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# Tribal farmers' traditional knowledge and practices for pig farming in Nagaland

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ABSTRACT

Pig husbandry is an important farming component in Nagaland which plays a significant socio-economic role in the livelihood of Naga tribes. The present study documented the Indigenous Traditional Knowledge (ITK) on pig farming as practised by tribal farmers in Nagaland. Some commonly used plants for feed were *Manihot esculenta, Colocasia esculenta* L.*, Ipomea batata, Euphorbia hirta* L.*, Musa* spp.*, Eichhornia crassipe, Bidens spilosa Ficus hispida* L. *etc.* Ethnoveterinary plants identified were *Oroxylum indicum* for treatment of oral and foot lesion in FMD and also for deworming; *Rhus chinensis* for treatment of fever; *Hibiscus cannabinus* L. for fever and dysentery; *Spondias pinnata, Rhus similata* and *Curcuma caesia,* guava, bamboo, banana, papaya against diarrhoea and dysentery; *Gynura cusimbua* for its healing properties and *Cinnamomum verum* as anti-helminthic. *Gur* for diarrhoea and dysentery; brick powder and wood ash for deworming; beehives for curing fever and termite's earth for prevention of piglet's anaemia were reported for the first time. Other plants which were documented in the present study were *Carica papaya* L., *Lagenaria siceraria*, *Citrus* spp. and *Ananas comosus* (L.) Merr. as abortifacient; application of wood ashes with kerosene oil after castration to prevent bleeding and as disinfectant and *Carica papaya* as galactogogue.

**Key words**: Ethnoveterinary, Feed, Indigenous Knowledge, Nagaland, Piggery

Nagaland is a tribal inhabited mountainous state with non-vegetarian food habits and agriculture as main occupation of the inhabitants. Backyard pig rearing is an integral part of Naga tradition and plays a significant role in the livelihoods and socio-cultural practices of the tribal farmers in Nagaland. Pigs alone account for 55.38% of the total livestock population in Nagaland as per 19th Livestock Census (GoI 2012) and also the per capita consumption of pork in Nagaland is the highest in the country (NSSO 2011–12). The pig production systems in Nagaland vary amongst ethnic groups, locations and cropping systems, but it is mainly characterized by small units, dependence on traditional management, fattening over breeding, dependence on locally available feed and food waste, low productivity and uses of different Indigenous Traditional Knowledge (ITKs) by each tribe in general management, healthcare and breeding. Over the years, the traditional management, based on local traditional knowledge, continues to dominate production system with the exception that scavenging systems have given way to penning and indigenous pigs have been replaced mainly by crossbreed (Singh and Mollier, 2016).

The socio-economic backgrounds, remoteness and inaccessibility to medicine and veterinary services compel the farmers to adopt and rely on the time tested traditional knowledge for management of the pig during its different growth stages. To the best knowledge of the authors, there is no information documented on the rich ITKs of pig rearing tribal farmers of Nagaland. In this regard, the study was carried out to document ITKs of tribal Naga farmers on commonly used plants in pig farming for scientific testing, validation and standardization.

## MATERIALS AND METHODS

Nagaland is located between 96–98° E longitudes and 26.6–27.4°N latitudes. The altitude varies from 300 m to 2300 m above mean sea level. The state is inhibited by 16 tribes namely *Angami, Ao, Chakhesang, Chang, Kachari, Khiamniungan, Konyak, Kuki, Lotha, Phom, Pochury, Rengma, Sangtam, Sumi, Yimchunger* and *Zeliang*. Data on different aspects of pig husbandry, viz. general management, feed, breeding and disease management were collected by survey and case study method. Respondents from ten districts, viz. namely Dimapur, Kiphire, Kohima, Longleng, Mokokchung, Peren, Phek, Tuensang and Wokha were randomly selected through multistage random sampling technique. Two blocks were randomly selected from each district and subsequently one village from each

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Table 1. Commonly used plants as feed for pig in Nagaland

| Common Name | Scientific name | Part use | Method of use |
|---|---|---|---|
| Cassava/tapioca | *Manihot esculenta* | Root and leaves | Raw/Cooked |
| Colocasia | *Colocasia esculenta* | Leaves and petiole | Cooked |
| Sweet potato | *Ipomea batatas* | Root, leaves and vines | Raw/Cooked |
| Asthma plant | *Euphorbia hirta* | Whole plants | Raw/Dried/Cooked |
| Banana | *Musa* spp. | Pseudostem (mostly), leaves and plantain | Raw/Cooked |
| Water hyacinth | *Eichhornia crassipes* | Whole plant excluding roots | Raw/Cooked |
| Beggar Tick, Spanish needle, *Kumra* (hindi) | *Bidens pilosa* | Leaves and stalk | Raw/Cooked |
| Hairy fig | *Ficus hispida* | Tender leaves | Raw/Cooked |
| *Gynura* spp. | *Gynura cusimbua* | Whole plant excluding inflorescence | Cooked |
| Papaya | *Carica papaya* | Fruit (mostly) and leaves | Raw/Cooked |
| Vasukah, Buka (Sanskrit) | *Borreria hispida* | Whole plant | Cooked |
| Spider flower | *Osbeckia* sp. | Leaves | Cooked |
| Chinese gooseberry | *Saurauia nepaulensis* | Leaves | Cooked |
| Toothache Plant | *Spilanthes acmella* | Leaves | Cooked |
| Kalijiri, Somraj | *Vernonia anthelmintica* | Leaves | Cooked |
| Amaranth | *Amaranthus sp.* | Leaves and stalk | Cooked |
| Climbing hempweed | *Mikania scandens* | Whole plant | Raw/Cooked |
| Spilanthes | *Spilanthes mauritiana* | Leaves and stalk | Raw/Cooked |
| Paper mulberry | *Broussonetia papyrifera* | Leaves | Cooked |
| Alligator weed | *Alternanthera philoxeroides* | Leaves and stalk | Raw |
| Pumpkin | *Cucurbita pepo* | Fruit | Raw |

block. Total 165 randomly selected piggery farmers (6–9 farmers/village including the key informants) were surveyed to represent different tribal communities. Semi-structured interview schedule was developed and tested to collect the relevant information. A range of Participatory Research Appraisal (PRA) tools and techniques (direct observation, focus group and individual discussions, field visits and questionnaires) were used to elicit information following Guarino and Friis-Hansen (1995) and Christinck *et al.* (2000). Field trips were also made to identify and collect the listed plant specimens and/or ethnobotanical products. The validity of the data collected was also cross-checked with the staff of state agriculture and veterinary departments and *Krishi Vigyan Kendras* (KVKs). The authors also made an attempt for non-experimental validation of documented plants and their products though a systematic collection of secondary data followed by an extensive literature review on the taxonomy of the plant specimens collected and their ethno botanical applications (Lan, 2001).

## RESULT AND DISCUSSION

Although piggery is one of the main livestock components of Naga traditional farming system, rural tribal farmers usually rear two to three pigs per household. The scavenging system of pig has been almost entirely replaced by penning system throughout the state. Farmers rear pigs in intensive system in temporary pig sties, constructed with locally available materials made of wood or bamboo with roofing made with thatch or corrugated galvanised iron (CGI) sheet. Similar findings were reported by Patra *et al.* (2014). The floor is generally made of wooden planks, bamboo, *kaccha* and concrete. Most of the pig sheds are constructed near the house. Although, the indigenous pig has been mostly replaced by crossbreeds, Nagas prefer the indigenous black coloured local pig (*Tenyi vo*) for its unique meat taste.

Availability, accessibility and affordability of quality feed remain major constraints for pig rearing in Nagaland. Conventional feed ingredients used in commercial farm are not economical for small scale farmers because of its high cost. The tribal farmers have evolved a self-sustainable local resource based production system, in which pigs are mainly fed with local vegetation, crop residues and kitchen waste (Kumaresan *et al.* 2007). Male pigs are usually castrated by the farmers themselves as majority of the farmer's rear pigs for fattening purpose. Piglets are generally weaned two to three months after farrowing. Meat preservation by smoking can be generally observed in most of the rural household kitchens. Smoked meat is highly preferred by Nagas because of the distinct flavour produced and long storage capacity.

*Feed management:* A wide range of non-conventional feeds for pig were found to be used in different districts of Nagaland depending upon the availability (Table 1). Local vegetation, leaf, stem and roots are chopped into pieces and are either fed raw along with kitchen waste or cooked with broken rice or wheat bran or rice bran or in combination of all these as a slurry. Feeding the waste residues of locally made rice beer is common in rural areas. Feeding of balanced concentrate feed is not practised by the tribal farmers due to lack of knowledge, non-availability and high cost of the same. Storage of feed is not commonly found except by some farmers in case of cassava, colocasia and asthma plant (*Euphorbia hirta*) for feeding in the winter season. Raw eggs, dried fish, honey and salt (especially in piglets) are also fed separately or in combination. Old

Table 2. Commonly used plants for diseases management in pig

| Plants/materials | Botanical name | Parts | Disease | Method of use |
|---|---|---|---|---|
| Broken bone tree | *Oroxylum indicum* | Bark | FMD | Paste of the tree's bark is applied on the lesion for five to seven days |
| | | | Deworming | Decoction of the bark are mixed in water for deworming. |
| Nutgall tree | *Rhus chinensis* | Fruits | Fever and tongue lesion | Fruits of Nutgall tree are fed with stingless bee honey for five to seven days. |
| *Ganja*, Bhang | *Cannabis sativa* | Leaf inflorescence | Fever and lack of appetite | Raw or dried leaves and inflorescence of *ganja* are feed to increase the appetite particularly during fever. |
| | | | Respiratory disease | Juice are extracted after crushing the fresh *ganja* leaves and then fed with rice for two to three days. |
| Banana | *Musa* spp. | Pseudostem Leave | Diarrhoea and dysentery | Feeding of pseudo-stem and leaves of banana plant for three to five days. |
| Wild mango (Hog plum) | *Spondias pinnata* | Bark, fruits and leaves | Diarrhoea and dysentery | Fruit and leaf are mixed with feed and fed for three to five days. Also, bark juice is mixed with drinking water of the animal. |
| Mesta | *Hibiscus cannabinus* | Dried leaves and flower | Dysentery and fever | Dried leaves and flowers are fed either separately or mixed with feed for three to five days. |
| Guava | *Psidium guajava* | Young shoot and leaves | Diarrhoea and dysentery | Young shoots and leaves are mixed with feed for three to five days. |
| Papaya | *Carica papaya* | Leaves and fruits | Diarrhoea, dysentery and deworming | Papaya leaves and fruits are fed for three to five days. |
| Black Turmeric | *Curcuma caesia* | Root | Diarrhoea and dysentery | Root of black turmeric are crushed and fed for three to four days. |
| *Naga denga* | *Rhus similata* | All parts excluding roots | Diarrhoea and dysentery | All parts excluding roots of *Naga denga* are crushed and fed for three to five days. |
| Bamboo | *Bambusa vulgaris* | Leaves | Diarrhoea and dysentery | Leaves are crushed and fed for three to five days. |
| Hairy fig | *Ficus hispida* | Leaves | Deworming | Cooked with rice or wheat bran or fed in raw for two days. |
| Cinnamon | *Cinnamomum verum* | Bark | Deworming | Dried bark of cinnamon is feed for two to three days. |
| Stinging nettles | *Urtica dioica* | Bark | Dermatitis | Bark is kept for 10 to 15 days around the neck to remove the maggots. |
| Turmeric | *Curcuma longa* | Powder | Dermatitis | Paste of turmeric powder and mustard oil are applied externally in the infected area for 10 to 15 days. |
| Neem | *Azadirachta indica* | Leaves | Dermatitis | Paste of neem leaves is applied in the infected region for 10 to 15 days. Boiled water of neem leaves are used for cleaning the infected area. |
| *Gynura* | *Gynura cusimbua* | Leaves | Wound healing | Paste of the leaves is applied externally for seven to ten days. |
| Tobacco | *Nicotiana tabacum* | Leaves | Leech and mites | Tobacco extract or leaves are externally applied to get rid of leech/mites. |
| Mustard | *Brassica* spp. | Oil | Fever, Respiratory disease | Feeding of gur and raw mustard oil. |

Table 3. Commonly used materials for diseases management in pigs

| Material | Disease | Method of use |
|---|---|---|
| Stingless bee honey (*Tetragonula irridipennis*) | Diarrhoea and dysentery | Honey is mixed with feeds and fed for three to five days. |
| *Gur*/Molasses | Diarrhoea and dysentery | Mixed with feeds and fed for three to five days. |
| Wood ashes | Deworming | Wood ashes are mixed with drinking water or mixed with raw feeds. |
| Beehives | Fever | Beehives are burnt partially then mixed with feed and fed once. |
| Earth from termite mound | Piglet anaemia | After farrowing, farmers use to keep piglet in termite earth for one month as it is rich in iron. |

cassava root are usually peeled off before feeding to avoid toxicity. *Euphorbia hirta* also known as *Dudheli* is one of the most common feed usually found in the rainy season. The plant is usually fed raw, and are also dried for use in lean seasons. It is grown widely in most parts of India and in other tropical countries, especially on roadsides and on wastelands (Linfang *et al.* 2012).

Leaves and petioles of *Colocasia esculenta* as feed for pig have been reported in India and other countries (Patra *et al.* 2014). Use of *Ipomea batatas* (An and Lindberg, 2004); *Eichhornia crassipes* (Men *et al.* 2006); *Biden pilosa* (Muhanguzi *et al.* 2012) and *Musa* spp. (Nath *et al.* 2013) have also been reported in different studies. *Ficus hispida, Gynura cusimbua, Carica papaya, Borreria hispida, Osbeckia, Saurauia nepaulensis, Amaranthus, Mikania scandens, Spilanthes mauritiana, Broussonetia papyrifera* and *Alternanthera philoxeroides* are some of the non-conventional feeds used by the farmers in the North East India. *Spilanthes acmella*, *Vernonia anthelmintica* and *Bidens spilosa* are also reported to use as feed in low input traditional farming practices of North Eastern Himalayan region (Moanaro *et al.* 2011). *Alternanthera philoxeroides* has high protein content and are recommended for use as feed for animal and fish (Li *et al.* 2013). The waste of locally prepared rice bear is available in plenty, as rice beer is a popular drink in the state. It is especially drunk by all the Naga tribes either as Zutho or Ruhi or Madhu or Yi (Ngachan *et al.* 2013). *Naga* tribes commonly feed the raw or dried leaf and inflorescence of locally available *ganja* or *bhang* (*Cannabis sativa*) to increase the appetite in pig. *Cannabis sativa* has been well known for many years for its ability to enhance appetite and weight gain (Fride and Mechoulam 2001).

*Disease management:* Diarrhoea, classical swine fever, endo-parasitism, mange, respiratory problems, anaemia, foot and mouth disease (FMD) are the major health problems of pig in Nagaland (Patra *et al.* 2014). For treatment of diseases, Naga tribals use ethno-veterinary plants in different ways (Table 2).

The bark of *Oroxylum indicum* is used by ethnic communities of North East India for treating animal diseases animals (Moirangthem *et al.* 2008). *Rhus chinensis* has been used as a traditional medicine in Asia for treatment of cold, fever and malaria (Rayne and Mazza, 2007). *Hibiscus cannabinus* is used to cure fever, dysentery, pains and bruises (Lee *et al.* 2007); guava, bamboo, papaya and banana for diarrhoea and dysentery (Saran *et al.* 2015); *Gynura cusimbua* for its healing properties (Rana and Blazquez, 2007); *Cinnamomum verum* as anti-helminthic (Williams *et al.* 2015); tobacco for anti-leech (Bahmani and Rafieian-Kopaei, 2014) and the use of neem leaves and bark paste for skin related disorders is well documented. Paste of turmeric (*Curcuma longa*) powders and mustard oils and wood ash are used as anti-inflammatory, anti-infection, and for quick healing of the wound (Manohar *et al.* 2009). Use of *Spondias pinnata, Rhus similata* and *Curcuma caesia* for diarrhoea and dysentery; *Cinnamomum verum* for deworming; stinging nettles for maggot infection; gur for diarrhoea and dysentery; bricks and wood ash for deworming; beehives for curing fever and feeding of piglets with earth from termite mounds for piglet anaemia are reported for the first time to the best knowledge of the authors and these further need scientific validation (Table 3).

*Breeding management: Carica papaya* L., *Lagenaria siceraria*, *Citrus* spp. and *Ananas comosus* L. Merr. are fed as abortifacients for unwanted pregnancy. Fruits of these plants are given as feed continuously for three to four days. *Carica papaya* L. (Saran *et al.* 2015)*, Lagenaria siceraria*, *Citrus* spp. and *Ananas comosus* (Farnsworth *et al.* 1975) are used as abortifacients in human and animals. A rare practice of cutting the tip of the vulva to prevent oestrus in female pig to prevent breeding is found in remote areas near the Myanmar border. Application of wood ash separately or mixed with kerosene oil after castration is commonly used without any scientific rationale. Paste of turmeric (*Curcuma longa*) powder and mustard oil are also commonly applied as anti-inflammatory, anti-infection, and for quick healing of the wound. Raw eggs and salt are fed to induce estrus in female pig for breeding purpose. Leaves of *Bambusa vulgaris* are fed for treatment of retained placenta in pig because of its high estrogen content which causes contraction of uterus and thus expels the retained placenta (Lans *et al.* 2007). Green papaya (*Carica papaya*) fruit and leaf are fed raw or boiled to the lactating sow as galactogogue (Lans *et al.* 2007). Prescribed doses varied across the different tribes and regions, and even in the same community; as ethno-veterinary dosages could be described as case and context specific rather than a specific set of guidelines (Longuefosse and Nossin 1996).

Indigenous traditional knowledge is a very important feature of pig rearing in Nagaland intricately woven with

the socio-cultural life of tribal farmers particularly in remote and inaccessible areas mainly due to lack of scientific pig production and also the wisdom of the tribal farmers which has developed over long period of time. However, ITKs are yet to be fully harnessed by scientists, practitioners, and policy-makers. Various ITKs needs to be scientifically tested, validated and standardised for their widespread use. Different stakeholders have to jointly undertake observation, documentation, and validation of local and indigenous knowledge for future. Analysis of the nutrient content and pharmacologically active compound present in these plants should be done for further exploitation. Moreover, many of the plants species are not cultivated and are collected from wild, therefore, conservation of these plants is of prime importance.

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