

Diversity of Legumes in the Papum Pare District of Arunachal Pradesh of India

Bipul Chandra Kalita, Pankaj Bharali, Loxmi Jamoh and Hui Tag¹

Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh-791112, Arunachal Pradesh

¹Corresponding author, E-mail: huitag2008rgu@gmail.com

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Abstract

Present study highlights the diversity and distribution of the members of Leguminosae within Papum Pare District of Arunachal Pradesh. This study reports 59 species of Leguminosae which is classified under three subfamilies, namely, Papilionoideae, Mimosoideae and Ceasalpinioideae. Of the total 59 species reported, 17 species are tree, 19 shrubs, 11 species are climber & Liana and 12 species are herbaceous which is put into diverse ethnobotanical uses by the local residents (*Nyishi*) of the study sites.

Key words: Legume Diversity, Distribution, Local Uses, Papum Pare, Arunachal Pradesh

INTRODUCTION

Leguminosae is one of the largest families of angiosperm with 18,000 species classified into around 650 genera and further classified under subfamilies Papilionoideae, Mimosoideae and Ceasalpinioideae (Polhill 1994). The largest genera reported are *Astragalus* with more than 2000 species, *Acacia* with more than 900 species and *Indigofera* with around 700 species (Lewis *et al.* 2005). Other genera include *Crotalaria* with 600 species and *Mimosa* with 500 species (Polhill & Raven 1981). The diversity of legumes is highest in Peninsular India which hosts about 550 species, followed by Himalaya with 500 species, and in the North-East Region of India, 400 species are reported to be widely distributed along different altitudinal gradient (Baker 1876; Hussain & Kopoor 1990; Sanjappa 1992). Out of 8,000 angiosperm species reported from the Himalayas, 5000 species are found in the Arunachal Himalayan region and the Leguminosae is one of the dominant families found in the region (Chowdhery *et al.* 1996). Due to its commercial, food, medicinal, aesthetic and socio-cultural values many leguminous species are being cultivated by the local tribes in Arunachal Pradesh beside their natural distribution (Dash 2009). Apart from the part publication made by the few workers on some selected genera such as *Desmodium* and allied genera by Dash & Singh (1998) and Dash (2009) from Sikkim and Arunachal Pradesh, no comprehensive taxonomic treatment are available to date on the other genera of Legumes of Arunachal Himalayan region of India. Therefore, present study deals with the survey and documentation of the native as well as exotic species of Leguminosae distributed along different forest types in the Papum Pare district of Arunachal Pradesh. It also deals with ethnobotanical uses of the each species by the local residents residing in the district.



Figure - 1. Map of the study area

MATERIALS AND METHODS

Study site:

Papum Pare district of Arunachal Pradesh of North-East India is located within geographical coordinates between $26^{\circ} 55'$ and $28^{\circ} 40'$ N latitude and longitude $92^{\circ} 40'$ and $94^{\circ} 2'$ E. It occupies an area of 2875 sq km with total population of 176573 persons. The entire region of Papum Pare district is mountainous forming a part of the Eastern Himalayas. The area comprises of a cross-section of the foothill region adjoining the border of Assam, the lower

hills and the lofty mountain extending northwards (Anonymous 2011). The natural vegetation comprises mainly of tropical semi-evergreen and sub-tropical evergreen forests. The vegetation of the lower altitude are dominated by tall trees such *Duabanga grandiflora*, *Ailanthus integrifolia*, *Tetramelis nudiflora*, *Altingia excelsa*, *Phoebe cooperiana*, *Bombyx ceiba*, and medium size tree such as *Bauhinia variegata*, *Dillenia indica*, *Castanopsis indica*, *Ficus semi-cordata*, *Kydia glabrescens* along with shrubs, bamboo, wild banana, cane and various kinds of creepers. At higher altitudes, *Quercus simplifolia*, *Egelhardia spicata*, *Rhus chinensis*, *Berberis*, *Rosa sp.*, ferns and fern allies, and *Rhododendron* are the dominant species. Present study has covered six administrative circles that include all types of tropical moist, tropical deciduous, tropical and subtropical evergreen forest of the district.

Field survey

An extensive field survey was carried out during May 2011 to April 2014 for cataloguing the members of Leguminosae in six major administrative circles of the Papum Pare District of Arunachal Pradesh, namely, Balijan, Doimukh, Itanagar, Kimin, Naharlagun and Sagalee with altitude ranging from 100-2500m following the methods of Jain & Rao (1977). Voucher specimen was prepared for each species and the identification of species was done by consulting herbarium of Botanical Survey of India, Arunachal Regional Centre, Itanagar. Available literatures on Leguminosae by Baker (1876), Sanjappa (1992), Polhill (1994), Lewis *et al.* (2005) were consulted for taxonomic position and distribution record about Leguminosae of India and world. The accepted names were verified from the website www.theplantlist.org. The voucher specimens were deposited in the Herbarium of Department of Botany, Rajiv Gandhi University (HAU), Rono Hills, Doimukh for future reference. The ethnobotanical survey was also carried out simultaneously in the above mentioned localities through interaction with knowledgeable local residents (*Nyishi*) to record medicinal, food and cultural uses of the selected species of Legumes encountered during field survey.

RESULTS AND DISCUSSION

A total of 59 species of Legumes was recorded from the study sites, of which 17 species are trees, 19 species are shrubs, 11 species are climber & liana and 12 species are herbs. The highest number of 33 species was recorded from subfamily Papilionoideae followed by Caesalpinoideae (19 species) and Mimosoideae (07 species). Of the total 34 genera reported, *Bauhinia* has the highest number of 7 species followed by *Crotalaria* with 5 species, and *Senna* and *Caesalpinia* with 4 species each. Most importantly, a new distribution record of *Caesalpinia crista* was made from Arunachal Pradesh during field survey.

The common genera encountered during field survey are *Albizia*, *Bauhinia*, *Crotalaria*, *Dalhousiea*, *Pueraria*, *Mastersia*, *Senna*, and *Caesalpinia*. The most widespread species observed are *Bauhinia variegata*, *Bauhinia purpurea*, *Bauhinia scandens*, *Dalhousiea bracheata*, *Crotalaria juncea*, *Crotalaria pallida* and *Mimosa pudica*. These species are mostly found in open and degraded forests, road side, plantation sites and agricultural fields. A few species such as *Caesalpinia crista*, *Caesalpinia bouduc* and *Acacia sp.* are also located in the dense forest areas. The recorded plant species along with their ethnobotanical uses are presented in the Table 1.

In the present study maximum diversity of Leguminosae are found in tropical moist forest of Banderdewa range while Kimin forest range represents least diversity of leguminous species. Notably, the capital city Itanagar is also harbouring good species diversity but the population structure of different species is found be negligible in comparison to the other

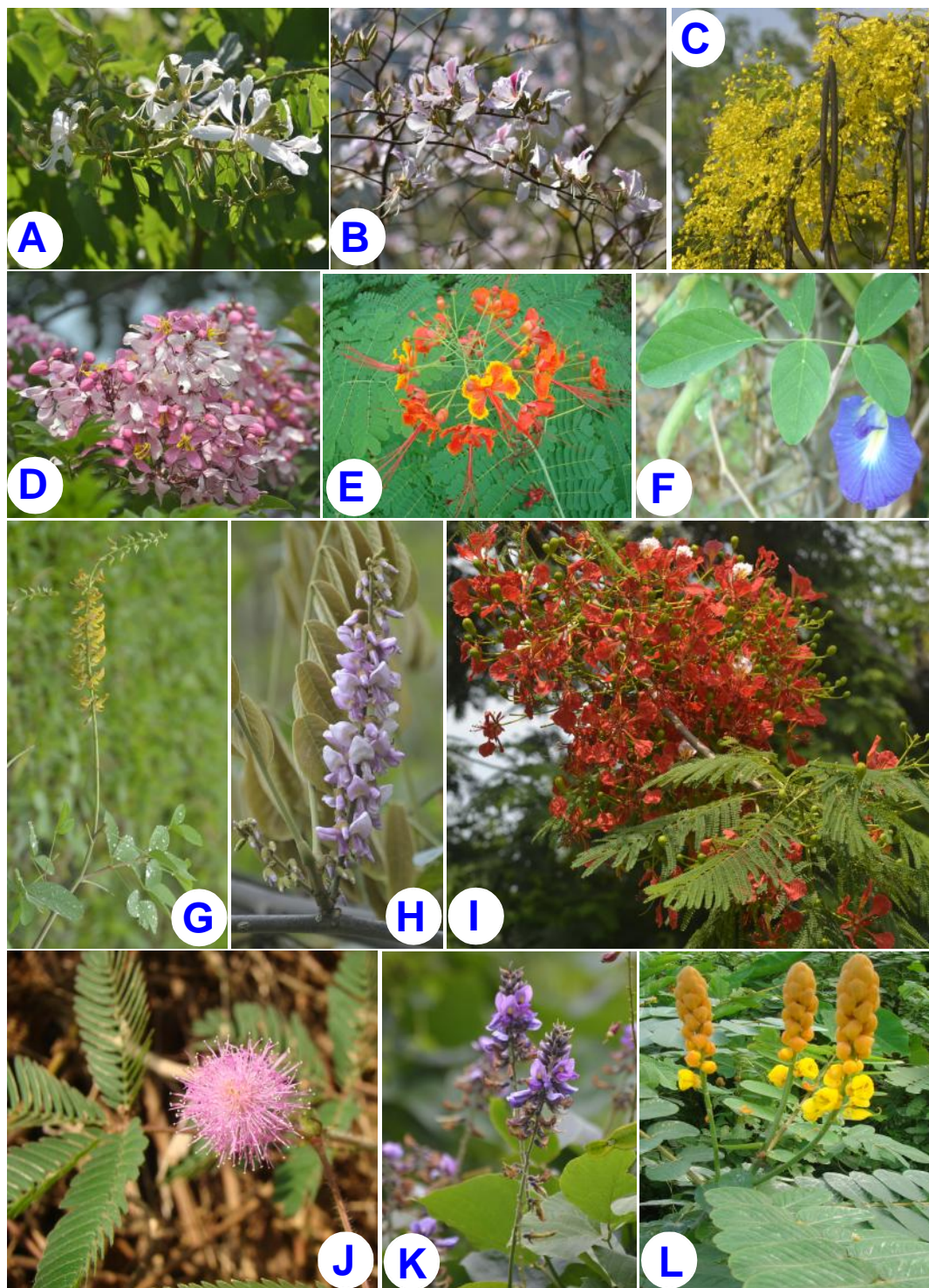


PLATE – I. Common legumes of Papun Pare district of Arunachal Pradesh : A. *Bauhinia variegata*; B. *Bauhinia purpurea*; C. *Cassia fistula*; D. *Cassia javanica* subsp. *nodosa*; E. *Caesalpinia pulcherrima*; F. *Clitoria ternatea*; G. *Crotalaria pallida*; H. *Derris elliptica*; I. *Delonix regia*; J. *Mimosa pudica*; K. *Pueraria montana* var. *lobata*; L. *Senna alata*

study sites. This may be due to the anthropogenic activities including increasing human population, deforestation and urbanization. Among the total recorded plants, 44 species are put into diverse ethnobotanical uses as medicine, ritual, ornamentals and vegetables by the

Table 1. Checklist of Leguminosae species recorded from the Papum Pare district of Arunachal Pradesh

Species with Voucher Number	Subfamily	Habit	Forest type	Distribution	Local Uses
<i>Acacia farnesiana</i> (Linnaeus) Willdenow; BCK/HAU-0610	Mimosoideae	Shrub	Moist deciduous	Doimukh	Gum is used for wound healing, skin irritation
<i>Albizia arunachalensis</i> K.C. Sahni & H.B. Naithani; BCK/HAU - 0220	Mimosoideae	Tree	Tropical to Subtropical	Itanagar	Produce locally useful timber; wood used for rice husking
<i>Albizia lebbek</i> (Linnaeus) Bentham; BCK/HAU-0110	Mimosoideae	Tree	Tropical to Subtropical	Bandardewa	Gum is used by locals against skin allergy
<i>Albizia lucidior</i> (Steudel) I.C. Nielson; BCK/HAU-0189	Mimosoideae	Tree	Tropical to subtropical	Naharlagun, Bandardewa	Fire wood, fencing, ornamental
<i>Bauhinia acuminata</i> Linnaeus; BCK/HAU-0657	Caesalpinioideae	Tree	Tropical	Sagalee	Firewood, fencing, ornamental
<i>Bauhinia khasiana</i> Baker; BCK/HAU-689	Caesalpinioideae	Shrub	Moist tropical	Doimukh,	-
<i>Bauhinia purpurea</i> Linnaeus; BCK/HAU-0711	Caesalpinioideae	Tree	Tropical Deciduous	Sagali	Wood for local house construction; leaves used as vegetable
<i>Bauhinia roxburghiana</i> Voigt; BCK/HAU-0315	Caesalpinioideae	Tree	Moist deciduous	Bandardewa	Timber used as house post
<i>Bauhinia scandens</i> Linnaeus; BCK/HAU-0690	Caesalpinioideae	Liana	Tropical	Itanagar	Stem fiber is used for making ropes
<i>Bauhinia vahlii</i> Wight & Arnott; BCK/HAU-0699	Caesalpinioideae	Liana	Tropical	Doimukh	Seeds edible; Stem fiber used for making bow string
<i>Bauhinia variegata</i> Linnaeus; BCK/HAU-0710	Caesalpinioideae	Tree	Deciduous	Nirjuli	Leaves and flowers used as vegetable; wood as house post
<i>Caesalpinia bonduc</i> (Linnaeus) Roxburgh; BCK/HAU-0719	Caesalpinioideae	Shrub	Deciduous	Nirjuli	Leaves and seeds are diuretic
<i>Caesalpinia crista</i> Linnaeus; BCK/HAU-0795	Caesalpinioideae	Shrub	Tropical	Nirjuli	Bark paste used against skin diseases
<i>Caesalpinia pulcherrima</i> (Linnaeus) Sweet; BCK/HAU-0814	Caesalpinioideae	Shrub	Tropical	Nirjuli	Ornamental in home gardens
<i>Caesalpinia tortuosa</i> Roxburgh; BCK/HAU-0822	Caesalpinioideae	Shrub	Tropical	Doimukh	-
<i>Cajanus cajan</i> (Linnaeus) Millspaugh; BCK/HAU-0833	Papilionoideae	Shrub	Tropical	Kimin, Bandardewa	Pod used as vegetable
<i>Cassia fistula</i> Linnaeus; BCK/HAU-0390	Caesalpinioideae	Tree	Deciduous	Itanagar, Bandardewa	Seed paste used against abdominal pain
<i>Cassia javanica</i> subsp. <i>nodosa</i> (Roxburgh) K. Larsen & S.S. Larsen; BCK/HAU-0410	Caesalpinioideae	Tree	Deciduous	Sagalee	Produce timber; grown as road side shade and ornamental tree
<i>Chamaecrista mimosoides</i> (Linnaeus) Greene; BCK/HAU-0974	Caesalpinioideae	Herbs	Tropical	Sagalee	-
<i>Codariocalyx motorius</i> (Houttuyn) H. Ohashi; BCK/HAU-0853	Papilionoideae	Shrub	Tropical	Itanagar, Balijan	Leaf locally used as herbal tea
<i>Crotalaria pallida</i> Aiton; BCK/HAU-0855	Papilionoideae	Herb	Tropical	Itanagar	Root paste used against bleeding and skin inflammation

Species with Voucher Number	Subfamily	Habit	Forest type	Distribution	Local Uses
<i>Crotalaria juncea</i> Linnaeus; BCK/HAU-0847	Papilionoideae	Shrub	Tropical to subtropical	Doimukh Bandardewa	Extracted stem fiber used for crafting household utility
<i>Crotalaria retusa</i> Linnaeus; BCK/HAU-1055	Papilionoideae	Herb	Deciduous	Itanagar	-
<i>Crotalaria sessiliflora</i> Linnaeus; BCK/HAU-1059	Papilionoideae	Herb	Tropical	Itanagar	-
<i>Dalbergia sissoo</i> DC.; BCK/HAU-0419	Papilionoideae	Tree	Tropical	Naharlagun, Bandardewa	Timber used for crafting furniture
<i>Delonix regia</i> (Hooker) Rafinesque; BCK/HAU-602	Caesalpiinoideae	Tree	Tropical Photo	Bandardewa, Naharlagun	Planted ornamental and road side as tree
<i>Dalhousiea bracteata</i> (Roxburgh) Bentham; BCK/HAU-719	Papilionoideae	Shrub	Tropical Photo	Kimin, Itanagar	Leave used by local hunters for making trekking hats
<i>Derris elliptica</i> (Wallich) Bentham; BCK/HAU-0482	Papilionoideae	Liana	Tropical Photo	Sagali	Paste of root bark is Piscicidal
<i>Derris robusta</i> (DC.) Bentham; BCK/HAU-0478	Papilionoideae	Shrub	Tropical	Naharlagun	Root and stem bark is insect repellent
<i>Desmodium elagans</i> DC.; BCK/HAU-0860	Papilionoideae	Shrub	Tropical	Kimin, Bandardewa	-
<i>Entada phaseoloides</i> (Linnaeus) Merrill; BCK/HAU-0869	Mimosoideae	Liana	Tropical to subtropical	Nirjuli	Roasted seeds used as substitute for shampoo
<i>Erythrina stricta</i> Roxburgh; BCK/HAU-0498	Papilionoideae	Tree	Moist tropical	Itanagar, Bandardewa	Branches used for fencing and for making ritual altars
<i>Flemingia macrophylla</i> (Willdenow) Merrill; BCK/HAU-0879	Papilionoideae	Shrub	Moist deciduous	Doimukh	Contour hedg for erosion control in terraced crop field
<i>Glycine max</i> (Linnaeus) Merrill; BCK/HAU-1063	Papilionoideae	Herb	Tropical to subtropical	Itanagar	Seed used in fermented food items
<i>Indigofera tinctoria</i> Linnaeus; BCK/HAU-0885	Papilionoideae	Shrub	Tropical	Kimin	Dye yielding plant, local biofencing
<i>Indigofera trita</i> Linnaeus f.; BCK/HAU-0889	Papilionoideae	Shrub	Tropical	Naharlagun, Bandardewa	Dye yielding plant, local biofencing
<i>Lens culinaris</i> Medikus; BCK/HAU-01070	Papilionoideae	Herb	Tropical	Itanagar	-
<i>Lespedeza elliptica</i> Bentham; BCK/HAU-0913	Papilionoideae	Shrub	Tropical	Nirjuli	Grown as ornamental in home gardens
<i>Mastersia assamica</i> Bentham; BCK/HAU-1076	Papilionoideae	Climber	Tropical	Kimin	Fiber used in local rituals
<i>Mimosa pudica</i> Linnaeus; BCK/HAU-1079	Mimosoideae	Herb	Deciduous	Nirjuli	Root paste used against snake venom
<i>Mucuna macrocarpa</i> Wallich; BCK/HAU-1085	Papilionoideae	Liana	Tropical	Doimukh	Pod used as vegetable
<i>Mucuna pruriens</i> (Linnaeus) DC.; BCK/HAU-1090	Papilionoideae	Climber	Tropical	Kimin	Seed is antidote against venom
<i>Ormosia robusta</i> Baker; BCK/HAU-0510	Papilionoideae	Tree	Tropical	Bandardewa	Fuel wood for local residents
<i>Parkia timoriana</i> (DC.) Merrill; BCK/HAU-0515	Mimosoideae	Tree	Moist tropical	Sagalee, Bandardewa	Pod consumed as vegetables
<i>Peltophorum pterocarpum</i> (DC.) K. Hyne; BCK/HAU-0560	Caesalpiinoideae	Tree	Tropical	Bandardewa	Planted as Avenue tree
<i>Phyllodium pulchellum</i> (Linnaeus) Desvaux; BCK/HAU-0915	Papilionoideae	Shrub	Tropical	Nirjuli	Grown as ornamental in home gardens

Species with Voucher Number	Subfamily	Habit	Forest type	Distribution	Local Uses
<i>Pongamia pinnata</i> (Linnaeus) Pierre; BCK/HAU-0576	Papilionoideae	Tree	Tropical	Naharlagun	Seed used against skin inflammation
<i>Pueraria montana</i> var. <i>lobata</i> (Willdenow) Sanjappa & Pradeep; BCK/HAU-0844	Papilionoideae	Climber	Tropical	Rono Hills, Kimin	Stem fiber used for making local ropes
<i>Pueraria phaseoloides</i> Benthams; BCK/HAU-0929	Papilionoideae	Climber	Tropical	Doimukh	Stem fiber used in local ritual
<i>Senna alata</i> (Linnaeus) Roxburgh; BCK/HAU-0840	Caesalpiniodeae	Shrub	Tropical	Nirjuli	Leaf paste used against ringworms
<i>Senna tora</i> (Linnaeus) Roxburgh; BCK/HAU-0998	Caesalpiniodeae	Herb	Deciduous	Doimukh	Leaf and seed infusion used against low blood pressure during pregnancy
<i>Smithia ciliata</i> Royle; BCK/HAU-0946	Papilionoideae	Herb	Tropical	Kimin, Bandardewa	-
<i>Smithia grandis</i> Baker; BCK/HAU-1097	Papilionoideae	Herb	Tropical	Sagalee	-
<i>Tamarindus indica</i> Linnaeus; BCK/HAU-0598	Caesalpiniodeae	Tree	Tropical	Itanagar	Fruits used as pickle, and medicine against cough
<i>Tephrosia candida</i> (Roxburgh) DC.; BCK/HAU-0962	Papilionoideae	Shrub	Tropical	Nirjuli	-
<i>Vigna mungo</i> (Linnaeus) Hepper; BCK/HAU-1110	Papilionoideae	Herb	Tropical	Itanagar	Green immature pods used as vegetable
<i>Vigna umbellata</i> (Thunberg) Ohwi & H. Ohashi; BCK/HAU-1121	Papilionoideae	Climber	Tropical	Sagalee	-

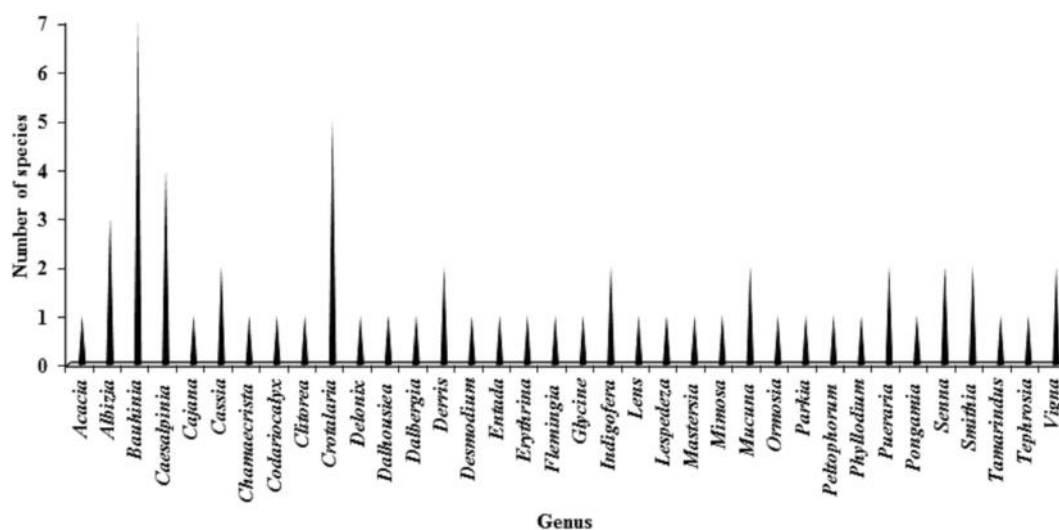


Figure 2. Number of legume species under respective genera recorded from the study area

local residents of the study sites. The wood of the tree species such as *Albizia chinensis*, *Bauhinia purpurea*, *B. variegata*, and *Cassia fistula* are used for local house construction, fencing of home garden, upland agricultural field and fabrication of local furniture. The root paste of *Derris elliptica* are mainly used as piscidal agent while stem fiber of *Bauhinia vahlii* is used as *Bow String* by local hunters. Few climber and herbaceous species such as *Cajanus cajan*, *Glycine max* and *Vigna mungo* are used as food while exotic species such

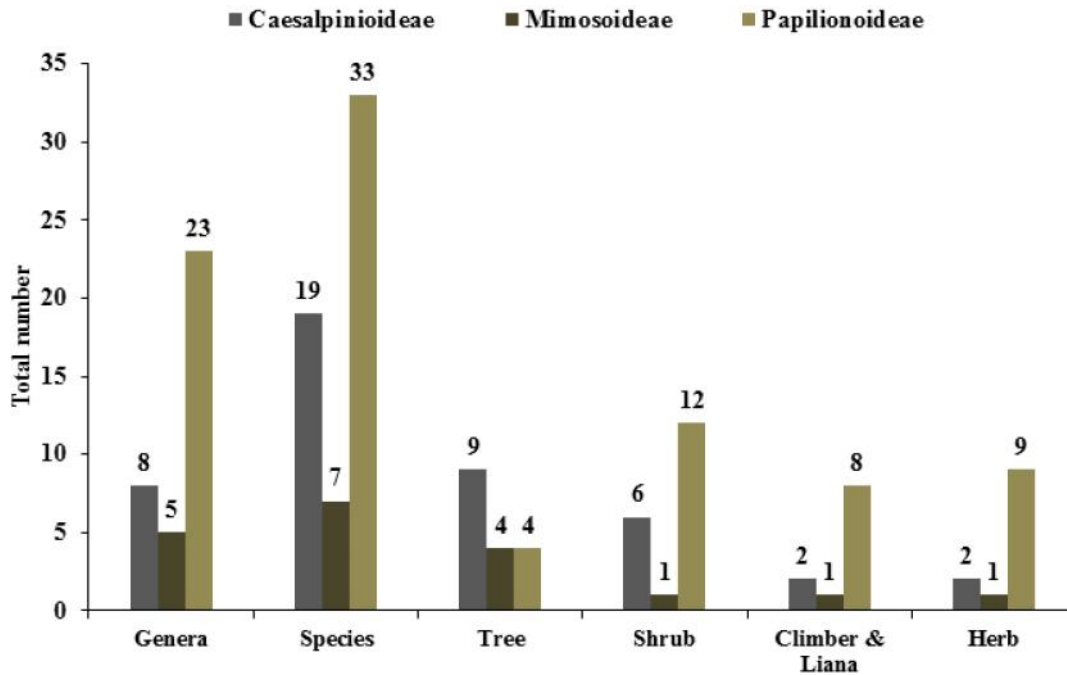


Figure 3. Number of genera, species, and habit groups under three subfamilies of Legume

as *Tamarindus indica* and *Pongamia pinnata* are mainly used as medicinal agent. Our study also found some exotic species such as *Caesalpinia pulcherrima*, *Cajanus cajan*, *Dalbergia sisso*, *Delonix regia*, *Pongamia pinnata*, *Tamarindus indica*, and *Vigna munga* which are being cultivated by the local residents as source of fuel wood, ornament, medicinal and vegetable.

It may be concluded that the present study has made an important contribution towards understanding of some legume species of Papum Pare district in particular and Arunachal Himalayan Region in general. Further revisionary taxonomic study by the current team of authors is underway to catalogue Leguminous species distributed within entire range of Eastern Himalaya including Arunachal Pradesh.

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