

Ethnobotanical investigations in the genus *Momordica* L. in the Southern Western Ghats of India

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Abstract Western Ghats, one of the megadiversity hotspots, hold a rich treasure of diversity in *Momordica* L. comprising *M. charantia* var. *muricata*, *M. charantia* var. *charantia*, *M. dioica* and *M. sahyadrica*. Vernacular names of these species vary from place to place. Traditional uses of these species comprising food, medicinal and cosmetic, culinary preparations, vernacular names in local dialects and taboos and religious beliefs relating to their domestication and folk taxonomy are dealt with in this paper.

Keywords Domestication · Ethnobotany · *Momordica* L. · Western Ghats

Introduction

The genus *Momordica* L., best known for the bitter gourd, comprises several species of medicinal importance in Asia and Africa. Besides the cultivated bitter gourd (*M. charantia* L. var. *charantia*), other species occur in the wild state and are gathered by tribal communities as vegetables. Six

species occur in India and among them, only three species, viz., *Momordica charantia* var. *muricata* (Willd.) Chakrav., *M. sahyadrica* Joseph et Antony and *M. dioica* Roxb. are distributed in Western Ghats (De Wilde and Duyfjes 2002; Joseph 2005; Joseph et al. 2006; Joseph and Antony 2007).

Southern Western Ghats host a great deal of inter- and infraspecific diversity in the genus *Momordica*, that has been important in sustenance of life for the forest dwelling communities. Ethnic diversity is one of the richest in the Western Ghats of India. About 35 tribes live even in the small geographic territory of Kerala (Personal communication, Rallis 2002). The indigenous people have selected and domesticated plants with desirable traits for their homestead gardens. Usefulness of various *Momordica* species as anthelmintic, vermifuge, cathartic, hypoglycemic, aphrodisiac, antipyretic and in the treatment of burns, bilious disorders, diabetes, cataract, hypertension, leprosy, jaundice, snake bite, haemorrhoids and piles has been mentioned by van Rheede (1688), Watt (1891), Kirtikar and Basu (1933), Uphof (1968), Walters and Decker-Walters (1988), Rastogi and Mehrotra (1990), Yang and Walters (1992), Dwivedi (1999), Jeffrey (2001), Bhatt et al. (2003), and Deshmukh and Rothe (2003). Out of these, only Rheede's account of their medicinal uses in Malabar pertains to the present study area. Traditional knowledge related to use of *Momordica* species by indigenous tribe is not yet fully documented in published literature. Moreover, as a genus of

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increasing economic importance, its folk taxonomy, vernacular names, level of domestication, traditional usage, socio-cultural aspects and cultivation practices if any by the agrarian and minor forest produces gathering tribes in this region are worth investigating.

Materials and methods

An extensive ecogeographical survey was conducted during September–November, 2004 across a vast stretch of southern Western Ghats covering all the major areas of distribution in the states of Kerala and Karnataka in India (Fig. 1). During the survey, ethnobotanical information was collected from members of various tribal communities and ethnic and linguistic groups, general public, farmers and practitioners of traditional medicine. ‘Kani’ tribes in several pockets of Neyyar and Peppara Wildlife Sanctuaries, ‘Malapandarangal’ in Achenkoil forest division and Aryankavu tract, ‘Ulladar’ in Cherthala and Vaikkom Tehsils, ‘Malaarayar’ in Peechi and Chimmony Wildlife Sanctuaries, ‘Paniyar’ in Mananthavady and Vattachira tribal colonies,

‘Kurichiar’ in Kannavam and Nedumpoil forests, ‘Hill Pulayar’ in Chinnar Wildlife Sanctuary, ‘Marathis’ (Naiks) in Panathur, Kasaragod, ‘Muthuvans’ and ‘Mannans’ at Sholayar and Parambikulam Forest, ‘Uralis’ in Ayyappankovil forest (in Kerala), ‘Kurbas’ in Somvarpet and Madikeri, ‘Jainu Kurbas’ in Nagarhole Wildlife Sanctuary, ‘Siddi’ and ‘Gowli’ tribes in Dandeli Wildlife Sanctuary, ‘Koragas’ at Subramanya Reserve Forest, ‘Kudumbis’ at Kumbrawada forest and agrarian communities living on forest edges such as ‘Poojaris’ in Sakhleshpura and Bisle forests (Hassan District) and ‘Gowdas’ in Chikmagalur, Hassan and Uttar Kannada districts of Karnataka were interviewed to elucidate their traditional knowledge related to the species. Besides, vegetable markets at ‘Sanivarsanthe’ near Somavarpet, ‘Adithyavarsanthe’ at Yellapur, Mangalore, Sagara, Udupi, Karkala and Tirthahally (all in Karnataka), Kasaragod and Tellicherry (Kerala) were visited and vegetable vendors were interviewed.

To get a broad overview of the cultural importance of these plants and the cultural context of their uses, anthropological methods were applied (Bernard 1988; Martin 1995). An open-ended semi-structured



Fig. 1 Geographical location of the study sites in the Southern Western Ghats of India

interview with a rather simple questionnaire was employed to elicit information regarding the vernacular names in their local dialect/region, specific uses, associated folklore, level of domestication and cultivation practices followed and the market potential of the *Momordica* species. While recording the local names, the literal meaning of the plant names was also documented in order to understand local plant classification and nomenclatural systems. Processed herbarium sheets, green and ripe fruits preserved in FAA, seeds and photographs of plants were shown to the target group and were asked to identify the specific material to ensure the taxonomic authenticity of the species that they are referring to. Help of forest officials and bilingual men were sought in Karnataka to interview tribal chieftains and wise men of the community. Wherever possible, women were encouraged to express their views especially with regard to culinary preparations and home remedies. Germplasm materials (seeds/tubers) were collected from the specific locations with their consent and physical help. As stated by Guarino and Friis-Hansen (1995), in a typical germplasm collection programme, often facing the limitations of time and resources, it may not be feasible to carry out some of the exercises stipulated by the full protocol. In the present case, some of the preliminary steps of confidence building had to be dispensed with, taking into account the vast area to be covered and also that we had already built up a working rapport over the years with most of the respondents especially in the state of Kerala.

Results

Local uses of *Momordica* genepool by the indigenous people are very extensive (Table 1). Similarly, vernacular names of *Momordica* species in various areas/dialects are given in Table 2. *M. sahyadrica* and *M. dioica* are esteemed as vegetables, both cultivated and wild gathered. *M. charantia* var. *muricata* is also used as vegetable. Different plant parts of all these species are used in indigenous medicine to cure various ailments. Many homesteads at Pariyaram on the banks of Chalakudi River grow *M. dioica* ('erumapavalam') as vegetable. Regular consumption of fruit vegetable is reported to have curative effect on piles. The medicinal uses of *M. sahyadrica* are restricted to Malayarayar, Gowli

and Jainu Kurbas, all forest dwelling and grazier tribes. Paniyas of Manathavady are the only tribe using *M. sahyadrica* as leafy vegetable. Kudumbis (Konkan) consider its fruits as a health food for patients with bronchial asthma.

For the people of Malanadu and Konkan (in Karnataka and Goa), its fruits are auspicious and during "Anantha Padmanabha Pooja" a 'prasadam' (curry or rasam) made of tender fruits is served in Shimoga area. In Hassan district, a vegetable dish made of potato, chickpea and *M. sahyadrica* is a must for 'Ganesha pooja' celebrations. The whole of 'madahagalikkai' is cooked (mature fruits deseeded) in a variety of ways. The manner of preparation is often dictated by customs, taste of particular ethnic group or creativity of the woman who cooks. In Hassan district, it is cooked in curries with chickpea and potatoes. 'Konkanis' prepare delicious 'pakko-das' (hot snacks) by dipping green slices in chickpea batter and deep-frying. For Shimoga 'Brahmins', it makes tasty 'rasam' (sour soup) even in small quantities. In the Kerala part of Western Ghats, sliced tender fruits are cooked in to dry vegetables ('thoran') of different types. Small quantity fruits are consumed as 'chutney' by roasting them, wrapped in banana leaves, in hot ash. 'Paniyars' use the leaves as dry vegetable or curried in to 'dhal'.

Momordica charantia var. *muricata* is cooked in many ways like bitter gourd, however, the surplus being sun dried as preserve for off season use. Thus depending upon the ingenuity and fancy of a chef, wild bitter gourds are curried, fried, pickled, dried or stuffed to suit different palates. However, in more progressed and urbanized tribal societies in Kerala, the knowledge and interest in culinary preparations of wild *Momordica* are eroding, as the younger generation depends heavily on store bought food and the consumption pattern has changed drastically.

There is a taboo against the cultivation of *M. sahyadrica* throughout South Western Karnataka. The belief that planting *M. sahyadrica* tubers will invite misfortune to the planter is deep rooted among all the tribes except 'Siddhis'. Even when somebody (usually old people) dares to plant a tuber, he keeps a large inverted basket over his head, in the hope that the tuber will never attain the size of his head and hence no dire consequences to his life. 'Marathi' ('Gowda') sugarcane farmers of Haliyal and Samb-rani in Uttar Kannada district in Karnataka strongly

Table 1 Ethnic uses of *Momordica* species in southern Western Ghats in India

Species	Plant parts and uses	Tribes and forest tracts
<i>Momordica charantia</i> var. <i>muricata</i>	Tender & ripe fruits as cooked vegetable, reported to be hypoglycemic	All over Kerala by all castes and communities
	Mature fruits sliced cross sectionally and salted or blanched in salt water and sun dried as 'vattal', for off season use	All forest dwelling communities
	Root paste administered in milk to reduce the impact/scars in small pox	Traditional medicine- Ponthenpuzha
	Leaf juice rubbed on the affected parts for treatment of ringworm.	'Malapandarangal'-Aryankavu
	Leaf juice applied to wounds to stop bleeding from wounds	'Kurichyars' of Kannavam
	Leaf juice administered in small quantity to anaemic patients	'Malaarayar' of Chimmony
	Five to six drops of leaf juice extracted from half- fried leaves is administered to infants over which breast feeding for bowel movement	Local inhabitants of Kayamkulam and 'Kani' tribes of Neyyar WLS
	Three drops of leaf juice in a glass of goat milk is consumed for a week to reduce chest congestion and removal of phlegm	'Hill Pulayas' of Chinnar WLS
	Leaf extract in cow milk administered as "nasyam" for sinusitis	Traditional medicine- Quilon
	One teaspoon leaf juice plus few drops of honey administered thrice a day for cough, congestion and chest pain in children	'Siddhi' tribe of Dandeli WLS
<i>M. dioica</i>	Tender fruits and deseeded mature and ripe fruits cooked as vegetable	'Ullada' in Cherthala, Vaikkam and local people in Alapuzha and Ernakulam
	Ripe fruits eaten raw and aril of ripe seeds consumed as a refreshment	'Malampandarangal' of Aryankavu
	Tubers used extensively in the preparation of 'Lehyam' and decoctions for treatment of intestinal ulcer, piles and snake bites	'Ullada' vaidyas of Cherthala
	Tubers used for preparing medicated oil, said to be a vitalizer especially for head, bone and nerve injuries	'Malampandarangal' of Achenkovil
	Tuber paste applied as anti-inflammatory medicine for Hydrocele ("Gandipitha")	'Jainu Kurubas' of Nagarhole
<i>M. sahyadrica</i>	Fruit vegetable as cure for intestinal ulcer and piles	'Malayan' tribe of Neriamangalam
<i>M. sahyadrica</i>	Tender and ripe fruits are cooked as vegetable and considered a delicacy	'Kurichyar' (Wynad), 'Paniyar' (Kozhikode)
	Tender leaves, twigs and male plants cooked as leafy vegetable	'Paniyar' of Manathvady
	Tuber paste is smeared over the body as a substitute for soap	'Malaarayar' of Chimmony WLS
	Tuber paste as washing soap/detergent	'Malaarayar' of Peechi WLS
	Tuber paste as anti-inflammatory medicine in mastitis of milking cows	'Gowli' tribes of Dandeli WLS
	Tuber paste in treatment of painful eruptions, swellings and breast inflammations in humans	'Gowli' tribes of Dandeli WLS
	An ounce of juice extracted from tuber and equal quantity of <i>Calotropis</i> bark used as abortifacient in early stages of pregnancy	'Malayarayar' of Peechi WLS
	Tender fruit vegetable consumed as health food for asthmatic and intestinal ulcer patients	'Kudumbis' of Kumbrawada

reject its cultivation as they believe that its cultivation will lead to money drain and no rain for crop sowing and resultant drought, besides the popular belief across the communities and region that tuber when it

attains the size of the skull will signal the death of the planter. Only three out of the twenty farmers interviewed believe that this taboo is a superstition and they have planted a few tubers in their kitchen

Table 2 Vernacular names of wild *Momordica* spp. in Western Ghats

Accepted taxon name	Vernacular name	Tribe/Linguistic groups	Area
<i>M. charantia</i> var. <i>muricata</i>	Chundappaval	'Kurichyas'	Kannavam, Aralam WLS
	Karandkappaval	Malayalam	Central Travancore
	Kattupaval	Malayalam	Central Travancore
	Naippaval	Tamil	Chinnar WLS
	Kundupavai	Tamil	Ayyappankovil (Iddukki District)
	Padupavai	Tamil	Ayyappankovil (Iddukki District)
	Nadanpaval	Malayalam	Travancore
	Kuttathippaval	'Kani'	Neyyar WLS
	Undappaval	Malayalam	Aramkani, Neyyar WLS
	Kaduhagalikkai	'Kurubas'	Madikeri (Coorg District)
	Jungli karela	'Sidhi'	Dandeli WLS
<i>M. dioica</i>	Kattu kappakka	Malayalam	Peechi-Vazhani WLS
	Kattupaval	'Malaarayar'	Peechi-Vazhani WLS
	Naipaval	'Malapandarangal'	Shendurny WLS
	Venpaval	'Kani'	Kollam
	Erumappaval	Malayalam	Trichur & Ernakulam Districts
<i>M. sahyadrica</i>	Vaikka	'Kurichyar'	Kannavam, Nedumppoil
	Mada hagalikka	'Poojari'	Sakleshpura
	Kadukovakka	'Kurubas'	Coorg
	Kattupaval	'Mannan'	Parambikulam
	Pothupaval	'Malayarayar'	Vaniyampara, Peechi WLS
	Madavala hagalikai	'Gowli'	Uttar Kannada
	Katteli	'Gowli'	Dandeli WLS
	Madahagala, Mattahagala	'Kudumbi'	Kumbrawada
	Karayachakka	'Kurichias'	Wynad
Akkachikka	'Kani'	Peppara and Neyyar WLS	

garden. Nevertheless, all the communities relish it as a delicacy and the surplus from the wild gathered harvest is sold in the market. Farmers in Chikmagalur and Hassan Districts protect the female plants among the coffee shrubs by providing them with manures and trellies.

There is no such taboo in the neighbouring state of Kerala, where a few seed-planting attempts were seen. At Kannavam forest, 'Kurichya' farmers collect seeds from ripe dehisced fruits and store it above smoke hearth for 5–6 months. Seed sowing is done in the first pre monsoon shower and seedlings trailed to trellies. A few 'Malaarayar' families in Elanadu forest (Thrissur, Kerala) were also found to raise a crop of *M. sahyadrica* from female tubers gathered from wild. However, the produce is exclusively for home consumption and pollination left to nature. In

Sakleshpura, Hassan district (Karnataka), farmers prepare pits of 60 × 60 × 60 cm size on well-drained slopes. The pits are covered with agricultural wastes and burnt thoroughly. The next day, they are filled with well rotten cowdung, leaf mould and laterite soil in equal proportions and the pits are irrigated well. Next day, a sprouting female tuber collected from the wild is planted in the pit and later provided with trellies or pandal. An average yield of 5.0 kg per vine within a harvest period spread over 4 months was reported by these farmers.

One of the first priorities to be evaluated when looking at the viability of a new crop is its acceptability to the consumers. An assessment of the quality of the food products and their yields in natural stands adds to the desirability of the species in agro ecosystems. In the case of *M. sahyadrica* and

M. dioica, fruits are an esteemed and relied upon resource in several areas of its distribution range. The market potential for *M. sahyadrica* was found to be very high throughout the region. Forest gatherers in general told that they get a price between Rs. 20–60/kg, whereas vegetable vendors opined that retail price is between Rs. 80–100/kg and during pooja season, it may go up to Rs. 125/kg. At Kannavam forest in Kerala, informants remember selling the fruits at Rs.1/- per fruit (amounting to Rs. 30/kg) to ‘Chettiaris’ (business community hailing from other states).

Market survey reveals that ‘madagalikai’ fetches a competitive price (Rs. 80–120/kg) in the local market, resulting in a substantial financial return with relatively no inputs. Mangalore, Goa, Karwar, Haliyal, Yellapur, Ummachi, Dandeli, Sagara, Somavarpet and Sanivarasanthe are the main markets where ‘madagalikai’ is brought for sale. Peak harvest season is August–September. No special skills are needed for harvesting. Even though 10–12 days mature fruits are ideal, the older ones can be used after deseeding. Keeping quality and shelf life of tender fruits are good according to vegetable vendors of Sagara market in Shimoga district.

Discussion

Cultural and social attributes of human communities have substantial influence on biodiversity conservation and sustainable utilization of genetic resources (Sam et al. 2006). Barring bitter gourd, all the species are wild gathered delicacies of the rainy season. The taboos discouraging *M. sahyadrica* husbandry has deep roots in conservation ethics. As seed germination is a difficult proposition, being a high value delicacy, without the protection of this ‘tuber-planting ban’, the species is bound to become extinct in the wild. Female plants are named ‘madahagali’ and male plants ‘matagali’ in Karnataka high ranges, coinciding with ‘kattupavakka’ and ‘sappu’ in Wyanad, where only male tubers are prescribed for medicinal uses. Tender twigs and leaves of male plants are cooked as vegetable and are recommended for pregnant women and anaemic patients in the “Paniya” community of Wynad. As the pollenisers are needed only in lesser proportion (1:15) and the sex ratio being 1:1, this choice of male plants might have been a purposively

introduced belief by the primitive societies as a conservation measure.

The medicinal uses of *M. sahyadrica* for mastitis, hydrocele, breast swelling and pain in the early days after child birth and painful eruptions underlie its anti-inflammatory value which however needs to be scientifically evaluated. The abortifacient uses are similar to that of *M. angustisepala* in Nigerian folk medicine (Aguwa and Mittal 1983). Rajendran and Sikarwar (2003) have reported use of *M. dioica* root paste by ‘sahariyar’ tribes in Madhya Pradesh as abortifacient. Secondary metabolites like momorcharin, trichosanthin are known for their ribosome inhibiting properties and may be responsible for the abortifacient effects. This species being newly described (Joseph and Antony 2007), there is no published ethnobotanical information so far and this is the first report. Use of tuber paste as detergent and toilet soap hold promise in the cosmetic and health care industry. Villagers consider its food value equivalent to mutton, giving credence to its high nutritional value, thus the nutraceutical potential of the fruits needs to be further investigated. Some of the apparently unimportant claims like raw consumption of seed aril and ripe fruits for rejuvenating and refreshing effects give indications of its antioxidant value. Seed aril is a good source of lycopene imparting deep red colour to water and may be investigated as natural food colourant, herbal lipstick and in facial creams. The medicinal uses of *M. charantia* var. *muricata* and *M. dioica* by various tribes across the Western Ghats area is in conformity with the observations of van Rheede (1688), Watt (1891), and Kirtikar and Basu (1933). Anti-ulcerogenic effect of *Momordica charantia* in Turkish folk medicine (Gurbuz et al. 2000) and gastro protective and ulcer healing properties of *Momordica* species in Sri Lanka (Fernandopulle and Ratnasooriya 1996) are in conformity. Similar uses with related taxa are reported from indigenous societies in Africa and South East Asia (Ng.T.B. et al.1986; Aguwa and Mittal 1983).

The patronage extended to *M. sahyadrica* as a high value vegetable might have arisen after the introduction of coffee in Karnataka high ranges. Vast stretches of forest openings, higher population of berry eating birds, ideal habitat for trailing, less weed competition and care provided by coffee growers might have contributed to its increase in population

as the maximum population density was found in the plantation districts. Frugivorous birds such as bulbul, barbets and Indian treepie which also feed on coffee berries play a significant role in seed dissemination as the seeds pass through their guts undamaged while the sweet slimy aril is digested. A few respondents made an observation that forest tracts subjected to summer fire tend to have high population of *M. dioica* in the subsequent year. It may be that forest fire by increasing soil temperature helps in breaking physical dormancy. The practice of keeping seeds in storage baskets exposed to kitchen smoke, observed in few tribal households, have a similar stimulating effect on germination.

Numerous medicinal values ascribed to these species indicate their long association with the people. Volunteer plants (self sown) in coffee estates are given a special management package to ensure good yield during festive season. This may have some evolutionary repercussions as thinning of plants growing from the same heap of bird castings effects genetic drift and lead to selection. The ceremonial use of the plant during ‘poojas’ implies an intensification of human-plant relationship because the plant has acquired a cultural significance beyond the mere satisfactions of a biological need. Further, diversified culinary uses and dishes are found only in the upper class ‘Brahmins’ and ‘Konkanis’ who enjoy a financially better position in the society.

Interpretation of vernacular names given to a plant can provide evidence for evaluating the human interaction with the plant. A perusal of available literature reveals many vernacular names for *Momordica* species in various Indian languages (Gurudeva 2001). However, wild species with narrow distribution range and rarity often do not figure in the vernacular vocabulary or may have the same name as to its comparatively better known relative. Nevertheless, local dialects may have some names specific to the user community that need to be recorded for germplasm collection and ethnobotanical study of the target taxon. A descriptive prefix combined with a generic root forms the specific names in the natural folk classification system (Nutall 1924; Gates 1939). Thus for *M. charantia* varieties and races in Western Ghats, the generic root (pavakka = bittergourd) preceded by trait specific epithets such as ‘nadan’ (= local), ‘kattu’ (= wild), ‘chunda’ (= small), ‘karanakka’ (= very bitter) and ‘mullen’ (= spiny)

describes and demarcates genotypes and races. Vernacular names vary from place to place. For a collector, it is very essential to know the vernacular name of the plant in local dialect. Often, the same plant is known by different names in adjacent regions or two plants known by the same name. However, the generic root broadly remains the same in the same language and only the prefix often changes according to species and dialect. The specific prefix has something to do with a quality trait or habitat of the species, often a web of mutually inclusive words. A perusal of the vernacular names of *Momordica* shows that same or a related specific prefix is used in different regions by different communities. Thus, ‘Erumappaval’ (‘she-buffalo’ bitter gourd), which is the vernacular name for *M. dioica* in Malayalam has become ‘Pothupaval’ (‘he-buffalo’ bitter gourd) for *M. sahyadrica* in Peechi-Vazhani WLS where both have overlapping distribution. However, robust plant type, showy flower and slightly large fruits might have prompted the primitive gatherers to ascribe this gender-based designation. The adjectives, ‘ven’ (= white, milky), ‘pal’ (= milk), ‘nei’ (= butter, soft, delicious), ‘kuttathi’ (= darling) are used to describe sought after traits in beauty-food context and hence indicates social value attached to these plants. Where the species is given less patronage, epithets like “kadu-kundu-padu”, all meaning wild or weedy are used to distinguish it from the cultivated. However, in South Western Karnataka, where *M. sahyadrica* has a higher distribution, the male-female plant concept is made clear by assigning different vernacular names.

Momordica charantia var. *muricata* landraces, even though of small size, are esteemed for their taste and flavour and are cultivated in restricted ranges and have fruit fly tolerance. Through a continuous cycle of planting and harvesting seeds, traits conferring adaptation to an agro ecosystem are fixed, thereby initiating the domestication process (Harlan 1965). ‘Kuttathipaval’ of Neyyar Wildlife Sanctuary, ‘Rudrakshahagalikai’ of Hassan, ‘Karanakakai’ of Central Travancore and ‘Undapaval’ of Malabar coast fall in the category of semi-domesticates where a few plants are raised in the backyards for one’s own consumption.

All this information indicates that the genus *Momordica* has a significant ethnobotanical history in Western Ghats. Divergence of variant populations of *M. charantia* var. *muricata* from the truly wild

type (Joseph 2005) is the result of their association with human activities over time in several locations across Western Ghats. This association is manifested by encouragement of local variant populations through plant utilization and habitat modification and it represents progression towards domestication. The tribal communities, living in the forest or forest periphery have gone a step further in domestication of these wild plants, thus giving credence to the view that women folk of Western Ghat tribal communities were the early domesticators of crop plants (Janaki Ammal 1974). High genetic diversity, preponderance of pre domesticates, innumerable uses, religio-cultural beliefs all lead to the assumption that the small variety (*M. charantia* var. *muricata* = methipavai = rudraksha hagalikai = karandakakka) is a pre domesticate of the tribal communities in the Western Ghats. The rapid rate at which the existing traditional knowledge is becoming obsolete, eroded and pushed to oblivion has to be checked for ensuring an economically and ecologically sound access to food for everybody, while conserving and improving the natural resources. The conservation and utilization of this traditional knowledge will help in new crop domestication and crop diversification.

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