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Indigenous brinjal variety “*Gobindpali brinjal*”: A ray of hope for the tribal farmers of Malkangiri District, Odisha - A case study

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Abstract

Although a lot of this perception may be based on a lack of evidence, indigenous vegetables (IVs) are thought to be under-utilized crops. A much greater diversity of vegetables exists in traditional food systems, but many of these crops are not fully integrated in current markets and diets. While some of the vegetables are specific in their distribution, a large number are distributed across countries and regions. A recent study by Diversity International scientists in collaboration with the Food and Agriculture Organization of United Nations revealed that a total 1,097 vegetable species, with a great variety of uses and growth forms, are cultivated worldwide. Still, we only seem to be familiar with less than 7% of these traditional species. These indigenous vegetables have been collected, conserved and used by farmers, yet the scientific community was not aware of or paid little attention to them. This paper provides an overview on the scope and value of indigenous vegetables grown in Odisha. Based on household data, farmer comments, PRA output and field survey results from the Khairiput block of the Malkangiri district, this article emphasized the critical reason for conservation and popularization of the indigenous vegetable Gobindpali brinjal as it helps the tribal farmers to support their livelihood and earns them higher income. The study demonstrates that Indigenous brinjal cultivar ‘Gobindpali brinjal’ not only plays a significant role in ensuring food security for poor households, but also constitute an increasingly appealing food group for upper income groups by linking consumption data with food market and consumer preference data. Based on household data and farmers feedback and output of PRA and field survey work from the Khairiput block of Malkangiri district, this paper highlights the role that Indigenous vegetable, Gobindpali brinjal which plays an important role for farmers income and support their livelihood. In conclusion, this study concluded that indigenous vegetables are not underutilized, but undervalued. By preserving biodiversity and indigenous knowledge on production and consumption of this Indigenous vegetable, and by providing improved package and practices scientists can contribute to the well-being of thousands of poor tribal farmers by enabling them to participate in growing markets for this crop. Also it was concluded that there is a greater scope of crop improvement through selection of this brinjal cultivar from this particular geographical growing tract and it should be taken for the Geographical Indications (GI) of goods under (registration and protection) act, 1999.

Keywords: Indigenous vegetables, Gobindpalli brinjal, Bio diversity conservation, varietal development, Geographical Indications (GI)

Introduction

Indigenous (traditional) vegetables are best defined as species that are locally important for the sustainability of economies, human nutrition and health, and social systems – but which have yet to attain global recognition to the same extent as major vegetable commodities such as tomato brinjal or cabbage (Keller *et al.* 2005) ^[15]. Given the hundreds of indigenous vegetables consumed worldwide, their accumulated value for mankind is considerable. These species deserve much greater recognition and investment in agricultural research and development than they have presently. Indigenous vegetables are primary candidates for greater use of crop biodiversity in horticulture as they are already consumed and enjoyed locally and can be produced profitably in both rural and urban environments. (Keatinge *et al.* 2015) ^[6] and (Rana *et al.* 1998) ^[10]. A much greater diversity of vegetables exists in traditional food systems, but many of these crops are poorly integrated in current markets and diets. A recent study by Bioversity International scientists in collaboration with the Food and Agriculture Organization of United Nations revealed that a total 1,097 vegetable species, with a great variety of uses and growth forms, are cultivated worldwide. Still, we only seem to be familiar with less than 7% of these species.

Brinjal (*Solanum melongena* L.) is an important and indigenous vegetable crop of India. India is the second largest producer of brinjal in the world. It contributes 9% of the total vegetable production of the country. It is due to improvement in production technology, protection measures and the genetic improvement which has shown significant advancement in yield, quality, diseases and insect-pest resistance, its place of origin is considered to be India, where it continues to grow wild. This spiny, bitter, orange, pea-sized fruit has been cultivated throughout India and China for more than 1500 years. As trade routes opened, eggplant was introduced to Europe by the Arabs and transported to Africa by the Persians. Wild brinjal can be found growing in Malaysia and India. However, seedling health has been improved by precise nursery raising practices. Standardization of cultural practices, irrigation and nutritional requirements of different cultivars under different soils and climatic conditions helps in better crop stand. Protected cultivation makes the availability of brinjal during off-season and proved to be effective for borer free fruits. Brinjal or Eggplant is an important crop of sub tropics and tropics. The name brinjal is popular in Indian subcontinents and is derived from Arabic and Sanskrit whereas the name eggplant has been derived from the shape of the fruit of some varieties, which are white and resemble in shape to chicken eggs. The brinjal is of much importance in the warm areas of Far East, being grown extensively in India, Bangladesh, Pakistan, China and the Philippines. It is a versatile crop adapted to different agro-climatic regions and can be grown throughout the year. It is a perennial but grown commercially as an annual crop. A number of cultivars are grown in India, consumer preference being dependent upon fruit colour, size and shape.

Indigenous or traditional vegetables show very substantive biodiversity, are adapted to specific marginal soil and climatic conditions, and often can be grown with minimal external inputs (De la Pena *et al.* 2011) [1]. Diversifying current production systems with traditional vegetables will increase their heterogeneity and will subsequently lead to better resilience to abiotic and biotic stresses (Lin, 2011) [7] provides several examples of successful pest and disease suppression and buffering against climate variability in more diverse agro ecosystems. These traditional vegetables are naturalized (introduced long ago and now accepted as “traditional”) or indigenous to the locality under study and are adapted to local food and farm systems after generations of interactions with humans and the environment (Van Zonneveld *et al.* 2021) [13]. This diversity of vegetables is more than a local peculiarity – it could play an important role in ensuring adequate levels of nutrition and in meeting the challenges of agricultural production posed by climate change and soil degradation. Many traditional vegetables are known to have higher nutritional value than their commercial counterparts, and are well-adapted to local conditions, exhibiting resistance to drought, pests, diseases and marginal soil conditions.

Malkangiri district is situated in high Altitude and comes under agro climatic zone namely south eastern Ghat zone. The general topography of the area is of undulated mountains, large river bed or watercourses. Sandy and clay type of soil predominate the entire district. There are three major types land available in the district like low land i.e. Beda Jami which located at the bottom part of catchment area of hills, contain high moisture so useful for paddy cultivation. Another type is medium land; plotted in the middle part of local basin, having good moisture retention capacity and fertility,

therefore suitable for short duration paddy or horticulture farming. Up land called as Dhipa Jami generally situated at the upper level of hills having low water retention capacity, affected with soil erosion and very poor organic content is mostly used for cattle grazing or seasonal crop during rainy season. The climate of the major portion of the district is influenced by its varied elevation. Generally hot and high humidity climate prevails during April and May and cold during November and December. It receives 1500 mm rain fall annually. Major portion of the rain fall occurs during south – western monsoon from July to September. Around half of the portion of the district is covered with dense semi-evergreen and moist deciduous forest which is suitable for maintain soil fertility of the region. Hence the overall ecological situation of the district is conducive for horticulture activities. The agro climatic and socio economic situations of Orissa favour growing of a number of horticultural crops. In the existing bio-physical constraints and limited infrastructures, we have to trap our horticulture potential by joining hands with different stakeholders in the field of research, extension, production, post-harvest, value addition & marketing for making our state self-sufficient. Besides this it is aimed to provide nutritional security and right to food for all.

Malkangiri, a district with major stratum of Adivasis or schedule tribes and primitive people is an underdeveloped district [3]. Agriculture is the dominant sector of the economy as well as of employment for the people of the district. A major portion of the cropped area is exposed to the mercy of nature every year which requires positive attention of the Government. The district faces problem of soil degradation and ecological imbalance. Rainfall uncertainty in recent years is affecting crop production. It also causes actual cropping pattern to vary from intended cropping pattern. The dry land areas of Chitrakonda, cut-off areas of Kudumulugumma block, Bonda Hills of Khairput block are comparatively less productive regions having poor moisture retention capacity. Access to irrigation is very limited in these areas. Apart from on-farm agriculture, animal husbandry, collection of NTFP from forest, fishing, wage labour (mostly in unorganized sector), Beedi and snuff making are the other important occupations of the inhabitants of the district reported by (Mohanty, 2006) [8].

Malkangiri district lies in the Southern Most part of Odisha was earlier the part of Koraput district Malkangiri, a district with major stratum of Adivasis and primitive people is an underdeveloped district of Odisha [3]. It is an area of dry-zone agriculture where millets, oilseeds, and pulses are grown. Some of the area now under coarse cereals can be diverted to pulses and oilseeds. Horticulture, dairy development and poultry farming can also be encouraged. The climate of the District is warm and sub-humid. The Average annual rainfall is about 1667.7 mm with 79 Rainy days. Relative Humidity is generally high especially in the monsoon and post-monsoon months i.e. 25% to 70%. The District with its hilly areas and the agro-climatic conditions is suitable for various agricultural activities like Cultivation of Paddy, Ground nut, Maize etc. and also for various horticultural crops like Mango, Cashew, etc. But Vegetable production provides a promising economic opportunity for reducing rural poverty and unemployment in developing countries and is a key component of farm diversification strategies [4]. Vegetables are mankind's most affordable source of vitamins and minerals needed for good health. Lack of information on traditional vegetables is,

however, a major barrier to their use and promotion because it hampers a wider recognition of their values and understanding

of how best to grow, process and market them.

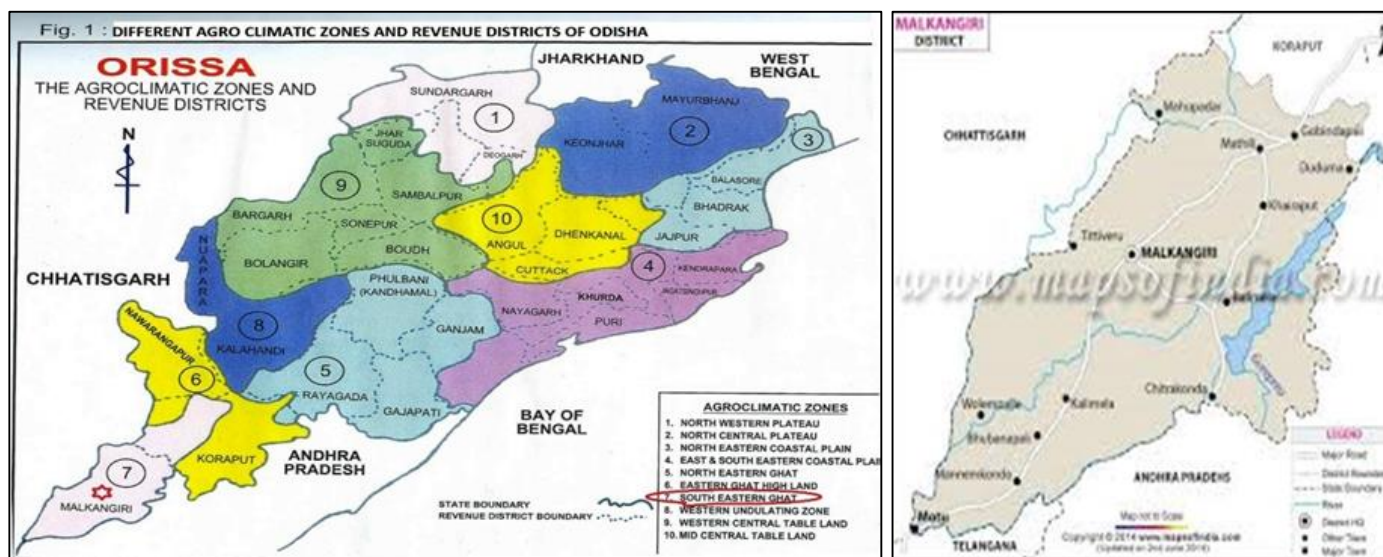


Fig 1: Map of Odisha showing geographical area under study

During rainy season, most of the areas of the district become impassably swampy and flashy floods for some times isolate it from the outer world. The literacy rate of the district is just 48.5% and in case of women it is 38.3% which is miserably low in comparison to the state women literacy average of 64 % (2011 census). Per head income of the district is one of the lowest in the state and percentage of below the poverty line family is also one of the highest in state.

Odisha is the second largest producer of brinjal accounting for (18.9%) of total production of brinjal in the country [9]. The State produces 1.97 m. MT of brinjal from an area of 0.13 m ha. With productivity of 15.0 t ha⁻¹ (Sidhu, and Dhatt, 2007) [11]. To Enhance horticulture production, improve nutritional security and income support to farm households; Establish convergence and synergy among on-going and plan programmers for horticulture development is needed and to Promote develop and disseminate technologies for horticulture development through seamless blending of traditional wisdom and modern scientific knowledge and to Create employment generation opportunities for skilled and unskilled persons, especially unemployed youth, Cluster approach has to be maintained while taking up area expansion programmer under vegetable crop particularly in the districts like Malkangiri which are considered to be potential areas. Technical guidance to farmers needs to be given frequently by the Horticulture Department and Krishi Vigyan Kendra (KVK), Malkangiri which are funded for various activities need to fully utilize for HRD purpose of the farmers. Use of drip irrigation and plastic mulching for economic use of water, better management of weeds and performance of the crops has to be intensified. Water harvesting structures may be constructed with the support of NHM and linked to Micro Irrigation System. For conservation of indigenous vegetables focus should be given on the rescue, improved conservation, and seed increase of promising lines, variety trials and participatory evaluation of selected accessions, and training personnel in germplasm management (Ebert, 2011) [2]. Indigenous vegetables play a significant role in addressing increasing incomes, reducing malnutrition and maintaining biodiversity (Habwe *et al.* 2009) [5].

Research Objective

This particular field study was under taken to identify the distinctive and uniqueness and other phonological characteristics of the local cultivar Gobind Pali Brinjal for future research and conservation of the germplasm as there is a greater scope for preservation of this promising local cultivar for improvement through selection and for breeding purpose for varietal development. At the same time, indigenous knowledge on how and where to collect, cultivate and prepare traditional vegetables was disappearing (Keller *et al.* 2005) [15]. This paper aims to contribute to a conservation agenda for traditional vegetables by examining the geographical diversity and conservation status of this traditional brinjal cultivar.

Materials and Methods

A total forty numbers of farmers growing this particular local cultivars were selected randomly from village namely Gojiaguda from Gobindpali GP of Khariput block as most of the farmers in this particular village were growing this traditional brinjal variety in large area since last 70 years. Focused group discussion (FGDs) was conducted for four times during the cropping season in year 2020 and 2021 to document the Uniqueness of Gobindpali brinjal with its varietal characteristics, to identify the varietal uniqueness and farmers adopting practices in local area.

Results and Discussion

A total forty numbers of farmers growing this particular local cultivars were selected randomly from this village and focused group discussion was conducted for four times during the cropping season to document the uniqueness of Gobindpali brinjal with its varietal characteristics and farmers adopting practices. The data were collected by pre-structured interview schedule and compiled. Also some information were documented from secondary sources and from the old aged farmers of that villages to assess the varietal characteristics, its origin and field performances, disease pest incidence severity and yield attributing parameters, also consumer preference and market information were collected and analyzed to draw the conclusion.

Uniqueness of Gobindpali brinjal identified during field survey and FGD

In the district of Malkangiri, Odisha a unique brinjal found at village Gajiaguda, GP- Gobindapalli, Block – Khairput, Malkangiri and Odisha. The brinjal shape is long and bold. Due to the lower portion is long so it is called as Gojia in the

local language. According the village name Gojiaguda so it is called as Gojiaguda baigan or Gobinda palli brinjal. The village where cultivating the brinjal is established in 100 years ago having 70 NOS households and 300 NOS of population, Brinjal cultivated around 70 years ago in his own farms and collected in his own seeds.



Fig 2: Farmers growing nursery of Gobinda Palli brinjal in Sep. first week

The nursery raising in the 1st week to 4th week September and transplanting in the month of 1st week of October. This brinjal cultivar plants grows up to 1.5 to 2 meter height. The flower colour is light purple. The size of the fruit is 30 cm length and 15cm width, Weight of the fruit is 1-1.5 kg from the 1st harvest and 700 to 800 g of the 2nd harvest. 2 to 3 fruit setup of the 1st harvest and after 1 week 10 to 12 fruits at 2nd harvested. A Brinjal plant gives 3 to 4 times harvested in 5 months (January to May). The selling of fruits from his local markets at Gobindapalli and supply near city Jeypore and also supply the capital of Odisha, Bhubaneswar. The Uniqueness of fruits having fruit size, keeping quality as well as the fleshy is more. This brinjal variety provides the better test with roasted. This traditional brinjal cultivar are known as it has higher nutritional value than their commercial counterparts, and are well-adapted to local conditions, exhibiting resistance to drought, pests, diseases and marginal soil conditions.

Cultivar Gobidapalii Brinjal Description, Characteristics and Uniqueness

Table 1: Phenotypic Characteristic of variety Gobindpali Brinjal (N-40)

Parameters	Observations
Plant Height (cm)	150-210
AVG No of Branch per plant (no)	4.8
Flower Color	Light Purple Color
Av Fruit Size length in (cm)	32.6 cm long and 15 cm
Fruit Weight (g)	880-1200
Fruit Color	Greenish white
Crop Duration	7-8 months
No of Fruits/Plant (no)	15-22
Special Character of Fruit	Less Seed, Good keeping quality, better test when roasted
Thrown character	Less

Table 2: Production process adopted by the local farmers

(N-40)

Production packages	Farmers adoption practices
Ploughing	Manual (2 times with bulk drown plough)
Seed Treatment	No seed treatment / Liquid Cow urine soaking
Source of Seed	Own saved seed
Nursery bed preparation	Raised seed bed
Nursery Duration	20 to 25 Days Old Seedlings
Transplanting	Line Transplanting
Gap filling	After 7-10 days after transplanting
Spacing	60 x 60 cm
Fertilizers & Manures	FYM 15-20 t ha -1
Intercultural operation	Manual weeding earthing up with application of FYM at 30 th day of planting
Plant protection	No Chemical fungicide & Pesticide, Only cow urine and Neem seed kernel extract @5%
Shoot and Fruit borer Management	Removing the terminal shoot showing boreholes, remove the affected fruits and destroy, Need based application of Azadirachtin 1.0%EC (1000ppm) @ 3 ml/lit
Incidence Damping Off	Less than 5.0%
Disease Incidence - Bacterial and Fungal I Wilting	6-15%
Incidence of shoot and fruit borer	Moderately resistance
Irrigation	Need based
1 st Harvesting	60 Days After Transplanting (DAT)
Yield/Plant	12-15 kg
Yield (q ha-1)	250-300
Net return (Rs ha-1)	Rs 3.8 lakh per ha

Seed Processing and preservation of local germplasm practices adopted by the growers

The seeds and planting materials of traditional vegetable species are maintained to large extent by the owners himself according to (Rana *et al.* 1988) ^[10] Farmers left some selected disease free healthy brinjal in the plants in the field, after the 1st harvest according to their seed recruitments. To preserve good quality seed, selection of good fruit at first picking stage for seed purpose was done by the growers and the fruits after fully maturity turns yellow color and farmers harvest those fruits and cut it down in to pieces as well as separated the seeds from fruit. Seeds having mucilage type seed coat, which separated through the repeated, washing the seeds with water. After washing, sun drying to seeds for 2-3 days and storage the seeds in their home for the next season.

Strategy for biodiversity conservation and large scale adoption

During PRA and FGD some suggestions were given by the respondents to take steps to promote and to conserve of this brinjal variety and the suggestions are documented as below. Steps to be taken at policy level for Conservation of varieties and popularization through large scale demonstration as area expansion programs in cluster approach should be done by Horticulture development and Krishi Vigyan Kendra for area expansion under this local cultivars. (Weinberger *et al.* 2007) ^[14] Stated that some traditional crops, vegetable crops, which are neither grown commercially on large scale nor traded widely, may be termed as underutilized crop. Necessary steps may be taken at policy level for providing marketing facility and establishment supply chain for preservation and Promotion of Govindpali brinjal cultivation also the

respondents. Most of the Farmers are growing brinjal in their own land and some provisions may be given to the tribal farmers under the study area under Forest Right Act Right to hold and live in the forest land under individual or common occupation for habitation or vegetable cultivation for their livelihood support and providing them some additional income. It was also suggested for technical support and skill training to the tribal farmers may be arranged by Krishi Vigyan Kendra and Horticulture department under Tribal Sub Plan for enhancing productivity and crop protection.

During the PRA it was observed that lack of irrigation was the most perceived constraints by the respondent and to mitigate this issue action should be taken under the irrigation programmers, construction of check dam, diversion weir, water harvesting structure, dug well, M.I.P, etc. may be taken up for irrigation purpose to help the tribal farmers, so that more farmers will be able to take vegetable cultivation particularly local cultivar Gobindpali brinjal in this tribal remote area. Some of the respondents opined that Emphasis should be given on Supply of minikits, bio-fertilizers and bio-pesticides along with supply of agricultural implements like Power Tiller, Sprayers, Pump set to the eligible ST beneficiaries under the Agricultural programmer of Farm Mechanizations. Training cum Awareness program should be organized on seed treatment with the bio-fungicide i.e. *Trichoderma*, *Pseudomonas*, plant protection by use of bio-product i.e. Panchagavya, Amrit-Jal, Vermiwash, Neem oil etc. along with use of manures as per the recommendation through organic manures (vermicompost, cow dung manures etc.) should be arranged and selection of good fruit at first picking stage for seed purpose to promote and conserve this traditional brinjal cultivar in the locality.



(Field visit of KVK scientist and Horticulture officers to Gobindpali village and FGD with the Farmers group)

Fig 3: Group discussion with the tribal farmers and collection of information

Conclusion

It was concluded from the field study that landraces like Govindpali brinjal has its own distinctive characters like high yield potential, good size and luster and moderately disease pest resistance particularly to Bacterial and Fungal wilting. This variety in localized condition under farmers field gave a yield about 250-300 (q ha⁻¹) and it has high consumer preference and market demand due to its fruit quality and its good taste in culinary purpose. The genetically characteristics should be studied and it should be preserved by NPBGR

Center, Govt. of India for further varietal improvement in brinjal and for conservation of bio diversity as this local cultivar had unique distinctive characteristics for which identification and conservation of this germplasm is highly essential. Traditional vegetables are gaining increasing interest from various partners. A number of organizations have been considering traditional vegetables for their food and nutrition security, and livelihood improvement programs. Native vegetables like Gobindpali brinjal can be crucial for improving diet quality in these highly bio diverse regions,

while vegetable production can support a holistic transformation of agricultural production for adaptation to climate change and provision of more nutrient-dense foods. There is a greater scope of crop improvement through selection of this local brinjal variety from this particular geographical growing tract and it should be taken for the Geographical Indications (GI) of goods under (registration and protection) act, 1999. Emphasis should be given on bio diversity conservation, improvement, awareness creation and technology promotion activities, ensuring improved seed availability, and capacity building activities which will promote utilization of traditional vegetable varieties.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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