

## Wild, semi-domesticated and underutilized legumes of Nagaland, India

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### Abstract

Legumes are mostly recognized for their dietary and economic values. Pulses play major role in balanced nutrition as they are major sources of proteins and carbohydrates. In Nagaland, India there are many wild legumes which have the potential to be used as pulses, yet not explored for their uses. Present study in six districts of Nagaland recorded 19 species of edible pulses with some of their varieties and 31 non-edible but medicinal legumes.

**Key words:** Edible pulses, Medicinal legumes, Nagaland, Semi-domesticated legumes, Underutilized crops, Wild edible legumes.

### INTRODUCTION

With the ever growing population, the dependency on only few crop species has become a serious problem. On the other hand, underutilized crops could be cheaper option against those few crop species to sustain the future generation. These crops are also referred to as 'neglected and underutilized species'/'orphan crops'/'minor crops' (Padulosi *et al.* 2002). Underutilized crops have high nutritional values and medicinal values yet those are under exploited of their potential. Apart from their use as source of food, some are important due to their medicinal properties, vegetables, fibers, construction materials, dyes etc. Underutilized crops enjoy high adaptive advantages under marginal agro-ecological and edaphic situations (Thies 2000; Rai *et al.* 2002; Deb *et al.* 2016). Agriculture remains the most important sector of the state economy. Out of the total geographical area of 16, 57,900 ha, the gross area under agriculture is 3,68,130 ha with shifting or jhum cultivation occupying about 90 % of the area under agriculture (Nakro 2011). The Jhum fields are cultivated with various crops including legumes which have been used for the sustenance of the family but in recent times, due to their demand in the market, the farmers have started to cultivate the crops for commercial purpose. Nitrogen fixing legumes can also be utilized to reclaim and improve fertility of jhum fields so as to make jhum cultivation more productive and sustainable.

Pulses are major source of plant proteins, carbohydrates and other nutrients like phosphorus, minerals, vitamin C, riboflavin and essential amino acids. Some are also reported to have medicinal properties (Nene 2006). Pulses belong to the legume family Leguminosae, which is the third largest among the angiosperm, representing more than 700 genera and about 19,000 species (Christenhusz & Byng 2016). Over the years, many wild varieties of legumes have been domesticated. Most of the cultivated pulse plants are annuals having shrub/ herb habit and due to their ability to fix atmospheric nitrogen those are, therefore, used as green manure. They maintained soil health and quality through increasing soil organic matter, improving soil porosity and structure, recycling nutrients, decreasing soil pH,

diversifying the soil microscopic life and breaking disease build-up and weed problems (Sanjappa 1990).

Previous studies had reported rich crop diversity in Nagaland (Barua *et al.* 2006; Nakro 2011; Singh & Misra 2014). However, till now, no work has been done on legumes and particularly on underutilized legume crops of Nagaland (Takatemjen *et al.* 2009; Deb *et al.* 2013, 2016). The present study was undertaken to document the wild and semi-domesticated legumes including non-edible but medicinal legumes growing in different districts of Nagaland. The present communiqué reports a part of the work done in some districts of Nagaland.

## MATERIALS AND METHODS

### Survey Area

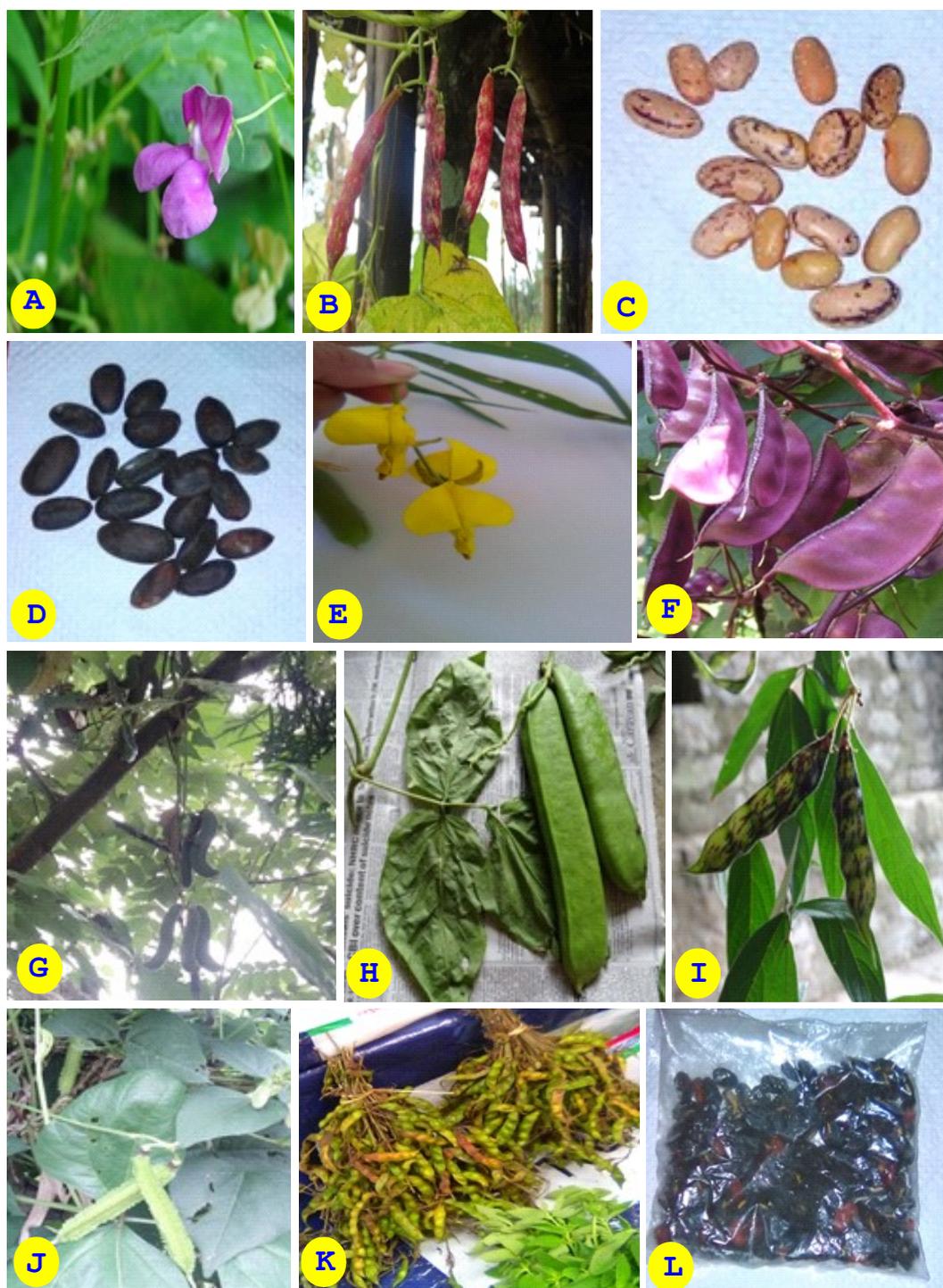
Survey was done in six districts of Nagaland in Northeast India viz., Dimapur, Kohima, Mokokchung, Tuensang, Wokha and Zunheboto. Nagaland is a remote state of North-East India and is located between 25°06' to 27°04' N latitudes and 93°20' to 95°15' E longitudes with an altitude of 300 – 3840 m above mean sea level with a geographic area of 1.6 M ha (16,579 km<sup>2</sup>). The state is bounded by Assam in the West, Myanmar in the East, Arunachal Pradesh in the North and Manipur in the South. The state is represented by hilly terrain comprising closely spaced elevated ridges with alternate intermountain valleys. Nagaland has forest cover of 8,629 sq km i.e. 52.04 % of total area (NEC 2002). The climate ranges from humid subtropical to temperate type and minor variations are caused by changes in physiography. Monsoon is the longest lasting for five months from May to September with May, June, and July being the wettest months. Owing to varied topography and relief, annual rainfall varies from 1000 mm to over 3000 mm at different places with an average of 2000 mm (Nakro 2011). The average annual temperature ranges from 18 – 20° C for higher altitudes and 23 – 25° C for lower altitudes. Geo-morphologically, the terrain can be broadly grouped into four topographic units: alluvial plains (150 to 200 m amsl), low to moderate linear hills (200 to 500 m amsl), moderate hills (500 to 800 m amsl) and high hills (over 800 m).

### Methodology

Exploration trips to 18 villages and locations in 6 districts (Mokokchung, Kohima, Wokha, Dimapur, Zunheboto and Tuensang) of Nagaland (Table 1) were undertaken to survey and collect the edible and medicinal pulses/ legumes. Survey was conducted in different seasons of the year. The seeds as well as the plants of different species were collected, identified

**Table 1.** GPS location of the six districts under the present survey

Sl. No.	District	Villages/ places Surveyed	Elevation in m	Central location
1.	Mokokchung	Chuchuyimlang, Mopungchuket, Tuli, Ungma, Changki	1388	26°33' N & 94°53' E
2.	Dimapur	Dimapur	184	25° 90' N & 93°73' E
3.	Zunheboto	Sema Settsu, Zaphumi, Lumami	1361	25° 97' N & 94°52' E
4.	Wokha	Wokha	1859	26°10' N & 94°27' E
5.	Tuensang	Helipong, Siphongsang, Kuthor, Chingdang Saddle, Chingmei	1855	26°24' N & 94°75' E
6.	Kohima	Khonoma village, Forest colony, Lower Chandmari	1223	25°67' N & 94°12' E



**PLATE-I:** Some edible pulses of Nagaland. **A– C:** Flowers, fruits and seeds of *Phaseolus vulgaris*; **D:** Seeds of *Parkia timoriana*; **E:** Flowers of *Crotalaria leshenaultii*; **F:** Fruit of *Lablab purpureus*; **G:** Fruit of *Mucuna pruriens*; **H:** Pods of *Canavalia gladiata*; **I:** Pods of *Cajanus cajan*; **J:** Fruit of *Psophocarpus tetragonolobus*; **K:** Pods of *Vigna umbellata*; **L:** Marketed packets with seeds of *Vigna unguiculata*

and information on their traditional uses were gathered from the local people. Besides the wild, the markets of the districts were also surveyed and studied. Plants were identified using local floras (Kanjilal *et al.* 1938) and the names were further checked in <http://www.theplantlist.org> for updated nomenclature. The collected voucher specimens were stored and deposited in the Herbarium of the Department of Botany, Nagaland University.

## RESULTS AND DISCUSSION

During the survey, nineteen species of edible pulses were collected and identified (Table 2). Identification of some of the species and their varieties collected are under progress. The usage of the surveyed species also has been documented in Table 2. Besides the pods and seeds, leaves, inflorescence and flowers of some of the leguminous species are taken as food in different ways by the local people. Most of the pulses are consumed because of their

**Table 2.** List of edible pulses found in Nagaland along with their common and vernacular names and uses

Sl. No.	Botanical Name [Subfamily]; Herbarium Accession No.	Common name	Ao name	Uses
1.	<i>Cajanus cajan</i> (L.) Millsp. [Papilionoideae]; NU-AP-01	Pigeon pea/ red gram	Mahajang	As vegetable
2.	<i>Canavalia gladiata</i> (Jacq.) DC. [Papilionoideae]; NU-AP-02	Sword bean/ jack bean	Kongkilang- jang	As vegetable, for treatment of inflammatory diseases
3.	<i>Cicer arietinum</i> L. [Papilionoideae]; NU-AP-03	Bengal gram/ chick pea	Chana	Rich in proteins, immature grains are eaten raw or boiled, used for treating nervous system disorders
4.	<i>Crotalaria spectabilis</i> Roth [= <i>C. leschenaultii</i> DC.] [Papilionoideae]; NU-AP-04	Showy crotalaria	Langliben	Flowers eaten raw for laxative effect and has antiseptic properties
5.	<i>Crotalaria pallida</i> Aiton [Papilionoideae]; NU-AP-05	Rattle pod	Langliben	Flowers eaten as vegetable
6.	<i>Lablab purpureus</i> (L.) Sweet [= <i>Dolichos lablab</i> L.] [Papilionoideae]; NU-AP-06	Indian bean/ field bean	Matsuklashi	As vegetable. For fever, abdominal pain and antiseptic
7.	<i>Glycine max</i> (L.) Merr. [Papilionoideae]; NU-AP-07	Soyabean	Azüngkenyi h	High content of Proteins and oil. Taken as dried seeds, pounded seeds (powders) taken as a beverage for anemic patients, fermented seeds taken as food.
8.	<i>Lablab purpureus</i> (L.) Sweet [Papilionoideae]; (NU-AP-08) [= <i>D. lablab</i> ]	Hyacinth bean	Matsuklashi	As vegetable
9.	<i>Lens culinaris</i> Medik. [Papilionoideae]; NU-AP-09	Lentil/ Masur		Rich in carbohydrate. Pulse as food
10.	<i>Mucuna pruriens</i> (L.) DC. [Papilionoideae]; NU-AP-10	Cowhage/ velvet bean	Mesemerh	Root decoction induces the flow of urine, as body tonic
11.	<i>Parkia timoriana</i> (DC.) Merr. [= <i>Parkia roxburghii</i> G. Don] [Mimosoideae]; NU-AP-11	Tree bean	Yongjak	As vegetable, helps in curing diarrhea and dysentery
12.	<i>Phaseolus vulgaris</i> L. [Papilionoideae]; NU-AP-12	Kidney/ French bean	Kholar	High in protein. Source of food. Diuretic, hypoglycemic and reduces blood sugar level.
13.	<i>Pisum sativum</i> L. [Papilionoideae]; NU-AP-13	Peas		As pulse and for making flour

Sl. No.	Botanical Name [Subfamily]; Herbarium Accession No.	Common name	Ao name	Uses
14.	<i>Psophocarpus tetragonolobus</i> (L.) DC. [Papilionoideae]; NU-AP-14	Winged bean	Dakra	As vegetable, salads, treatment of cough
15.	<i>Vigna aconitifolia</i> (Jacq.) Marechal [Papilionoideae]; NU-AP-15	Moth bean	Azüngken	In savory dishes, used for treatment of liver ailments and fever
16.	<i>Vigna mungo</i> (L.) Hepper [Papilionoideae]; NU-AP-16	Black gram	Azüngken	Presence of proteins such as albumins and globulins. Seeds are eaten as salad, flour for sweet and savory dishes
17.	<i>Vigna radiata</i> (L.) R. Wilczek [Papilionoideae]; NU-AP-17	Green gram/ Mung	Azüngken	Seeds as whole seed or dhal
18	<i>Vigna umbellata</i> (Thunb.) Ohwi & H. Ohashi [Papilionoideae]; NU-AP-18	Rice bean	Rohongerzu ngken	Vegetable
19	<i>Vigna unguiculata</i> (L.) Walp. [Papilionoideae]; NU-AP-19	Cowpea/ yard long bean	Lolce	Taken as vegetable. Seed decoction taken orally for kidney stones

high nutritional value. Some of the collected species of pulses are shown in Plate 1. In all the places visited, the patterns of occurrence of pulses were found to be similar. However, *Mucuna pruriens* and *Canavalia gladiata* were found to be less prevalent in Tuensang and Mokokchung, respectively, as compared to other districts surveyed. *Phaseolus vulgaris* and its varieties were most abundant in the Tuensang district. It has also been observed that most of the wild edible legumes are now protected in Jhum areas or being cultivated in the fields or domesticated in home gardens. These plants provide valuable livelihood resources for most of the rural people. The people of Nagaland are mostly dependent on natural resources for their food and traditional medicines. The market survey also showed high demand for legumes especially *Parkia timoriana*, *Phaseolus vulgaris* and *Glycine max* besides the beans. Pulses are produced in large quantities, which generate income for local people. However, due to the problems faced for transportation, the grains are unable to export to the neighboring districts or states. Most of the edible legumes and pulses are being sold in the local markets at very reasonable rates. For example, a packet (1 kg) of *Phaseolus vulgaris* seeds is being sold at a price of ₹80 – 100. The marketing systems in most of the districts are still unorganized and un-regulated. And the market rate is not static. During the survey and collection of edible pulses, 31 non-edible leguminous species with medicinal properties were also recorded from the study area which are documented in Table 3. Besides the nutritional aspects, these plant resources also have immense medicinal values. They are used as diuretic, laxative, to treat skin infections, jaundice, rheumatism, hypertension etc. Diversity of grain legumes as well as medicinal legumes in Nagaland is observed which are yet to be properly investigated. The prevailing agro-ecological condition of North-East India is very suitable for growth of underutilized crops. As shifting cultivation is much practiced in Nagaland, the forest lands are becoming barren. Therefore, in order to improve the jhum lands, fast growing trees and legumes are being introduced such as *Parkia timoriana*, a tree species of Mimosoideae, which helps in the reclamation of Jhum lands.

Barua *et al.* (2006) documented 81 accession of grain legumes from Nagaland with 27 accession of *Phaseolus vulgaris*, followed by 19, 16, 9, 9 and 1 accession of *Vigna unguiculata*, *Vigna umbellata*, *Lablab purpureus*, *Glycine max* and *Psophocarpus*

**Table 3:** Some wild legume species of medicinal importance along with their common names (mostly non-edible)

Sl. No.	Botanical Name [Subfamily]; Herbarium Accession No.	Common Name	Uses
1.	<i>Abrus precatorius</i> L. [Papilionoideae]; NU-AP-20	Rosary pea	Leaves used in sore throat; roots for jaundice
2.	<i>Acacia auriculiformis</i> Benth. [Mimosoideae]; NU-AP-21	Australian wattle, Ear leaf acacia, earpod wattle	Roots for sore eyes and rheumatism
3.	<i>Adenanthera microsperma</i> Teijsm. & Binn. [Mimosoideae]; NU-AP-22	Red bead tree	Red dye from wood
4.	<i>Albizia chinensis</i> (Osbeck) Merr. [Mimosoideae]; NU-AP-23	Silk tree / Chinese albizia	Leaves for treating skin diseases
5.	<i>Albizia lebeck</i> (L.) Benth. [Mimosoideae]; NU-AP-24	Black siris tree	To treat skin infections
6.	<i>Albizia procera</i> (Roxb.) Benth. [Mimosoideae]; NU-AP-25	White siris	For stomach problems
7.	<i>Bauhinia variegata</i> L. [= <i>Phanera variegata</i> (L.) Benth.] [Caesalpinioideae]; NU-AP-49	Orchid tree	Stomach disorders, tonic, skin diseases.
8.	<i>Cassia fistula</i> L.; NU-AP-27	Indian laburnum/ golden shower	Purgative
9.	<i>Clitoria ternatea</i> L. [Papilionoideae]; NU- AP-32	Butterfly pea	Roots as antidote to snake bite; dye yielding plant
10.	<i>Derris elliptica</i> (Wall.) Benth. [Papilionoideae]; NU-AP-33	Derris	Fish poison; to treat throat cancer
11.	<i>Desmodium heterocarpon</i> (L.) DC. [Papilionoideae]; NU-AP-34	Desmodium	Decoction of leaves are used for cold
12.	<i>Entada gigas</i> (L.) Fawc. & Rendle [= <i>Entada scandens</i> (L.) Benth.] [Mimosoideae]; NU-AP-36	Niger bean	To treat gastrointestinal disorders
13.	<i>Entada phaseoloides</i> (L.) Merr. [Mimosoideae]; NU-AP-37	Box bean	Extract of stem to treat a range of skin disorders
14.	<i>Erythrina arborescens</i> Roxb. [Papilionoideae]; NU-AP-38	Coral shrub	Fevers and pain
15.	<i>Erythrina stricta</i> Roxb. [Papilionoideae]; NU-AP-39	Coral tree	Skin rashes
16.	<i>Erythrina variegata</i> L. [Papilionoideae]; NU-AP-40	Indian coral bean	Leaves for wounds
17.	<i>Flemingia semialata</i> Roxb. [Papilionoideae]; NU-AP-41	Winged stalked Flemingia	Deworming
18.	<i>Flemingia strobilifera</i> (L.) W.T.Aiton [= <i>Moghania strobilifera</i> (L.) Kuntze]; [Papilionoideae]; NU-AP-45	Wild hops	Epilepsy
19.	<i>Leucaena leucocephala</i> (Lam.) de Wit [Mimosoideae]; NU-AP-42	Jumpy bean	Against parasites in man
20.	<i>Mimosa himalayana</i> Gamble [Mimosoideae]; NU-AP-43	Kingrei	As a hedge plant
21.	<i>Mimosa pudica</i> L. [Mimosoideae]; NU- AP-44	Touch me not	Skin infectious diseases
22.	<i>Mucuna atropurpurea</i> (Roxb.) Wight & Arn. [Papilionoideae]; NU-AP-46	Mucuna	Hypertension
23.	<i>Mucuna poggei</i> Taub. [Papilionoideae]; NU-AP-47	Buffalo bean	Astringent
24.	<i>Mucuna rostrata</i> Benth. [Papilionoideae]; NU-AP-48	Pica-pica	Urinary tract infections

Sl. No.	Botanical Name [Subfamily]; Herbarium Accession No.	Common Name	Uses
25.	<i>Senna alata</i> (L.) Roxb. [= <i>Cassia alata</i> L.] [Caesalpinioideae]; NU-AP-26	Ringworm shrub	Skin infections and as purgative
26.	<i>Senna occidentalis</i> (L.) Link [= <i>Cassia occidentalis</i> L.] [Caesalpinioideae]; NU-AP-28	Coffee weed/ coffee senna	Diuretic
27.	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby [= <i>Cassia siamea</i> Lam.] [Caesalpinioideae]; NU-AP-29	Yellow cassia	Anti-inflammation
28.	<i>Senna sophera</i> (L.) Roxb. [= <i>Cassia sophera</i> L.] [Caesalpinioideae]; NU-AP-30	Senna sophera	For diabetes
29.	<i>Senna tora</i> (L.) Roxb. [= <i>Cassia tora</i> L.] [Caesalpinioideae]; NU-AP-31	Sickle pod	Laxative effect
30.	<i>Tephrosia candida</i> (Roxb.) DC. [Papilionoideae]; NU-AP-50	White hoary pea/White tephrosia	Wound healing
31.	<i>Vigna unguiculata</i> (L.) Walp. [= <i>Dolichos biflorus</i> L.]; [Papilionoideae]; NU-AP-35	Horse gram	Seeds as tonic and diuretic

Sources: Sanjappa (1990), Nene (2006), Anonymous (2009), Agriculture Technology Management Agency (Anonymous 2012), Pradheep *et al.* (2016) and present study.

*tetragonolobus*, respectively. Singh and Misra (2014) also reported high grain legumes diversity with 59 accessions during their survey in Dimapur, Kohima, Mokokchung and Tuensang districts of Nagaland. The exploitation of legumes, especially pulses, would be helpful in overcoming the nutritional deficiencies in rural area and boost the socio-economic conditions. The pulses are the sustainable seed-grains for the future. According to the 'Status paper on pulses' prepared by the Ministry of Agriculture, Government of India, Bhopal (Anonymous 2012), the domestic consumption of pulses in India was 186.5 lakh tons for the triennium ending 2010 - '11. Against this, India produced an average quantity of 158 lakh tons. During this period, there was a gap of 28.5 lakh tons of pulses in demand and supply. This gap was due to high growth of human population as compared to pulse production. Therefore, a focus was made on the availability and distribution of legumes from the rural areas and a detailed collection of data on the rural resources of pulses available in various places of different districts in Nagaland have been attempted. These plant resources have the potential to uplift the economic conditions of the local people and add to their food security.

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