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Special Features and Characterization of Rice Land Races of *Karen* Community in Andaman and Nicobar Islands, India

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Rice is the most important and traditional food crop of Andaman and Nicobar Islands. The crop has wide spectrum of genetic variability owing to ethnic diversity of the settlers' population thus more than 50% of rice area in the islands is still under traditional land races. Many years ago these ethnic land races were brought by different settlers from different states of mainland India and even neighbouring countries. *Karen* community who originally came from Burma now called Myanmar settled quite long back in North and Middle Andaman and brought ethnic rice cultures like *Khushbaya, Black Burma, White Burma, Mushley* and *Yaeon* etc which suit to their likings and requirements. These land races are still popular with the community and *Karens* are thus indirectly playing a vital role in conservation and cultivation of these rice cultures. Through social surveys and interviews, the special features of these rice landraces were elicited. These cultures have also been characterized in a systematic and scientific manner to establish their unique identity and morphological descriptors in the light of IPR scenario.

Andaman and Nicobar group of islands located in the Bay of Bengal is about 1200 km distant from mainland India. The International Union for Conservation of Nature has recently declared 19 "hope spots" in 2013 including A&N Islands, India (Anonymous, 2013). The hope spot refers to an area of ocean which deserves special protection because of wild life & significant wild life habitats. Rice is the mainstay cereal crop of the Andaman and Nicobar Islands and supports the lifeline of the islanders. Rice is cultivated in an area of about 8390 ha with a total production of 23,916 t resulting in productivity of 2.85 t ha^{-1} (Gautam *et al.*, 2013). Rice cultivation started during post- independence era with the settlement of various communities in the Islands. More than 50% rice area is under traditional land races in the islands (Mandal *et al.*, 2004). The availability of fertilizer is also a major constraint and hence the adoption of high yielding, fertilizer responsive varieties is quite less. Though several efforts have been made to replace these old land races with new high yielding varieties, the farmers of these Islands are not ready to give up these landraces due to their unique characteristics including better response to low management conditions, tolerance to adverse weather conditions and better grain quality liked by the diverse ethnic groups.

Karen community who originally came from Burma (now Myanmar) settled quite long back in North & Middle Andaman and brought rice cultures of their taste and other special features. Initially, 12 Karen families from Burma came to Andaman after persuasion by Beroti officer Dr. H. I. Marshall in 1925 for clearing jungles for making settlements (Mary Pee, 2013). The word "Karen" was coined by British, whereas Burmese called them as "Kaylin" meaning "polite and good hearted" The present population of Karens in the Andaman Islands is about 2000 and are mostly protestant Christian. They are by nature artistic and love music, dance, diving, singing and trekking. Predominantly they are agriculturist and earn their livelihood by rice farming, making mats, baskets, grain storing bins etc. The senior citizens of Karens mostly lived longer and some even up to 105 years. Their longevity is ascribed to their love for nature, plants, herbs and hard work. They practiced the concept of *early to bed and early to rise* and had only two meals in a day i.e. early brunch and supper.

The field exploration and surveys were conducted from 2011 to 2013 in the Karen villages in Middle Andaman. The location of the study areas is shown in Figure 1. The interaction interviews were done with key informants having the knowledge of the history of introduction and cultivation of ethnic land races of rice. The President, *Karen* Welfare Association, Webygram facilitated the collection of the information from the custodian farmers of Karen

rice land races through prior informed consent (Singh *et al.*, 2013). The seeds of their traditional rice cultures like Khushbaya, Black Burma, White Burma, Mushley, Yaeon etc. were collected, evaluated and characterized during *Kharif* 2013 at CIARI, Bloomsdale Farm, Port Blair.

The crop was transplanted following row and plant spacing of 20 and 15 cm, respectively. The recommended package of agronomic practices was followed for raising the crop. Their detailed characterization for the DUS (Distinctness, Uniformity and Stability) traits as recommended by Protection of Plant Varieties and Farmers' Rights Authority for rice crop was done at different growth stages to know their minute phenotypic details.

A field survey and interaction interview with the respondents revealed that they still cultivate old rice cultures like Khushbaya (*Choi-chi-mannai*), Black Burma, White Burma, Mushley, Yaeon etc due to their special features. These rice land races were originally brought by their forefathers somewhere around 1925 from Burma to suit to their taste and other growing requirements. These rice types are anciently and deeply ingrained in the livelihood and culture of Karen people. As per information derived from the interviews with key informants, some special features of these varieties which are mentioned in Table1.

The population of Karen settlers is about 2000 who are residing in Webygram, Karmatang, Lataw, Burmadera, Basecamp, Borang and Chipo villages. The ethnic affinity towards the rice landraces could be adjudged from the respondents that once originally pure Burmeese "Karen race" has become impure due to inter-marrying with other population, but the rice land races preserved and grown by them are pure. Though some of the *Karen* rice germplasm has already been characterized including the Black Burma and White Burma (Elanchezhiyan and Mandal, 2001), yet the significant differences have been revealed for some DUS traits as per the current study. These changes may be due to inherent variability present in each landrace due to the forces of evolution, or selection cycles by different custodians themselves.

Though there seems to be some variation persistent within the land races making each landrace a subgroup of diverse genotypes, however, the current study aimed at the detailed characterization as mentioned in Table 2 which is expected to keep genetic identity of selected landraces in present situation documented and preserved. These traditional landraces are not only important from social and cultural points of view but are valuable genetic resources to meet the needs and challenges of the future too. Earlier researchers indicated that Khushbaya rice can act as donor for quality traits, Black Burma can be used as source for abiotic stress tolerance particularly for salt and aluminium toxicities (Mandal *et al.*, 2004). White Burma was reported to be bearing good carbohydrate balance as preferred for breakfast dish, Mushley is useful germplasm for adaptability traits.

The Bay Islands are home to several unique rice land races patronised by different settlers communities. These land races reveal their historical and cultural identities and preferences. In view of their economic, genetic and cultural importance, prominent Karen rice types have been characterized in details as per standard system and custodian farmers' interviews. This information is

Table 1. *The special features of rice landraces still grown by Karen community in Andaman*

Land race	Origin	When brought	Salient features
Khushbaya	Burma	1925	Also called as "*Choi-chi-manai* which in Burmese means it can grow without manure. It is nutritive, gives high yield and used for lunch.
White Burma	Burma	1925	Sticky when cooked and used for *Lassa*/breakfast and gives energy for long time.
Black Burma	Burma	1925	It is sticky when cooked and 'halwa' is prepared from its flour which is better than 'maida' and used for breakfast. It has low grain yield.
Mushley	Burma	1925	It is used for both lunch and dinner. It has high yield, small grains and good taste.
Yaeon	Burma	1925	It is best in terms of taste, quality and soft like basmati rice. It is used for both lunch and dinner preparation but has low yield.

Table 2. *Characterization of popular Karen rice varieties performed by CIARI, Port Blair*

Variety Characteristics	Khusbaya	Red Burma	White Burma	Black Burma	Musley	Yaeon
Coleoptile colour	Green	Green	Green	Purple	Green	Green
Basal leaf Sheath colour	Green	Green	Green	Light purple	Green	Green
Leaf: intensity of green colour	Light	Medium	Medium	Dark	Dark	Light
Leaf: anthocyanin colouration	Absent	Absent	Present	Present	Absent	Absent
Leaf: distribution of anthocyanin colouration	Uniform	Uniform	Uniform	On tips only	Uniform	Uniform
Leaf sheath: anthocyanin colouration	Absent	Absent	Absent	Present	Absent	Absent
Leaf sheath: intensity of anthocyanin colouration	Very weak	Very weak	Very weak	Weak	Very weak	Very weak
Leaf: pubescence of blade surface	Absent	Weak	Strong	Strong	Weak	Weak
Leaf: Auricles	Present	Present	Present	Present	Present	Present
Leaf: anthocyanin colouration of auricles	Colourless	Colourless	Colourless	purple	purple	purple
Leaf: Collar	Present	Present	Present	Present	Present	Present
Leaf: anthocyanin colouration of collar	Present	Present	Present	Present	Present	Present
Leaf: ligule	Present	Present	Present	Present	Present	Present
Leaf: shape of ligule	Split	Split	Truncate	Split	Split	Acute
Leaf: colour of ligule	White	White	purple	White	White	White
Leaf: length of blade	Long	Long	Long	Long	Long	Long
Leaf: width of blade	Medium	Medium	Medium	Medium	Medium	Medium
Days to 50 % heading	91	91	91	107	107	91
Flag leaf: attitude of blade	Erect	Erect	Erect	Erect	Erect	Erect
Spikelet: density of pubescence of lemma	Strong	Medium	Medium	Medium	Strong	Strong
Male sterility	Absent	Absent	Absent	Absent	Absent	Absent
Lemma: anthocyanin colouration of area below keel	Absent	Absent	Absent	Absent	Absent	Absent
Lemma: anthocyanin colouration of area below apex	Absent	Medium	Medium	Medium	Absent	Absent
Spikelet: colour of stigma	Light green	Light purple	Light purple	Light purple	Light green	Light green
Stem: thickness	Thick	Thick	Thick	Thick	Thick	Thin
Stem: length (excluding panicle; excluding floating rice)	Long	Short	Short	Short	Short	Short
Stem: anthocyanin colouration of nodes	Absent	Absent	Absent	Absent	Absent	Absent
Stem: intensity anthocyanin colouration of nodes	Absent	Absent	Absent	Weak	Absent	Absent
Stem: anthocyanin colouration of internodes	Absent	Absent	Absent	Present	Absent	Absent
Panicle: length of main axis	Very long	Medium	Medium	Medium	Very long	Very long
Flag leaf: attitude of blade (late observation)	Semi-erect	Horizontal	Horizontal	Horizontal	Erect	Semi-erect
Panicle: curvature of main axis	Droopy	Semi-straight	Semi-straight	Semi-straight	Droopy	Semi-straight
Panicle: number per plant	Few	Few	Few	Few	Few	Few

Contd.

VarietyCharacteristics	Khusbaya	Red Burma	White Burma	Black Burma	Musley	Yaeon
Spikelet: colour of tip of lemma	White	Purple	Purple	Purple	White	White
Lemma and Palea: colour	Straw	Reddish to light purple	Reddish to light purple	Brown furrows on straw	Reddish to light purple	Reddish to light purple
Panicle: awns	Absent	Absent	Absent	Absent	Absent	Absent
Panicle: secondary branching	Clustered	Weak	Weak	Strong	Weak	Weak
Panicle: attitude of branches	Semi erected	Semi erected	Semi erected	Semi erected	Semi erected	Semi erected
Panicle: exsertion	Partly exserted	Mostly exserted	Well exserted	Well exserted	Well exserted	Well exserted
Time maturity (days)	117	117	117	125	125	117
Leaf: senescence	Medium	Medium	Medium	Medium	Medium	Medium
Sterile lemma: colour	Absent	Absent	Absent	Absent	Absent	Absent
Plant height (cm)	140	158	140	174	132	–
Grain : weight of 1000 fully developed grains (g)	23.5	23.3	30.0	24.1	27.1	–
Grain : length (L) in mm	8.73	9.78	10.75	9.7	8.75	–
Grain: breadth (B) in mm	3.48	3.83	3.95	3.85	3.25	–
Grain : L/B ratio	2.51	2.53	2.72	2.52	2.69	–
Gelatinization temperature	Medium	Low	Low	Low	Medium	–
Amylose content	High	Very high	High	High	Low	–
Yield (t/ha)	2.5	1.5	2.4	2.1	2.5	2.1

being used for documenting the DUS traits and registration of these important rice land races with Protection of plant varieties and Famers' Right Act (PPV & FRA), a *sui-genris* system to enable the *Karen* community to have exclusive rights for utilization and get benefits for society foreseeing the IPR regime.

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