as lemma and palea (the glumes) and the complete flower is between them. The lemma and palea together are known as the “hull”. The rice flower contains six functioning stamens (male organ) and a pistil (female organ). At the base of the flower are two transparent structures known as ‘lodicules’. Rice is a self pollinated crop. When rice flower becomes ready to bloom, the lodicules become turgid and push the lemma and palea apart, thus allowing the stamens to emerge outside the open floret. Rupturing of the anthers then leads to the



shedding of pollen grains. After the pollen grains are shed on stigma the lemma and palea close.

### **Nutritional value of Rice:**

- i. Rice is a nutritional staple food which provides instant energy as its most important component is carbohydrate (starch). On the other hand, rice is poor in nitrogenous substances with average composition of these substances being only 8per cent and fat content or lipids only negligible, i.e., 1per cent and due to this reason it is considered as a complete food for eating. Rice flour is rich in starch and is used for making various food materials. It is also used in some instances by brewers to make alcoholic malt. Likewise, rice straw mixed with other materials is used to produce porcelain, glass and pottery. Rice is also used in manufacturing of paper pulp and livestock bedding.
- ii. The variability of composition and characteristics of rice is really broad and depends on variety and environmental conditions under which the crop is grown. In husked rice, protein content ranges in between 7per cent to 12per cent. The use of nitrogen fertilizers increases the percentage content of some amino acids.
- iii. The comparative nutritional value of cereals in the table 1 showed difference in nutritional content of rice bran and raw rice. The brown rice is rich in some vitamins, especially B1 or thiamine (0.34 mg), B2 or riboflavin (0.05 mg), niacin or nicotinic acid (4.7 mg). In contrast, the white rice is poor in vitamins (0.09 mg of vitamin B1, vitamin B2 0.03 mg and 1.4 mg of niacin) and minerals as they are found mostly in the outer layers of the grain, which are removed by polishing process, or "bleaching" whereas parboiled rice is rich in these vitamins as a result of their particular process.

### **Rice Growing Region in India:**

Rice is grown under so diverse soil and climatic conditions that it is said that there is hardly any type of soil in which it cannot be grown including alkaline and acidic soils. Rice crop has also got wide physical adaptability. Therefore, it is grown from below sea-level (Kuttanad area of Kerala) upto an elevation of 2000 metres in Jammu & Kashmir, hills of Uttaranchal, Himachal



Pradesh and North-Eastern Hills (NEH) areas. The rice growing areas in the country can be broadly grouped into five regions as discussed below :

- a. North-Eastern Region: This region comprises of Assam and North eastern states. In Assam rice is grown in the basin of Brahmaputra river. This region receives very heavy rainfall and rice is grown under rain fed condition.
- b. Eastern Region This region comprises of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Eastern Uttar Pradesh and West Bengal. In this region rice is grown in the basins of Ganga and Mahanadi rivers and has the highest intensity of rice cultivation in the country. This region receives heavy rainfall and rice is grown mainly under rain fed conditions.
- c. Northern Region: This region comprises of Haryana, Punjab, Western Uttar Pradesh, Uttarakhand, Himachal Pradesh and Jammu & Kashmir. The region experiences low winter temperature and single crop of rice from May-July to September-December is grown.
- d. Western Region: This region comprises of Gujarat, Maharashtra and Rajasthan. Rice is largely grown under rain fed condition during June-August to October - December.
- e. Southern Region: This region comprises of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu.

Rice is mainly grown in deltaic tracts of Godavari, Krishna and Cauvery rivers and the non-deltaic rain fed area of Tamil Nadu and Andhra Pradesh. Rice is grown under irrigated condition in deltaic tracts.

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