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Exploration and appraisal of indigenous agricultural knowledge practiced by Garo tribal farmers in North-Eastern Himalayan region of India

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ABSTRACT

To identify and determine the efficacy of the indigenous agricultural knowledge (IAK) practiced by the Garo tribal farmer, information were collected from 12 Garo traditional healers (Ojhas) and 20 farmers having knowledge in traditional practices, from different villages of West Garo Hills and East Garo Hills district of Meghalaya. Moreover, 120 farmers were also selected from the same two districts through exhaustive snowball sampling method and interviewed for the appraisal of the identified IAKs. Study revealed that out of nine identified IAKs, the practices namely, use of Capsicum frutescence (Bird's eye chilli) to control fowl pox (72.50%), Premna latifolia (Dokime) as insect repellent (80.83%), Oryza sativa (Rice) with raw turmeric (Curcuma longa) to control fever in poultry birds (74.17%), Curcuma longa + Oryza sativa (Turmeric + Rice husk) to treat castrated animals (69.17%) were found to be effective as per appraisal of the respondents. Hence, proper extension strategy needs to be developed to validate and create awareness about these traditional knowledge and practices.

Keywords **:** Animal husbandry, Garo tribe, indigenous agricultural knowledge, medicinal plants, traditional healers.

Traditional knowledge has been playing a vital role in the development of mankind over time. Human communities have always generated, refined and passed on knowledge from generation to generation. Such "traditional knowledge" is often an important part of their cultural identities. Such knowledge is a community based functional knowledge system, developed, preserved and refined by generations of people through continuous interaction, observation and experimentation with their surrounding environment. It is a dynamic system, ever charming, adopting and adjusting to the local situations and has close links with the culture, civilization and religious practices of the communities (Pushpangadan *et al*., 2002). Traditional knowledge is associated with folk nomenclatures and taxonomy of plants and the environment and in practical domains such as disease aetiology and agricultural practices (Berlin,1992; Brush,1992; Ellen and Harris, 2002; Ellen *et al*., 2002). It is a broad term referring to knowledge systems, encompassing a wide variety of areas, held by traditional groups or communities or knowledge acquired in a non-systemic way (Mugabe, 1999). Rural people have been following from one generation to another generation to cope up with different situation, constraints, weather aberration, *etc*. Such knowledge needs to be valued and blended with new technology for socio-economic improvement. Developing the agricultural sector remains a critical factor towards the achievement of sustainable food production and, indeed, global food security. While indigenous agricultural knowledge is of immense value in improving food production, its documentation and dissemination remain a big challenge to the agricultural scientists throughout the globe (Abioye *et al*., 2011). Indigenous agricultural knowledge (IAK) can be analyzed for its technical role in food production strategies and for its role as cultural knowledge producing and reproducing mutual understanding and identity among the members of a farming group (Bebbington, 1991).

North-Eastern Himalayan regions of India have diverse agro-climatic habitats, large tracts of arable land, crops and cropping pattern suitable for growing location specific crops, which are being cultivated by hundreds of ethnic farming communities with their own indigenous technologies. This leads to variation in crop cultivation practices not only from one agro-climatic zone to another but also from one ethnic group to another. These ethnic farming communities are the storehouse of indigenous knowledge regarding the overall management of indigenous crops. This region is also well-known for diverse culture of human races and home of large number of ethnic people of India. North Eastern states of India are one of the richest repositories of medicinal and aromatic plants in the World. The age long intrinsic relationship between this ethnic people with the environmental resources mainly plants endued the modern civilization with many herbal medicines, though a large number of medicinal plants and their folk uses have remained endemic to certain tribes of the region [(Chakraborty *et al*., 2012), (Marak and Bandyopadhyay, 2015)]. Like other states in this region, Meghalaya is

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one of the tribal dominated states of North-East India with *Khasi, Jaintia* and *Garo* communities constituting majority of the population. Since time immemorial the Garo people are well-known for their indigenous practices in local medicine and had been the source of local treatment against various ailments in rural areas. A variety of indigenous technological innovations have been introduced by Garo communities for making the system more productive, less degradable and able to generate cash income for modern living. The innovations include: use of cover crops, retention of trees, prudent management of weeds, use of poles and logs for soil conservation, introduction of cash crops and fallow management, animal rearing etc. Evolved and adopted by these communities through experiential learning, these innovations have ample potential of replication elsewhere [(Deb *et al.*, 2013), (Jeeva *et al.*, 2006), (Rahman and Fardusi, 2012), (Khaleque and Gold, 1993)]. In the context of the substance of indigenous genotypes has the contribution and participation of the farmers who have trust on the merits of wild varieties (Bordolui *et al.*, 2015). In Garo Hills, a person who practices local medicine is known as '*Ojha*'. *Ojhas* are people with immense knowledge about various medicinal plants and their uses in agricultural practices in general, which developed Indigenous Agricultural Knowledge (IAK) system in the area. There are also some traditional practices which are commonly known and practiced by villagers and are passed on from generation to generation. Identification and utilization of such indigenous IAK is essential as traditional knowledge forms the foundation of modern science. Refining and blending the traditional knowledge with modern science and technology can offer a huge scope for the advancement and development of agriculture and allied fields. With this context the present study was undertaken with the following objectives:

1. To identify the Indigenous Agricultural Knowledge (IAK) practiced by the Garo tribal farmers of Meghalaya.
2. To determine the efficacy of the Indigenous Agricultural Knowledge (IAK) practiced by the Garo tribal farmers of Meghalaya.

MATERIALS AND METHODS

Many methods have been suggested by different authors for the documentation of Agricultural Indigenous Knowledge (AIK). The popular methods are identifying specialists, case studies, field observation, in-depth interview, participant observation, participative technology analysis, surveys, brain storming, games, group discussions role play, SWOT analysis, village reflections, village workshops, flow chart, mapping, taxonomies, participatory video and photo/ slide documentation. AIK could also be documented in the form of descriptive texts such as reports, inventories, maps, matrices and decision trees; audiovisuals such as photos, films, videos or audio cassettes as well as dramas, stories, songs, drawings, seasonal pattern charts, daily calendars and so on. Indigenous knowledge could also be stored in local communities, databases, card catalogues, books, journals and other written documents, audiovisuals and museums [(IIRA, 1996), (Karter,1993), (Chande, 1993), (Mane and Suteria,1993), (Abioye *et al*., 2011)].

For the present study, information on local names of plants and their traditional uses as IAKs were collected from 12 Garo traditional healers or *Ojhas* and 20 farmers having knowledge in traditional practices, residing in different villages of West Garo Hills and East Garo Hills district of Meghalaya. Out of five districts in Garo Hills, these two districts were selected purposively as practice of IAKs and concentration of traditional healers (*Ojhas*) is more. These traditional healers (*Ojhas*) were primarily identified from Sam Achik Hospital, Danakgre, West Garo Hills, Meghalaya (A Hospital of Garo Traditional Medicine) and list were prepared. According to the list, different villages of West Garo Hills district and East Garo Hills district of Meghalaya were visited and information was collected. Finally 12 numbers of traditional healers or *Ojhas* were found to be pertinent to provide meaningful information about the traditional practices and some *Ojhas* were reluctant to unfold their professional secrets about the traditional practices. 20 farmers having knowledge in traditional practices were also selected through snowball sampling method based on the criteria about authencity of their knowledge base according to the other fellow farmers and traditional healers (*Ojhas*). The details of traditional knowledge were recorded by using farmers' participatory methods such as participant observations and unstructured exchanges and also photo documentation. [Rajasekaran (1993), Rath (1993)]. The botanical identification of different plant species used in traditional practices were done with the help of experts from National Plant Breeding and Genetic Resources, Regional Station (ICAR), Plandu, Ranchi, Jharkhand.

The appraisal of the identified traditional practices was also conducted on selected respondents. The knowledge section of AIK of tribal communities in Kerala was measured in True, False and Don't Know categories, whereas perception regarding documented AIK was measured in Likert type of response scale ranging from strongly agree (1) to neutral (3), to strongly disagree (5) (Nidheesh, 2009). For the present study,

West Garo Hills and East Garo Hills district of Meghalaya were selected purposively based on the same earlier mentioned criteria. 120 farmers were selected as sample respondents from 13 villages of West Garo Hills and 8 villages of East Garo Hills district of Meghalaya through exhaustive snowball sampling method based on the criteria about their knowledge base according to the other fellow farmers. The data was collected with the help of semi-structured interview schedule for the appraisal of identified Indigenous Agricultural Knowledge (IAK). The degree of effectiveness of IAKs was rated as less than 50% efficacy for less effective, 50%-70% for effective and above 70% for very effective practices. The respondents were asked to indicate 'Don't know' for the practices not known to them (Sinha,2010).

RESULTS AND DISCUSSION

During survey nine plant species were identified which are used as local treatment against various ailments related to livestock and agriculture. The identified plant species belonged to the family Rutaceae, Zingiberaceae, Solanaceae, Poaceae and Brassicaceae. The medicinal ingredients used by the Garo medicine persons are of three kinds: plants, parts of animal body, and minerals (Mandal, 2013). The present study focuses on different parts of plants used as local measures. Plant species used as medicine in traditional practices against various ailments by villagers and *Ojhas* are presented in table 1. Study shows that different plant species are being used by the farmers for the treatment of poultry birds. For example, different *Capsicum sp* are being used for the treatment of disease like fowl pox, fowl mite etc. Some *Citrus sp* and wild turmeric are being used for the treatment of cattle diseases. Thus, priorities of multipurpose tree and shrubs in the traditional farming practices by the Garo tribal farmers help to utilize different plant species in the traditional practices (Jeeva *et al.*, 2006).

Appraisal of traditional practices also measured in the study according to the respondents' opinion about the efficacy of the practices, which revealed that some of the traditional practice may be of immense significance. Table 2 depicts the percentage of responses regarding efficacy of IAKs practiced according to respondents. It was found that out of nine IAKs identified in the study, the practices namely, use of *Capsicum frutescence* (Bird's eye chilli) to control fowl pox (72.50%), *Premna latifolia* (Dokime) as insect repellent (80.83%), *Oryza sativa* (Rice) with raw turmeric (*Curcuma longa*) to control fever in chicken (74.17%), *Curcuma longa* + *Oryza sativa* (Turmeric + Rice husk) to treat castrated animals (69.17%) were identified to be effective by the villagers. It is also supported by the fact that very little or no respondents were found who do not know about these commonly practiced traditional knowledge by the farmers as it is evident from table 2. *Capsicum frutescence* to control fowl pox and *Premna latifolia* as insect repellent were also indicated by 13.34 per cent and 16.67 per cent of the total respondents respectively as very effective measures. But, the respondents also opined that *Citrus maxima* (Pummelo-Jambura) as insect control measures (45.83%), *Curcuma rubescens* (Dikge Nojol) to control diarrhoea in cow (80%), *Brassica juncea* (Mustard- Besual) against flies and worms (74.17%), and *Citrus macroptera* (Wild Citrus- Chambil) to treat fever in animals (80.83%) were not known to them. But, 31.67 per cent respondents also opined that *Citrus maxima* as insect control measure is effective. The leaves of some of the *Citrus* species of this area contain geraniol, which are known to have either insecticide or repellent (Sinha, 2010).

The study unfolded that almost all plant parts like leaves, roots, fruits, seeds, rhizome, flowers and stems are used as medicine for curing diseases. An in depth study on such plant species and their uses can generate knowledge for improving agriculture and modern science as a whole. It was also observed that there are certain strong beliefs among Garo tribal villagers and traditional healers regarding certain practices. For instance; *Ojhas* believe that the effectiveness of medicine is less if the names and method of preparation is revealed to others. These act as one of the main reason for the slow and gradual disappearance of many indigenous traditional practices in the society. It was also reported by some *Ojhas* and villagers that some of the medicinal plants and herbs are on extinction and very hard to find even in the wild. This may be due to the practice of shifting cultivation (*Jhum*) among farmers in the selected villages. Seventeen Himalayan medicinal plants, including more than half of them used by Bhotia tribal community in Central Himalaya of India, are listed in the Red Data Book of Indian Plants. In addition, several other taxa, although not listed, have reached a stage of critically endangered category (Samant *et al.*, 1998). Implication may be drawn from the findings that there is a need to preserve such IAKs as it acts as the local source of help in places which are less advanced and have lack of proper infrastructure and communication facilities. Moreover, in-situ and ex-situ conservation strategies should also be taken to preserve several medicinal plants of this region to prevent from extinction. Most of the Indigenous Agricultural Knowledge practiced the villagers are eco-friendly and available freely in nature. Hence, proper extension strategy needs

Table 1: Traditional practices against various ailments by villagers and *ojhas* of Garo hills, Meghalaya

Plant name	Scientific name	Local name (Garo)	Disease	Indigenous knowledge	Rationale
Pummelo	*Citrus maxima*	Jambura	To control diseases and insect pests in rice field.	Slice small pieces of pummelo skin and broadcast in the rice field.	Insects are repelled due to the smell of pummel skin.
-	*Curcuma rubescens*	Dikge Nojol	To treat cattle suffering from diarrhoea.	Rhizome of the plant can be crushed and fed to the animal. The extracted juice of the rhizome is also applied on the body of the animal.	Rhizome may have some anti- diarrheic properties and helps in digestions.
Bird's eye chilli	*Capsicum frutescens*	Jallik Meski	Fowl pox	*Capsicum frutescens* is mixed with water after grinding. The solution can be applied near the eye of the infected bird.	Capsicum slurry may be helping to restrict any other type of infection
-	*Premna latifolia*	Dokime	Fowl mites	Leaves of the plant can be used in chicken hatchery as a repellent against fowl mites.	Smell of the leaves works as repellent.
Turmeric + rice	*Curcuma longa* + *Oryza sativa*	Haldi + Mi	To control fever in chicken	Feed hot rice mixed with raw turmeric.	Turmeric has anti-biotic property and rice is mixed due to easy intake during fever rather than grain.
Bamboo	*Bambusa vulgaris*	Wa'a	To pigs showing symptoms of fever and eating less food.	Fermented bamboo shoot can be given to pigs orally.	Fermented bamboo shoot may develop some pro-biotics.
Turmeric + rice	*Curcuma longa* + *Oryza sativa*	Haldi + Mi	Post-castration treatment of animals	Raw turmeric can be mixed with rice husk and applied to the wound after castration.	Turmeric has anti-biotic property
Mustard	*Brassica juncea*	Besual	Treatment of newly born calf to prevent infection from flies and worms.	Apply sugar mix with raw mustard oil in the naval cord of the calf to prevent infection.	Pungent smell of mustard prevents flies and worms.
Wild citrus	*Citrus macroptera*	Chambil	Treatment of cattle and pigs showing fever, weakness and eating less food.	Extracted juice of wild citrus can be used by feeding the animal.	Wild citrus have some medicinal properties.

Table 2: Frequency percentage of the efficacy of traditional practices according to respondents

IAK	Do not know	*Less effective	**Effective	***Very effective
Citrus maxima as insect control measures	45.83	15	31.67	7.50
Curcuma rubescens to control diarrhoea in cow	80	5	9.16	5.83
Capsicum frutescens to control fowl pox	0	14.17	72.50	13.34
Premna latifolia as insect repellent	0	2.50	80.83	16.67
Oryza sativa to control fever in chicken	1.67	15	74.17	9.17
Bambusa vulgaris to reduce fever in pigs.	28.34	65	6.67	0
Curcuma longa + Oryza sativa to treat castrated animals.	6.67	15	69.17	9.17
Brassica juncea against flies and worms.	74.17	20.83	5	0
Citrus macroptera to treat fever in animals.	80.83	7.50	11.67	0

*<50% efficacy **50-70% efficacy and ***>70% efficacy

Fig. 1: *Curcuma rubescens*

Fig. 2: *Capsicum frutescens*

Fig. 3: *Premna latifolia*

Fig. 4: *Curcurma longa*

Fig. 5: *Citrus macroptera*

to be developed to validate and create awareness about the importance and role of traditional knowledge and practices among the rural people.

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