

## STATUS, DISTRIBUTION AND CONSERVATION OF SOME THREATENED INDIGENOUS RICE VARIETIES CULTIVATED IN ODISHA, INDIA

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### *Abstract*

*The article presents an ethnobotanical investigation with the purpose to explore the traditional rice varieties cultivated in the interior localities of Jajpur district, Odisha, India. A total of 39 varieties of paddy, befitting the geo-climatic conditions of the place were identified. Most of them are disease and pest resistant varieties, suitable for lowland cultivation. They are also resistant to water logging and flooding. These traditional varieties are gradually being replaced by the high yielding hybrid germplasms, thereby threatening the existence of many invaluable traits present in such local landraces.*

**Keywords:** Local landrace; Rice germplasm; Jajpur district.

### **Introduction**

Rice, the staple food for more than 70% people of Indians, plays a pivotal role in Indian agriculture [1]. It is one of the most valuable crops among the food grains of India and covers about 25% of the gross sown area [2]. Moreover, more than three billion people throughout the world and particularly in South East Asia depend on rice [3]. The Indians have a long tradition of rice cultivation. Their country is supposed to be its land of origin, due to the maximum genetic diversity of this crop in the region. In fact, there were about 30,000 types of indigenous rice cultivars available in India [4], possessing many interesting and beneficial characteristics befitting the diverse geo-climatic conditions of this land. Yet, today only about 8000 botanically different varieties of rice are in existence in the whole world, out of which more than 4000 varieties were identified in India [5, 6].

Odisha, in Eastern India, harbours a rich diversity of rice varieties and is one of the premier rice growing states in the country. The state has 0.44 million hectares of land with this crop, producing 10,322,325 tons of paddy per year [7]. The farmers of Odisha have been cultivating traditional varieties of rice from time immemorial. Their methods have been developed by continuous practice and trial. The knowledge acquired through long experience was transmitted from generation to generation orally in the form of popular folklore and folk

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sayings [8, 9]. But this scenario was changed in the later part of 20th century and, consequently, much of those landrace varieties became extinct or are now on the verge of extinction. With the advent of hybrid revolution in agriculture during the 1960s-70s, the farmers welcomed and gladly accepted the hybrid seeds with a higher yield. As a result, the local landraces and specifically the traditional rice varieties have lost their acceptability and were replaced by new varieties, with high yielding characters.

Some of the indigenous rice cultivars became extinct, save a few in some interior places and tribal pockets of the country. Those local landraces of rice, however, regained their importance in the last decade of the 20th century, when the hybrid seeds failed to give the desired result being attacked by different infectious pests, diseases and other climatic hazards. The collection, conservation and maintenance of traditional varieties, then, became inevitable, so that their traits, like resistance to specific pests, diseases, salt and stress tolerance or erratic climate, could be saved and utilized in the future, for developing suitable new varieties. The National Bureau of Plant genetic resources (NBPGR), the premier central organization for conservation of germplasm, in collaboration with IBPGR are taking steps to collect and conserve those genes. But all the interior localities and rural pockets of the state, where tribal and rural folk still cultivate some of the landrace types, are not included in that program. In this context, there are no reports from Jajpur district of Odisha. The present study was carried out in rural areas of the district, to survey, explore and document the existence of such indigenous rice germplasms.

## Materials and Methods

Jajpur district ( $85^{\circ}40'$  –  $86^{\circ}44'$  E and  $20^{\circ}33'$  –  $21^{\circ}10'$  N) is situated in the coastal Odisha and covers an area of 2889 km<sup>2</sup>, with a population of 16.25 lakhs (2001 Census). It is bordered by Keonjhar district in the North, Cuttack in the South, Bhadrak in the East and Dhenkanal in the Western part. The district accounts for 1.86% of the state's territory and shares 4.41% of the state's population. Most of the people live in villages (95.51%) and agriculture is their main occupation. The net area sown in the district is around 140 thousand hectares, out of the 4796 thousand hectares in the state, producing around 316806 tons of paddies per year (Anonymous, 2010). The district has its unique importance in India, as 'Navigaya Kshetra' or "Birajakshetra". The shrines of "Sweta-Varah" (the white boar incarnation of Lord Vishnu) and "Sapta Matruka" (the seven mothers), along with numerous ancient shrines are further characteristic features of the area.

The climate of the district is warm and humid. Three distinct seasons are felt during the year. The rainy season (mid June to mid October), winter (mid October to February) and summer (March to mid June). The air temperature ranges from 38°C in the summer to 13°C in the winter, and the annual average rainfall is approximately 1500mm. The district is located in the deltaic region with close proximity to the Bay of Bengal. Obviously, it has all the features of a coastal climate, i.e. saline weather, influence of coastal wind and cyclone proneness. Most of this district is covered by the Brahmani – The Baitarani Delta with riverine and deltaic plains (75%) and hills occupy (25%). The soil of the eastern and central parts of the district is alluvial, whereas the western and northern parts have red and laterite soil in the foothill areas [10].

The people of Jajpur district are cultivating the traditional variety of paddy from times immemorial. With the introduction of mechanized agriculture and high yielding variety of

hybrid seeds there have been changes in farming patterns. But a few rural and tribal farmers in some interior pockets are still adopting the traditional method, using the indigenous rice germplasm inherited from their ancestors centuries ago. Our study was conducted for a period of two years (from June 2008 to May 2010) covering all of the 10 blocks (Bari, Barachana, Rasulpur, Binjharpur, Danagadi, Dasarathpur, Dharmasala, Jajpur, Korei & Sukinda) of the district. Villages where the paddy is the chief agricultural product were studied with prior information, collected from district agricultural office, as well as block headquarters. The experienced and old farmers were consulted and we received help from Gram Sevak, or village level revenue functionaries. Samples, if any, and all relevant data concerning the characteristics of a particular rice germplasm, cultivation practices, the land and soil suitable for a definite traditional variety, the necessity of water, the amount of yield or any other typical characteristic of a landrace variety etc. were collected and recorded. Further, in consultation with the peasants, the name and characteristics of the types cultivated previously in a locality, already extinct due to use discontinuation, were also noted. The data were compiled and relevant references were scrutinized to ascertain similar observations from other districts of the state. The name of a particular variety and its character like nature of land and soil where it is suitable for cultivation, plant height, grain size, colour, amount of yield and any specific feature are enumerated alphabetically in a tabular form for convenience of study. Varieties already extinct in a locality are indicated with asterisk mark.

## Results and discussions

The results revealed that 39 varieties of traditional rice germplasm were cultivated in the surveyed area (Table 1). Out of those 39 varieties, eight varieties were already extinct and the remaining were in a threatened state. A close scrutiny of data indicated that, except for a few varieties named 'Asina', 'Basumati', 'Puntia', 'Sathia' or 'Suryakanti', the majority are recent varieties, which, after being sown, need around six months before harvesting. They are also suitable for low land cultivation, which can withstand water logging as well as flooding, a common phenomenon in that district. Again the straws of the traditional varieties are hard and elastic, suitable for thatching houses, not as those of the high yielding varieties. Moreover, most of the varieties are without scent and are disease and pest resistant, with a moderate yield, requiring no chemical fertilizer and pesticides. These traditional varieties are commonly used for preparing cooked rice, fried rice and parched paddy colloquially called 'Mudhi' and 'Khai', flattened rice and watered rice. But it is a matter of regret that some of these varieties have disappeared from the locality, being replaced by the higher yielding hybrid varieties of paddy.

Landraces or traditional cultivars have a certain genetic integrity. They are balanced in population, variable and in equilibrium with both the environment and the pathogens and are genetically dynamic. Most importantly they are genetically diverse [11]. The genetic variability of these land races provides some built-in insurance against hazards of diseases and pest. They also provide some yield despite drought, flooding, hail, frost, diseases and pests etc. [12]. Such indigenous plants have a good power of physiological adaptation, they integrate in the ecosystem, mixed cultivation, along with fish, ducks and mollusks. Most of them have good yield without or with little need for fertilizers and pesticides. They are not long termed deleterious biological magnifiers in the ecological food chain.

When local landraces of rice are concerned, India is supposed to be their home in what is called Vavilov centre [13]. Zeven and Zhukovsky[14] (1975) have also included South Asia i.e. India and Burma (Myanmar) in the center – 4 i.e. Hindusthani center of diversity of this crop. Moreover, the Koraput district of Odisha is believed to be the place where rice originated from.

**Table 1.** Types and characteristics of traditional rice germplasm

Name of the variety	Nature of the land	Plant height(feet), grain size and colour	Average yield (q/ha)	Specific character/Use
Anjana JR-127	Low	5.0, medium blackish	31.24	Suitable for cooked and flattened rice.
Asina JR-132	High	4.0, medium thick, white	23.43	
Badala JR-102	Very low	5.0, medium thick, blackish	26.55	Suitable for boiled rice, flattened rice and rice cake.
Barapanka JR-72	Moderately high	4.5, long narrow, curved and grayish	18.74	Rice reddish coloured, early variety.
Basumati JR-18	High	3.5, long , narrow and white	31.24	Early variety, scented and suitable for rice pudding.
Bedanga JR-61	Low	5.0, long, thick and white	34.36	Boiled and flattened rice.
Betanati*	Low	4.5 , small, thick and white	28.11	Boiled rice.
Bhelari*	Low	5.0, small ,thick and grayish	31.24	Suitable for cooking and rice cake
Birijana JR-07	Low	4.5, medium and blackish	43.13	Suitable for cooked and fried rice.
Chauli JR-15	Low	5.0, long, thick and white	31.24	Suitable for cooking and flattened rice.
Dudukalama JR-3	Moderately low	5.0, long, and white	31.24	Cooked rice and scented.
Gangabali jr-64	Moderately low	4.0, small, thick and white	31.24	Suitable for cooked and fried rice.
Kaladhusuri JR-103	Moderately low	4.5, long narrow and blackish	34.36	Suitable for cooked and flattened rice.
Kalamabanka JR-52	Moderately low	4.5, long narrow, curved and greyish	23.43	Flattened rice.
Kalaktaki JR-48	Moderately low	5.0,small,heavyand blackish grey	34.36	Cooked and watered rice.
Kalasabalakhi JR-23	Moderately low	5.0, long and white	39.05	Cooked and flattened rice.
Kalashree JR-02	Low	4.0, small ,thick and white	39.05	Cooked and flattened rice.
Kamini JR-14	High	4.0, small, flat and white	18.74	Highly scented, suitable for rice pudding and ghee rice.
Kandhadhosara JR-30	Moderate	4.5, long, thick and blackish	34.36	Cooked and flattened rice.
Khura*	Moderate	4.5, small and blackish	31.24	Parched rice.
Machakanta*	Moderate	4.5, long,narrow,little curved and white	24.99	Scented, suitable for rice pudding.
Matiasaluri JR-01	Moderately low	4.5, long, thick and blackish	31.24	Watered rice.
Medana JR-09	Moderately low	4.5, long, narrow and white	31.24	Cooked rice.
Meghanada*	Moderately low	4.5, medium and black	23.43	Cooked and flattened rice.
Nadiaphula*	Moderate	4.5, short, thick and white	24.99	Lightly scented, cooked rice.
Naliasina JR-19	Moderate	4.0,medium,narrow,redish white	31.24	Coked and flattened rice.
Paninagara JR-05	Low	5.0,long ,thick and white	34.36	Cooked and flattened rice.
Pasakathi JR-06	Moderate	4.5,very long and white	31.24	Flattened rice.
Patasadi JR-11	Very low	5.0, short ,thick and grayish black	31.24	Withstand flooding, rice cake.
Patini JR-13	Low	5.0, long, thick and white	39.05	Flattened and roasted rice.
Pharam Nagara JR-04	Moderately low	4.5, long and white	31.24	Cooked rice.
Puntia JR-27	Moderately high	4.0, long, thick, long awned and white	23.43	Early variety, cooked rice.
Rabana JR-58	Very low	5.5, long ,thick,awned and white	31.24	Resistant to flooding, cooked and flattened rice.
Rakta Mandar *	Low	5.0, medium ,thick, long awned and red	31.24	Cooked rice.
Ramaboiti JR-113	Moderately low	4.5, medium ,thick, long awned and red	34.36	Cooked rice
Ranganadya*	Moderately low	4.5, short ,thick and red	31.24	Cooked rice.
Sathia JR-21	High	4.5, long ,thick and white gray	23.43	Early variety, cooked rice.
Suluri Champa JR-08	Moderate	4.0, narrow, medium and white	28.11	Cooked rice.
Suryakanti JR-33	High	4.0, long,thick,medium and white	15.62	Early variety, cooked and flattened rice.

That is evident from the availability of more than 300 local varieties of paddy still cultivated by the tribal farmers, by applying the age-old method of agriculture. It is because of

this that the place was recently declared a globally important agricultural heritage system by the FAO. This homeland is vitally important to plant breeders, because that is where the greatest genetic diversity of the crop is available. Such diversity is the safety net that ensures that no disease, pest or environmental change can send a species to extinction. This genetic pool or germplasm is key to this century's greatest advance in crop breeding. Realizing the importance of the local landraces, different international as well as national scientific organizations are taking steps to collect and conserve such invaluable germplasms. The present effort may help such endeavors to preserve the traditional rice varieties available and cultivated in this region, for the benefit of posterity.

## Conclusions

The present study indicates the persistence of indigenous rice varieties still cultivated by the small and marginal farmers of this locality. Thereby they become instrumental in saving it from the brink of extinction even in the face of hybrid revolution.

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