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Short Research Article

Studies on Existing Indigenous Rice Landraces and their Survival Strategies at Old Alluvial Region of North and South Dinajpur, West Bengal, India- A Case Study

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Abstract

The excellent rice biodiversity of old alluvial region of North and South Dinajpur district in West Bengal had a long history and it had been developed through evolutionary process over a long period of time and sustained through ages by maintaining a perfect interaction with the environment and ecosystem. However, that rich rice biodiversity is under threat as most of the varieties are extinct only with some exception. The existing indigenous rice landraces have been studied based on their associated ethnic cultivation techniques, adaptation, stress tolerance, morphological and physiological characters, overall production and current existence status. The landraces are well adapted under various agro-ecological conditions. Diversity can be observed in their morphological and physiological characters, tolerance to stress and response to different traditional agro techniques. The existence of these varieties are either because of their extra ordinary adaptation or stress tolerance character or excellent grain quality and therefore, high market price. Involvement of certain cultivars in ethnic and socio-religious life also plays an important role towards the survival of these landraces under the scenario of a disappearing indigenous rice biodiversity in this region. Suitable market oriented cultivation in terms of organic crop, promoting commercially as holistic food, processed product, aromatic quality rice etc. can increase demand and market price of these cultivars. Side by side, conservation and research work should be enhanced for these underutilized varieties. With such strategies cultivars can find their way of survival.

1. Introduction

Old alluvial region of North and South Dinajpur district in West Bengal, India has a long historical background. This region and its neighbouring areas were known as *Barendrabhumi* in history. The Bengali word *Barendra* comes from the Bengali words *Bor* (boon)+*Indra* (the god of fertility) and *bhumi* means land. *Barendrabhumi* indicates the meaning as 'the land having the boon of the god of fertility' (Sen, 2008a). In ancient period, the region was a part of the kingdom *Pundrabardhan*, which was initially a non-aryan state, mentioned in *Mahabharata*. Soil of this region itself indicates its oldness as old alluvial soil. Different rivers flowing over the region are mentioned in various ancient references (Roy, 2008). Historian Dr. Mehrab Ali mentioned about the existence of non-aryan paddy based rice-civilization (in Bengali *Bhat Sabhyata*) in ancient time in this region and neighbouring areas (Sen, 2008a). During 1100 AD, in *Ramcharit* or *Ramcharitam*, Sandhyakar Nandi had written about the rice biodiversity during the description of a village in *Barendrabhumi* (en.wikipedia.org). In different old references of Bengali literature like *Shunyo Puran* written by Ramai Pandit during 1300 AD (Chattopadhyay, 1977), *Shibayan Kabyo*, mentioned about various rice varieties of Bengal including the varieties of this region. Very specific information regarding rice varieties of Dinajpur district (erstwhile) is found in the book 'A statistical Account of Bengal (volume VII)' written by W. W. Hunter. A statement of G. Watt (1891) regarding Rangpur, neighbouring district of Dinajpur (erstwhile) –*almost every considerable village has a variety of its own*- is very significant for rice biodiversity of this region. So, it can be assumed that the excellent rice diversity of this region had a long history and it had been developed through evolutionary process over a long period of time and it sustained through ages by maintaining a perfect interaction with the environment and ecosystem. However, that rich rice biodiversity is under threat as most of the varieties are extinct only with some exception (Sen, 2008b).

Keeping in view of the above facts, current study has been

conducted to know about the characteristic features of the existing landraces of this traditional biodiversity in respect of their ecological adaptation, cultivation techniques, and existence status and to develop survival strategies by exploring their potential scope and opportunity. Conservation and research aspect associated with these existing indigenous varieties have also been taken into consideration during the investigation.

2. Materials and Methods

The present investigation was conducted in the old alluvial region of North (Raiganj subdivision is only under this) and South Dinajpur, West Bengal, India situated between 88° 2′ to 89° 1′ East longitude and 25° 10′ to 25° 48′ North longitude. Soil of the existing area ranges from loamy to clay with medium to high water holding capacity, moderately acidic with low to medium in organic carbon, low in available nitrogen, medium to high in available phosphorous and low in available potassium.

The study area has been well known for its diversity in local aromatic and non-aromatic rice land races. Investigation has two phases; in the first phase, survey was conducted to gather the relevant information about the existing land races, ethnic cultivation techniques for both *aus* as well as *aman* during 2006 and 2007. *Aus* and *aman* are the growing seasons of traditional photosensitive rice in the eastern part of the country. The agronomic data have been collected from the multilocational fields during same years. In 2012 and 2013, investigation conducted mostly on those areas where indigenous landraces were found during first phase of the work, to know their existence status after about 5-6 years.

3. Results and Discussion

Indigenous rice landraces have been evaluated based on their associated ethnic cultivation techniques, adaptation, stress tolerance, morphological and physiological characters, overall production and current existence status. The results have been presented and discussed according to their agro-ecological adaptation (Figure 1, 2, 3 and 4).

3.1. Characteristic features of the existing landraces, status of their existence, scope and opportunity

3.1.1. Deep to very deep (>1 m) and medium deep (15-50 cm) water lowland agro-ecosystem

3.1.1.1. Existing landraces, their ecological adaptation and associated cultivation techniques

Deep to very deep water landraces are Boona, Janroi, Jagdala, Kalirai, Jata etc. In the region, a major area comes under deep to very deep water low land. Inundation during rainy season is a common and regular phenomenon where traditional farming community practise agricultural activities adapted to that agro ecosystem. Generations after generations they could realize the situations, made them educated from nature through their experience, knowledge and accepted such genotypes which can tolerate stress in the form of inundation and flood. During hot summer of April-May, when low lands are dried, farmers sow their indigenous low land rice cultivars by the method of broadcasting, mostly without any land preparation i.e. under no-till condition. With pre-monsoon showers, seeds germinate followed by exponential growth of young seedlings. As the monsoon onsets, internodal elongation of the rice tillers starts with the rise of water level of lowlands. Under heavy flood, different low land varieties can withstand 1 to 3 metre or more water levels by floating their elongated slightly climbing stems. After flood, when inundated water starts receding, long, slightly climbing stems of rice plants remain laid on the semi-aquatic field. Gradually top part of the tillers remains partially erect at an acute angle with the horizontal surface of land. Stem of these varieties are thicker and leaves are broader than other indigenous varieties. Deep to very deep water rice varieties are grown without any externally supplied manure, chemical fertilizers or pesticides. Fertility status of low lands is normally sufficient to supply nutrients for these varieties grown as single crop in a year. These cultivars are more disease pest tolerant and therefore can be grown without use of any pesticides. These varieties are harvested during second fortnight of December to even first fortnight of January, after recession of standing water from the field. During harvesting, mostly partially erected panicle with a stem portion is harvested and horizontally laid tillers are left as residues. Variations are found in grain colour and size and shape of grain in different landraces under this agro ecosystem. Seed dormancy is a characteristic feature of the landraces under this ecosystem. Therefore, seeds which are fallen even on the moist soil, do not germinate during off season. Productivity of deep water rice genotypes are mostly between 3000−4500 kg ha^{-1} depending upon the availability of suitable growing condition. Production of bolder grains, more number of grains $panicle^{-1}$ and long duration are very important factors for higher productivity of these landraces compared to other indigenous landraces. Overall nature of these very deep water lowland cultivars is close to wild character.

Cultivars which are presently cultivated in medium deep lowland agro-ecosystem as rain fed crop are Changa, Silkumari, Shashimohan, and Mala. They are normally grown as transplanted rice. Sowing and transplanting operations are conducted during first fortnight of June and throughout the month of July, respectively. Direct sowing by broadcasting seeds is also practised. The landraces may grow up to a height of 120 to 180 cm depending upon the growing condition and landrace. These genotypes can withstand flood water until they


Figure 1: Deep water varieties Boona (left) and Jata (right) at vegetative stage grown in low lands


Figure 2: Shallow deep water non aromatic varieties Malsira (left) and Nagra (right


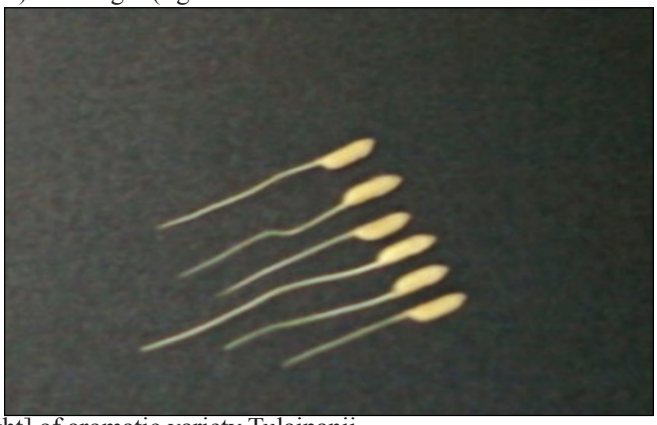

Figure 3: Panicle (in the field) [left] and grain (having awn) [right] of aromatic variety Tulaipanji


.Figure 4: Aromatic varieties Chinisakkar (left) and Khoishala (right) at reproductive stage

were fully emerged for a day to few days. They are cultivated without any fertilizers and pesticides. Harvesting is done during the month of December. The varieties has weak stem which lodge completely or partially at the stage of maturity due to weight of grains. To make the harvesting process easy, a bamboo is being driven by two persons with the help of two short ropes tied at the two opposite ends over the crop field in a single direction. Depending upon the growing conditions and landrace, yield varies from about 3000 to 4000 kg ha^{-1}. Due to bolder grain formation, yields of these genotypes are higher than landraces grown under shallow deep water lowlands and uplands. Colour, size and shape of grain vary in different landraces. Dormancy is also common for these landraces.

3.1.1.2. Present existence status

Genotypes adapted under medium deep to very deep water low land agro-ecosystem are least affected due to their typical adaptation to withstand deep water and flood situation. Availability of high yielding varieties for this type of agro-ecosystems are comparatively less and not much popular in this area under study. This also reduces the chance of indigenous varietal replacement with high yielding varieties. Some aged farmers are cultivating these landraces only because of their agri-tradition and taste habit. However, existing varieties are not beyond the threat. In fact, how long they will survive, that is a major cause of concern if their potential scope and opportunities are not properly utilized. Their present area of cultivation has been shrunk to a negligible amount with respect to their traditional areas. Traditionally water stagnation due to flood or heavy rainfall was a regular incidence in low lands. Therefore, flood tolerant landraces were also cultivated on a regular basis in low lands. In recent past, as there have been less incidence of heavy rainfall or flood, high yielding varieties suitable under shallow deep low land agro ecosystems have been expanded to traditional flood prone low lands. It is also noticed that there is a growing tendency among the farmers to keep the low land flood prone areas uncultivated during rainy season with traditional landraces; instead farmers are becoming more encouraged for *boro* rice cultivation with high yielding varieties. As a matter of fact, farmers are getting at least one assured rice crop with heavy yield from these potential flood affected low lands. Sometimes, after harvesting of *boro* rice, they are also growing high yielding varieties even with the risk of flood. If there is flood, farmers go for contingency cropping with early tori or mustard crop after recession of flood water. Otherwise, they normally get a good production of high yielding rice.

3.1.1.3. Strategies towards utilization of potential scope and opportunities

Present existing indigenous rice genotypes under low land agro ecosystem will only survive if livelihood of the farmers who are traditionally engaged in cultivation of these landraces are assured and well protected. That can be possible by identifying the farming community and certifying the traditional rice grain and products as organic by an appropriate institutional initiative since the adopted cultivation process is very much free from chemicals and eco-friendly, organic farming by default. As there is growing demand for organic and traditional food products in the market, these traditional rice growers can fetch premium price for their produce with proper market linkage. Growing of these landraces should not be left only as an agri-tradition of the farmers, but effort may be initiated to encourage the farmers to grow them as a commercial crop by utilizing their full potentiality. Deep to medium deep lowland varieties whichever is in existence, are bold grained and could not fetch good price in the market normally. However, these bold grained rice have uses in traditional agro-processed country-made products such as *chire* (beaten rice, prepared by pressing the soaked rice grains) and *muri* (puffed rice, prepared by popping the soaked rice grain or moist milled rice), the food products which are purely organic, having high food value and lot of consumers prefer to get them with a premium price. The need of the hour is to organise these traditional sector of food-processing and link them with the market channel after due value addition to the products such as grading and packaging. Traditionally Chenga and Silkumari varieties are very famous for good quality *muri* preparation. Another marketing strength of lowland varieties is the presence of red coloured bran in the husked unmilled grain. Grain containing red coloured bran is considered very well for health according to *Ayurveda* (Nene, 2005). Therefore, un-milled red coloured grains obtained from lowland varieties can be marketed under the brand 'holistic food' in national and international market.

3.1.2. Shallow deep water (0-15 cm) lowland and upland ecosystems

3.1.2.1. Non-aromatic landraces

3.1.2.1.1. Existing landraces, their ecological adaptation and associated cultivation techniques

During the first phase of study in 2006 and 2007, landraces like Nagra, Kalamkathi, Dudhkalam, Indrasail, Khatobada, Jhingasail, Katar, Malsira, Konchisail, Magursail, Dwarikasail, Kartiksail, Patharkuchi, Kanakchur were found in some or few places, however, their existence were under threat. Except a few like Malsira, Nagra, Magursail, Jhingasail, Joshoa, Kanakchur, other cultivars are now difficult to trace them out. The word *Sail* suffixed to different varieties of these shallow deep medium land agro ecosystem, derived from the Bengali word *Sali*, which indicates about transplanted rice. Therefore, it can be concluded that traditionally these cultivars were grown

as transplanted crop for a long period of time. Seeds of these landraces were normally sown between second fortnight of June to first fortnight of July in seedbed and transplantation conducted at an age of 30-40 days after sowing. Traditionally, sometimes *Bolan* or *Duguchhi* i.e. double transplanting are followed. Height of these landraces varies from 100 cm to 130 cm depending upon the landraces and their growing condition. Traditionally these cultivars are grown with organic sources of nutrients and without any pesticides. Susceptibility to lodging is a common phenomenon of these genotypes. Problem of lodging is enhanced by high soil fertility, high moisture content at maturity stage and high wind velocity. Harvesting normally carried out during end of November to mid-December. Bamboo driven pre-harvesting treatment is followed in case of almost all landraces. Depending upon the landraces and growing conditions, yield varies from 2000 kg ha^{-1} to 3500 kg ha^{-1}. These landraces are also characterised by seed dormancy. Variations in seed colour, seed size and shape, have been found in different cultivars under this agro ecosystem.

3.1.2.1.2. Present existence status

Few landraces which are in existence, are limited to few farmers in few plots only. Malsira is one of such variety. Existence of this variety is due to its attachment with the festival *nabanna* celebrated mainly by the farmers in the villages. The word comes from the Bengali words *nabo* means new and *anna* means rice. The festival is to celebrate the consumption of new harvest of rice on the Bengali calendar month *Aghran* (mid-November to mid-December). Involvement of Malsira in the festival is probably due to their coincidence of harvesting time with the time of festival. Another landrace Nagra was also involved with the festival because of its good quality and it was almost at its maturity stage during the time of the festival. But presently Nagra is in existence only because few farmers continue its cultivation as a traditional quality grain. Joshoa, Magursail, Indrasail, Jhingasail are varieties, which have been found in existence in a few plots only as a tradition of the farmers' family. Kanakchur is in existence as it is used for preparation of good quality 'popped rice' (in Bengali known as *khoi*) for worship of god as well as traditional taste habit of farming community.

3.1.2.1.3. Strategies towards utilization of potential scope and opportunities

The existing traditional cultivars of shallow deep lowlands are highly vulnerable towards their extinction as high yielding varieties have almost completely engulfed the whole lands available under this agro ecosystem. The cultivation of few existing landraces should be promoted commercially under organic farming principles as they are very less responsive to inorganic fertilizers and genetically tolerant to diseases and insect pests. Because of the low input intensiveness, cost of cultivation is much less and management is easier for their cultivation. Hence, promotion of commercial organic farming of these cultivars will not only bring assured profit for the farmers, but also the landraces will be saved from their extinction. Production of alternate processed food like *muri*, *chire, khoi* at domestic level or in small scale agro industry and their well organised marketing can also encourage farmers to cultivate these varieties. Beside boiled rice, Nagra, Magursail, Indrasail varieties are highly popular for production of processed product *muri* and *chire.* Kanakchur is even more popular for *khoi* than boiled rice.

3.1.2.2. Aromatic landraces

3.1.2.2.1. Existing landraces, their ecological adaptation and associated cultivation techniques

Tulaipanji, Kataribhog, Chinisakkar or Chiniatap, Jirasail, Khoishala, Kalochiniatap, Begunbichi, Kalanunia are being grown under rainfed shallow deep (0−15 cm water depth) lowland rice agro ecosystem in this region of old alluvial soil. These varieties can also be grown under upland ecosystem. Topographically this ecosystem exists under medium to upper land situation. Aromatic landraces can grow under normal to late or even very late condition. Under normal condition sowing is done between mid-July to mid-August and transplanting is done at an age of 30−45 days after sowing. In case of Tulaipanji, transplanting can be done even under very late condition at the end of September (Sen et al., 2005). *Bolan* or *Duguchhi* are also followed under traditional farming. These cultivars are tall and can attain the height of 100−125 cm. Stems are thin, weak and susceptibility to lodging is high. These landraces when raised earlier, the plants attained maximum height and problem of lodging is also more. To avoid excessive vegetative growth and height, late sowing followed by transplanting is practiced and lodging can also be reduced. Aroma and other quality parameters associated with these varieties can be expressed at its maximum level when the varieties are grown under moisture and nutrient stress condition. Best quality rice grain can be obtained from poorly fertile upland fields. Fertility and moisture stress not only improve quality, but also reduce the problem of lodging. On the other hand, late to very late sowing and transplanting not only check the vegetative growth, height and lodging, but also improve quality probably because of some sort of stress. These landraces are cultivated even without or with small quantity of organic matter. Addition of organic matter up to a limited level (which did not create the problem of lodging), may increase yield by making the grain bolder, but deteriorate quality. Harvesting is carried out during mid-December. Bamboo driven pre harvesting treatment is also done at the time of harvesting. With some exception,

yield varies mostly from 1000 to 2500 kg ha^{-1} depending upon the genotypes and their respective growing situations, except Kataribhog. Yield of Kataribhog was higher and it was about 3000 to 3500 kg ha^{-1}. Comparatively higher yield of Kataribhog is attributed by its higher number of grain panicle^{-1} along with comparatively higher 1000 grain weight (Sen, 2008b). Among different aromatic landraces, Tulaipanji, Kataribhog, Kalanunia have medium long and slender shaped grain. Chinisakkar, Jirasail, Begunbichi, Kalochiniatap, Khoishala have short and medium bold to bold shaped grain. Grain colour is also variable in different cultivars.

3.1.2.2.2. Present existence status

Several aromatic rice landraces adapted under shallow deep lowland or upland ecosystems, are still growing in a considerable area of old alluvial region of South and North Dinajpur. Some varieties like Tulaipanji, Chinisakkar or Chiniatap, Kataribhog are not only cultivated as a traditional cultivar, but also as commercial crop by a huge number of farmers due to high market price. Before ten to fifteen years, these varieties were even not known outside the market of North and South Dinajpur and neighbouring few districts. Due to their excellent quality, especially in case of Tulaipanji (Sen et al., 2005), necessary initiatives have been taken from the part of Government, media, business sectors to popularise the variety Tulaipanji in national and international level. Researchers and institutes have also conducted research work on Tulaipanji in recent past. Because of all these needful action, area and market of Tulaipanji have increased to a satisfactory level. Market price of good quality Tulaipanji rice during the year 2012 was about rupees 58.00 to 65.00 kg^{-1} in local market. Chinisakkar and Kataribhog growers have also been encouraged for their production due to increasing demand and market price of these varieties. Market price of Chinisakkar and Kataribhog were about rupees 50.00 to 60.00 and 38.00 to 42.00 kg^{-1}, respectively. In spite of their low productivity, low cost of cultivation and high market price has made their cultivation profitable. Cultivars like Jirasail, Khoishala, Kalochiniatap, Begunbichi, Kalanunia are also grown as quality aromatic varieties mostly for domestic use during various cultural, social and religious festivals. Some amount may be sold in local market with good market price. The landrace Khoishala is still growing in few areas, as it is a popular variety for the preparation of scented good quality 'popped rice'.

3.1.2.2.3. Strategies towards utilization of potential scope and opportunities

Initiative should be taken to expand the already developed market in case of Tulaipanji, Kataribhog and Chinisakkar. Other quality varieties like Jirasail, Khoishala, Kalochiniatap, Begunbichi, Kalanunia should be further popularised through Govt. sectors, participation in different trade or rural or agriculture related fares, involving media, business houses etc. Since these cultivars too are non-responsive to chemical inputs like other indigenous landraces, hence organic cultivation should be encouraged with proper certification and branding, which may open up the export opportunities of these traditional non-basmati scented rice. Good digestive quality also strengthens these aromatic landraces for marketing. Probably due to fineness of rice kernel, surface area is more and that enhances reaction with digestive enzymes. Alternate use as popular processed product like *chire* in case of Kataribhog and *Khoi,* in case of Khoishala may increase market demand and price. In local market (during 2013), price of Kataribhog milled rice is ₹ 40.00 to 45.00, whereas, its *chire* is ₹ 70.00 to 75.00. Market price of Khoishala *Khoi* is ₹ 68.00 to 72.00.

3.1.2.3. Aus landraces

3.1.2.3.1. Existing landraces, their ecological adaptation and associated cultivation techniques

A significant contribution in the traditional rice biodiversity of the area under study was made by different *aus* landraces. As *aus* rice is harvested during the Bengali month *Bhadro* (about mid-August to mid-September), so, this type of rice is known as *Bhadoi* in rural areas. Presently Lal Jumma, Dhaora, Suni are only in existence. Characteristic ecological adaptation of these cultivars due to their different types of genetic expression made them valuable rice genetic resources. These genotypes are adapted in upland or shallow deep low land rice ecosystem. These agro ecological situations prevail under topographically uplands or medium lands. Some excellent characteristic features of these varieties are short duration (90 days or even less), less water requirement and tolerance to low moisture stress, hardy in nature, lower height and seed dormancy. *Aus* landraces are sown with the occurrence of pre monsoon showers during the month of mid-April to whole May. Normally they are raised as broadcasted direct sown crop. Sometimes transplanted crops are also raised. In case of direct sown crop, *beushening* is practiced to control weeds, proper plant stand, maintaining rows and to encourage tillering. In this method, about 20-30 days after sowing field is cross ploughed with an implement locally known as *bida*. Crop is cultivated without any fertilizers and pesticides or irrigation. Height of these landraces mostly varied from about 80 to 100 cm. Harvesting use to practice during the month of August. Due to high moisture content in the field and heavy rainfall during harvesting period, paddy straw cannot be dried, so only about top half portion of the plant is harvested and rest part is left as residue to be incorporated in soil as organic matter. Yield mostly varies from about 2–3 t ha^{-1} with some exception of up to 4 t ha^{-1} depending on varieties. Higher yield attributed mostly by production of bolder grains. Higher yield can be obtained

when the crop is raised as transplanted crop.

3.1.2.3.2. Present existence status

Among indigenous rice, different types of *aus* varieties were disappeared first from this area under study and they are worst affected. During 2006 and 2007, genotypes like Lal Jumma, Dhaora, Kashipanja, Suni were survived in some areas, though were under massive threat. In 2012, only Lal Jumma, Dhaora and Suni varieties have been found in existence in few plots. Existence of this cultivar is due to their close attachment with the worship of the Goddes *Manasha* ('Goddes of snake' in Bengal). As harvesting time of newly harvested *aus* rice and time of worship of Goddes coincide with each other, so, probably because of that the new rice is used for the programme. Another ritual of the farmers of rural society of this region is the eating of newly harvested *aus* or locally called '*bhadoi*' rice during the Bengali month '*Bhadro*'. These socio-religious traditions are basically responsible for the existence of a few *aus* landraces. Recently due to disappearance of most of the *aus* landraces, there is a considerable demand in the market for *aus* rice to the socio-religious traditions. As a matter of fact current (local) market price varied between Rupees 70-80 kg^{-1} (during 2013).

3.1.2.3.3. Strategies towards utilization of potential scope and opportunities

Scope and opportunity for *aus* rice is almost similar like other indigenous landraces. Organic cultivation with proper certification and branding can promote their market. *Aus* landraces contains red coloured bran at the surface of grain, so marketing as 'holistic food' is also possible. As the varieties can grow with little water and duration is very less, so they may be useful under the changing climatic condition.

3.2. Conservation and research aspect associated with the existing indigenous varieties

For research and crop improvement purpose, *ex-situ* and *in-situ* conservations of the endangered cultivars are very important. Considering their pocket adaptation and ethnic cultivation techniques, *in-situ* conservation is very important to maintain the best genetic expression. As the genotypes are underutilized, so there exist huge scope of intensive research work towards crop improvement, introduction of agronomic management techniques, ento-pathological study and genetic study. Quality assessment of grain is another very important aspect for these cultivars. Economic and market oriented study will also be useful for promoting their cultivation. Economic evaluation can highlight actual B:C ratio for these varieties in comparison to other high yielding varieties. Research can be conducted on processing aspect also. Traditionally when grains were husked by *Dheki,* then bran was not removed. According to consumers, rice kernel with bran provides better quality in terms of taste and aroma. Scientific study (Buttery et al*.,* 1983) also reported about lower concentration of 2-acetyl-1-pyrroline in milled rice ranging from 6 ppb to 90 ppb compared to un-milled rice ranging from 100 ppb to 200 ppb in case of ten varieties. Therefore, proper processing technology is very important particularly for export quality aromatic rice.

4. Conclusion

Some indigenous landraces are in existence and being cultivated with ethnic cultivation techniques. The existence is due to their extra-ordinary adaptation or stress tolerance or excellent grain quality or involvement in ethnic and socio-religious life. Market oriented cultivation in terms of organic crop, holistic food, processed product, aromatic quality rice is important to increase their demand and market price. Conservation and research work should be enhanced for these underutilized cultivars. With such strategies cultivars may find their way of survival under the scenario of a disappearing indigenous rice biodiversity.

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