



## Determination of use value and informant consensus factor on ethnobotanic knowledge about wild legumes used by natives of Wayanad district, Kerala

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The present work is aimed to document the traditional knowledge about the various usages of leguminous plants (Fabaceae), by tribals of Wayanad district and its nearer places such as Vanimel and Vilangad villages of Kozhikkode district, Kerala. Ethnobotanical surveys/ interviews/ discussions were carried out in few randomly selected tribal hamlets for the data collection. Among these visits the plants used by tribal communities *Paniya* and *Kattunaikka* were focused for documentation. This study reports the data of 80 plants from the family Fabaceae. This report also observed that the tribal communities were deeply depending on various wild legumes for making infrastructures, agricultural utilities, making food/ fuel/ timber/manure and they solve their health issues to a large extent also by using some wild legume species. Among the eighty species, fifty were used in various medicinal preparations and thirty species were used for dietary needs in combination or alone. At the same time major group of plants are unable to demarcate between food and medicine. Use Value analysis shows that the tree legume species *Tamarindus indica* is relatively more important with 64 use reports (UV 0.98). Analysis of *Informant consensus factor* reveals that the homogeneity of knowledge is more for the plants with medicinal properties ( $F_{ic}$  0.97); whereas maximum heterogeneity ( $F_{ic}$  0.92) was found about agricultural utilities of plants. According to the results of DMR analysis *Dalbergia latifolia* ranked first, so that this species is getting more exploited, because it is highly preferable for all five categories studied under DMR analysis. Moreover the present documentation of ethnic knowledge about wild legumes is an attempt to serve as indigenous information for future sustainable utilization and conservation.

**Keywords:** DMR, Ethnic knowledge, Fabaceae, Informant consensus factor, Traditional uses, Use Value, Wayanad

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Forest dwellers are dealing with huge amount of traditional knowledge and ethnic diversity. Wild edible plants are important in the livelihood strategies of tribal populations<sup>1</sup>. Various forms of wild edible food reserves play a crucial role in suppressing their hunger as well as supplementing their nutritional needs. The relationship between humans, plant and animal has been since time immemorial and of course, the legumes are been cultivated and used for food for centuries all over the world<sup>2</sup>. Ancient men had discovered natural products to satisfy his needs, including relief from his personal ailments as well as of his fellow domestic animals<sup>3</sup>.

Legumes are consumed primarily as seed foods; but pods, leaves and roots or tubers of various species are also eaten<sup>4</sup>. The nitrogen fixing ability of many legumes provides an important source of biological nitrogen in agriculture and natural ecosystem, benefitting sustainable agricultural productivity and

providing essential ecosystem services<sup>5</sup>. So that legumes used prominently in crop rotations and in the mixed cropping commonly practiced in Indian agriculture<sup>2</sup>. Studies done by Nair and Volga *et al.* reveal several timber yielding tree legumes<sup>6,7</sup>, found in and around the study area. Apart from all these well-known uses many legumes possess local household utilities, those were also focused in this study.

Wayanad has the highest percentage of tribals in Kerala and it forms 17.1% of the total population of the district<sup>8</sup>. The ethnic diversity of the district is very impressive as evidenced by ten different tribal groups<sup>9</sup>, in which five of them were major and large communities such as *Kurichya*, *Kuruma*, *Adiya*, *Paniya* and *Kattunaikka*<sup>10</sup>. Two among the major five, *Paniya* and *Kattunaikka* were focused in this present study (Fig. 1). All the tribal communities are homogenous ethnic groups with a specific sense of identity based on common language and culture<sup>11</sup>.

Documentation of indigenous knowledge through ethnobotanical studies is important for the

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conservation<sup>12,13</sup> and utilization of biological resources<sup>14</sup>. The present study was devised to document the details of leguminous plants used by tribals of this area for various domestic needs. Many plants used in industrialized countries today were originally identified and developed through indigenous knowledge<sup>15</sup>.

## Materials and Methods

### Study area

Wayanad district is with a hilly terrain on the southern Western Ghats and located in the northeast part of Kerala state<sup>16</sup> and is considered one of the world's biodiversity hotspots, since it hosts great richness of flora and fauna. It has an area of 2136 km<sup>2</sup>, where 37% of the land area is forest covered and 55% cultivated by agriculture. It lies between North latitude 11° 26' to 12° 00' and East longitudes 75° 75' to 76° 56' and it lies at an altitude of 700 to 2100 M above the sealevel<sup>17</sup>. The altitudinal difference within the district results in climatic variations, which in turn determines the vegetation patterns<sup>18</sup>. This area is bounded on the north by Kodagu district (Karnataka) and on the east by Mysore district (Karnataka) and Nilgiri district (Tamilnadu). The south and west margins are lined by Malappuram, Kozhikkode and Kannur districts of Kerala state. The windward and leeward sides of Western Ghats contribute major

vegetation types of Wayanad district, such as semi-ever green forests, evergreen forests, moist deciduous forest, dry deciduous forest, temperate forests (shola), grass lands etc<sup>19</sup>. The traditional culture and the natural ecosystem of these regions have been relatively well conserved<sup>20</sup>.

### Field survey

Basic information about the distribution of tribes was collected from Tribal Development Office at Kalpetta, Bathery, Mananthavady and an NGO 'Sreyas' at Bathery. All the information gathered from various sources were analysed and summarized at famous agro biodiversity center, M. S. Swaminathan Research Foundation (MSSRF), Kalpetta. Field surveys were carried out in the study locations of Wayanad and Calicut districts of Kerala, during the year 2017 (May)– 2019 (April). After gaining the confidence from the tribal people transect walk were conducted to explore the diversity and ethnobotanical uses. Then detailed data in addition to the vernacular name, medicinal and culinary uses, were collected by conducting surveys/interviews/discussion using a semi structured questionnaire with person/groups and with traditional healers (Table 1). In addition to major and minor uses, detailed information about the preparation of decoction, paste, powder, juice and preprocessing etc., were also collected. The plant specimens were documented by preparing herbarium and by taking photographs.

The collected plants were identified taxonomically by using the flora of Presidency of Madras and handbook of flowering plants published by KFRI<sup>21</sup>. The identified plant specimens were then confirmed with the herbaria of Calicut University and MSSRF - CAbC, Kalpetta. Web based taxonomic database 'The Plant List' ([www.theplantlist.org](http://www.theplantlist.org)), Kew Botanical Garden ([www.mpns.kew.org](http://www.mpns.kew.org)) and keralaplants.in (<http://keralaplants.in/>) were also referred for proper and correct identification and updated nomenclature. The herbarium specimens were deposited in the Herbarium, Research Department of Botany, Sir Syed College, Taliparamba, Kannur, Kerala.



Fig. 1 — A. *Maatha*, an informer from Kattunaikka community, B. *Cheeru*, an informer from Paniya community

Table 1 — Demography of informants in the study

Age group	Paniya community			Kattunaikka community			
	Male	Female	Total	Age group	Male	Female	Total
Group I( 20-35)	2(20%)	8(80%)	10(38%)	Group I( 20-35)	7(53%)	6(46%)	13(33%)
Group II(36-50)	5(41%)	7(58%)	12(46%)	Group II(36-50)	4(40%)	6(60%)	10(25%)
Group III (50 Above)	3(75%)	1(25%)	4(15%)	Group III (50 Above)	5(31%)	11(68%)	16(41%)
Total 26(40% informants from Paniya community)				Total 39(60% informants from Kattunaikka community)			

### Data analysis

The data collected from 65 informants from two major tribal communities were statistically analysed as below.

### Use Value (UV)

According to Philips and Gentry<sup>22</sup> UV is used to determine the relative importance of a particular species with respect to other species; and it is obtained as sum of total use reports of a particular species divided by total number of informants. Equation is given below,

$$UV = \sum U/N$$

High value of UV indicates that the plant is relatively important for their life<sup>23</sup> and the lower value shows the lesser importance of the plant species with respect to others<sup>24</sup>.

### Factor informant consensus (F<sub>ic</sub>)

F<sub>ic</sub> is one of the most widely used statistical tool to determine the level of homogeneity of knowledge among informants<sup>25</sup>, as well as to study total usage of plant species according to cultural applicability<sup>26</sup>. F<sub>ic</sub> was first introduced by Trotten and Logan in 1986<sup>27</sup>, later it was modified by Heinrich *et al.*<sup>28</sup> and then gained more popularity. F<sub>ic</sub> was originally designed to analyze medicinal plants with intercultural relevance related to three populations in Mexico<sup>29</sup>. To analyse F<sub>ic</sub> on our data it is necessary to classify utilities of the plants into broad categories. The categories are as follows,

1. Agricultural uses
2. Household utility
3. Food/Fodder/Forage/Grazing
4. Timber/Shade providing/Fuel
5. Medicinal plant

The F<sub>ic</sub> was calculated as the number of use citations in each category (N<sub>ur</sub>) minus the number of species used (N<sub>t</sub>), whole divided by the number of use citations in each category minus one<sup>30</sup>.

$$F_{ic} = (N_{ur} - N_t) / (N_{ur} - 1)$$

F<sub>ic</sub> value ranges between 0.00 and 1.00. F<sub>ic</sub> becomes high when only one or few plant species are reported to be used by a high proportion of informants for a particular category, whereas low F<sub>ic</sub> value obtained because of the disagreement of informants over which plant should be used for which purpose<sup>31,32</sup>.

### Direct Matrix Ranking (DMR)

Direct Matrix Ranking (DMR) was calculated on the data collected from informants from the study area. It was to identify multipurpose plant species of that locality<sup>26</sup>. Total fifteen Informants were selected on the basis of their strong knowledge about plants and asked for giving values such as 0= not used, 1= least used, 2= less, 3= good, 4= very good, 5= best<sup>33</sup>. The average scores given to each plant were summed up and ranked.

### Results

The present study observed that the tribal communities suppress their hunger by deeply depending on various wild edible plants. And they solve their health issues to a large extent also by wild plants itself. The tribal people knew what to eat, how to collect, how to prepare and how to eliminate the toxicity exclusively. So they can avoid poisoning issues due to high deposition of some secondary metabolites; especially on eating some wild legumes.

Total 65 local informants [26 men (40%) and 39 women (60%)] from two major tribal communities Paniya and Kattunaikka contributed to the study. Among the 26 (40%) informants of Paniya, 2 (20%) males and 8 (80%) females belong to group I, 5 (41%) males and 7 (58%) females belong to group II and 3 (75%) men and 1 (25%) female belong to group III. Then among the 39 (60%) informants from Kattunaikka, 7 (53%) males and 6 (46%) females belong to group I, 4 (40%) males and 6 (60%) female belong to group II and 5 (31%) males and 11 (68%) female belong to group III (Table 1).

Out of the eighty species of leguminous plants selected from the study site (Table 2), majority of them (47) are from the sub family Papilionoideae (P), and 16 from sub family Caesalpinioideae (C) and 17 from Mimosoideae (M). In which Papilionoideae contains 29 genera whereas Caesalpinioideae and Mimosoideae contain 8 genera each (Fig. 2). Among the eighty species, fifty were used in various medicinal preparations and thirty species were used for dietary needs in combination or alone. At the same time major group of plants are unable to demarcate between food and medicine, because these are used for both edible and medicinal purposes. The plants such as *Cajanus cajan*, *Mucuna gigantia*, *Peuraria phaseoloides*, *Terramnus labialis*, *Senna tora*, *Tamarindus indica*, *Xylixlo carpa* are few from the above specified category. In some genus like *Vigna*, *Senna* and *Mucuna* were having more than one edible

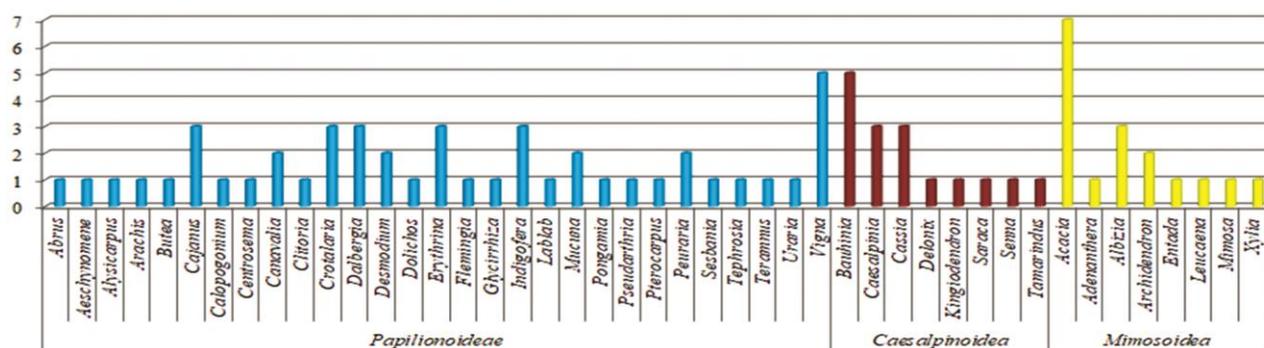


Fig. 2 — Number of legume genera under respective sub families.

Table 2 — List of Leguminosae species recorded from the study area

SI No	Plant Name (Accession No.)	Sub family	Local name	Habit	Traditional uses	TUR*	Use value (UV)
1	<i>Abrus precatorius</i> L. (1261)	P	Kunni	Climbing shrub	The red seeds with a black end are used for making ear ornaments (13). The leaves are cut in to pieces and boiled in coconut oil. This oil is used to reduce hair loss (2). Seeds were used against gonorrhoea (3).	18	0.27
2	<i>Acacia caesia</i> (L.) Willd. (1011)	M	Incha	Prickly climbing shrub	The stem juice is administered internally in respiratory troubles (8). Stem fibers are used to make bathing scrub (11). The juice extracted from the stem is also applied on skin before bathing as a natural herbal medicine (2).	21	0.32
3	<i>Acacia catechu</i> (L. f.) Willd. (956)	M	Karingali	Tree	A very strong combination of <i>Acacia catechu</i> extract and milk can relieve complaints of cough as well as bronchitis (13) and used as a forage crop (5). Pieces of bark are boiled in drinking water because of its anti-microbial activity (10).	28	0.43
4	<i>Acacia farnesiana</i> (L. f.) Willd. (3507)	M	Vahni	Prickly climbing shrub	Gum is rarely used for skin infections (7); wood is used for agricultural implements (18).	25	0.38
5	<i>Acacia nilotica</i> (L.) Delile. (1556)	M	Karuvellam	Prickly herb	Used as forage and as a shade tree (7).	7	0.10
6	<i>Acacia pennata</i> (L.) Willd. (1262)	M	Kattucheenikka/Mala-incha	Prickly climbing shrub	It is used in asthma, allergic disorders, body pain etc (6).	6	0.09
7	<i>Acacia sinuata</i> (Lour.) Merr. (1263)	M	Cheenikka	Woody climber	Leaves and tender parts are used against hair fall and dandruff (8). Water extract of fruit is used to repel leech (16).	24	0.36
8	<i>Acacia torta</i> (Roxb.) Craib. (955)	M	Incha/Kallinja	Prickly climbing shrub	Used in treatment of menstrual disorders (22). The fiber from bark is used for bathing (4).	26	0.4
9	<i>Adenanthera pavonina</i> L. (957)	M	Manjadi	Tree	Cooked/roasted seeds are eaten with rice (the seed may require additional steps to neutralize toxicity) (13). Young leaves are used as a vegetable and seeds are used to make ornaments (3).	16	0.24
10	<i>Aeschynomene indica</i> L. (958)	P	Jeluga/Nellithali	Under shrub	The decoction of leaves along with other ingredients is taken internally for 40 days to treat snakebites and the decoction is also mixed with bathing water (15) & it is a green manure (4).	19	0.29

(Contd.)

Table 2 — List of Leguminosae species recorded from the study area (Contd.)

SI No	Plant Name (Accession No.)	Sub family	Local name	Habit	Traditional uses	TUR*	Use value (UV)
11	<i>Albizia amara</i> (Roxb.) Bovin. (959)	M	Varachi	Tree	The stem yields a gum used in medicines against ulcers (3); this strong wood as well as bark were used in buildings (4).	7	0.1
12	<i>Albizia chinensis</i> (Osbeck) Merr. (960)	M	Pottavaka	Tree	The plant is used as a forage crop (2) and for providing shade (5).	7	0.1
13	<i>Albizia doratissima</i> (L. f.) Benth. (1012)	M	Kunnivaaka/ pulivaaka	Tree	The wood is used to manufacture some house hold articles (9).	9	0.13
14	<i>Alysicarpus bupleurifolius</i> (L.) DC. (1013)	P	Pullu	Perennial herb	Grazing & forage crop (2).	2	0.03
15	<i>Arachis hypogea</i> L. (1014)	P	Nilakkadala	Herb	Cultivated ground nut (46).	46	0.7
16	<i>Archidendron bigeminum</i> (L.) I. C. Nielsen. (1015)	M	Karimanjadi	Tree	Wood is used for fuel (3) and as timber (3).	6	0.09
17	<i>Archidendron monadelphum</i> (L.) I. C. Nielsen. (1018)	M	Pongu/ Kaatukonna	Tree	Wood is used for architecture (4).	4	0.06
18	<i>Bauhinia acuminata</i> L. (1020)	C	Vallimandaram	Climbing woody shrub	The aqueous extract of leaf has antifungal activity, hence used in skin itching (9) and it is used for firewood (5), bio fencing and as ornamental (3).	17	0.26
19	<i>Bauhinia malabarica</i> Roxb. (1022)	C	Vellamandaram	Tree	Leaf juice is applied over forehead to heal redness of eye of man /cattle (18).	18	0.27
20	<i>Bauhinia purpurea</i> L. (1023)	C	Mandaram	Small tree	Wood is used for local house hold construction (13). Young leaves are used as vegetable and also used as an ornamental (2).	15	0.23
21	<i>Bauhinia racemosa</i> Lam. (2517)	C	Manjamandaram	Tree	Leaves are used to make pickles (7). Seeds rarely used as pulse (4). Fiber from inner bark is used for rough ropes (9).	20	0.30
22	<i>Bauhinia variegata</i> L. (2631)	C	Mandaram	Tree	Fire wood and ornamental (6). Leaf extract and bark decoction is used in preparations against urinary disorder, skin disease etc (17).	23	0.35
23	<i>Butea monosperma</i> (Lam.) Taub. (2632)	P	Plashu	Tree	Bark, flowers, Gum and seeds are important to treat Inflammation, sprain, swelling due to any reason (31).	31	0.47
24	<i>Caesalpinia coriaria</i> (Jacq.) Willd. (2633)	C	Kazhanju	Tree	Roasted nuts with jaggery are used to alleviate acute colic pain (12).	12	0.18
25	<i>Caesalpinia crista</i> L. (2634)	C	Kazhinji	Climbing shrub	Bark paste and seed powder were used against skin diseases (10).	10	0.15
26	<i>Caesalpinia mimosoides</i> Lam. (2635)	C	Koomullu	Climbing shrub	Used in wound healing (9).	9	0.13
27	<i>Cajanus albicans</i> (L.) Millsp. (2637)	P	Thuvara	Shrub	Cultivated for its seeds (23) & it is a grazing & forage crop (11).	34	0.52
28	<i>Cajanus cajan</i> (L.) Millsp. (2636)	P	Thuvara	Woody shrub	Common pulse crop (42) as well as grazing & forage crop (16).	58	0.89
29	<i>Cajanus scarabaeoides</i> (L.) Thouars. (2638)	P	Arippayar	Climber	Young seed pods are used as vegetables (30). The decoction of the leaves has been used to improve digestion (13) & used as a fodder crop (6).	49	0.75
30	<i>Calopogonium mucunoides</i> Desv. (2639)	P	Segapusoppu	Twining herb	Used as a fodder/forage crop (20), famous as coverage crop (31).	51	0.78
31	<i>Canavalia cathartica</i> Thouars. (2640)	P	Maradasoppu	Perennial climber	Pods are widely used as vegetable and considered as famine food (38), used as a fodder crop (21).	59	0.9

(Contd.)

Table 2 — List of Leguminosae species recorded from the study area (Contd.)

SI No	Plant Name (Accession No.)	Sub family	Local name	Habit	Traditional uses	TUR*	Use value (UV)
32	<i>Canavalia rosea</i> (Sw.) DC. (2641)	P	Maradasoppu	Woody climber	Young seeds and pods are commonly cooked as vegetables (54).	54	0.83
33	<i>Cassia absus</i> L. (1891)	C	Thakarasoppu/ Karimkolla	Shrub	Leafy vegetable (35).	35	0.53
34	<i>Cassia fistula</i> L. (1896)	C	Kanikkonna	Tree	The sweet mucilaginous fruit-pulp is edible (19). Roots, leaves, seed and bark are used against troubles in stomach (34).	53	0.81
35	<i>Cassia occidentalis</i> L. (1901)	C	Ponnamthakara/ mattanthakara	Shrub	Leaf decoction is gargled for throat troubles and for upset in stomach & cough (33).	33	0.5
36	<i>Centrosema pubescens</i> Benth. (961)	P	Chapu	Climber	Used as a green manure or as a forage crop (49).	49	0.75
37	<i>Clitoria ternatea</i> L. (960)	P	Shangupushpam	Climber	Ornamental and also root paste is applied on poison affected region (55).	55	0.84
38	<i>Crotalaria calycina</i> Schrank. (1894)	P	Muyalchevi	Shrub	Whole plant is used to treat body pain; leaves are boiled in bathing water (2).	2	0.03
39	<i>Crotalaria juncea</i> L. (963)	P	Kilukkampetti	Shrub	Used for crafting household utility; such as 'kotta', 'muram' etc (23).	23	0.35
40	<i>Crotalaria retusa</i> L. (959)	P	Kilukilukki	Woody climber	Whole plant is used to treat skin infections, fever and severe cold (7). Leaves & flowers are used as vegetables (11). De hulled roasted seeds are also edible (9).	27	0.41
41	<i>Dalbergia lanceolaria</i> L. f. (1902)	P	Vettatholi	Tree	The bark of the tree is traditionally used as an analgesic, the decoction made from shoot is used in medicines for joint pain (10) and also the wood is used for general household purposes (47).	57	0.87
42	<i>Dalbergia latifolia</i> Roxb. (1895)	P	Kariveetti	Tree	The bark is used in traditional medicine to treat diarrhea (2) and is also timber yielding (51).	53	0.81
43	<i>Dalbergia sissooides</i> Wight & Arn. (2815)	P	Eetti/ Veeti	Tree	Timber used for household craftings and furnitures (37).	37	0.56
44	<i>Delonix regia</i> (Hook.) Raf. (2816)	C	Vaakamaram/ poomaram	Tree	Used for forage & shade tree (43).	43	0.66
45	<i>Desmodium gangeticum</i> (L.) DC. (2881)	P	Orila	Woody perennial herb	A decoction of the root and leaves is employed to treat kidney problems (14) and as green manure.	14	0.21
46	<i>Desmodium triflorum</i> (L.) DC. (1893)	P	Nilampulladi/ Nilamparanda	Herb	It is commonly used to treat diarrhoea, dysentery and for skin problems (17).	17	0.26
47	<i>Dolichos trilobus</i> L. (1637)	P	Kaatumuthira	Climber	Pods are vegetable (15). Dried/fresh seeds cooked with coconut milk and ground nut are edible (16). The dried tubers are used to treat chickenpox (3).	34	0.52
48	<i>Entada rheedi</i> Spreng. (3339)	M	Paranda/ Kakkuvalli	Tree	The inner meat of this seeds would be either consumed directly/chopped, dried, or mixed with other herbs and consumed as vegetable (8) & it is used in toothache, ulcers etc (11).	19	0.29
49	<i>Erythrina stricta</i> Roxb. (3400)	P	Vellamurukku	Tree	The stem is used to make households (21) and used for fencing (7) and used for making fishing net floats (18) & match sticks (6).	52	0.8
50	<i>Erythrina submbrans</i> (Hassk.) Merr. (3399)	P	Paalmurukku	Tree	Very young leaves are eaten as vegetable (38). Bark and leaves are used against dust disturbances in eye (9).	47	0.72
51	<i>Erythrina variegata</i> L. (1772)	P	Murukku.	Tree	The paste made by boiling the leaves with coconut is applied to get relief from joint pains (41).	41	0.63

(Contd.)

Table 2 — List of Leguminosae species recorded from the study area (Contd.)

SI No	Plant Name (Accession No.)	Sub family	Local name	Habit	Traditional uses	TUR*	Use value (UV)
52	<i>Flemingia macrophylla</i> (Willd.) Merr. (3410)	P	Pathorila	Shrub	Grown to prevent soil erosion in slanting fields (20).	20	0.3
53	<i>Glycyrrhiza glabra</i> L. (3518)	P	Irattimadhuram	Shrub	Used in cough and throat infections (36).	36	0.55
54	<i>Indigofera cassioides</i> DC. (1897)	P	Amari	Shrub	Flowers are occasionally used as vegetables (13). Roots are used for cough & chest pain (4).	17	0.26
55	<i>Indigofera glabra</i> L. (1898)	P	Amari	Perennial under shrub	Decoction of leaves is a bitter tonic used against fever (10).	10	0.15
56	<i>Indigofera tinctoria</i> L. (1899)	P	Neelayamari	Shrub	Leaves are dye yielding (2), leaf extract with coconut oil is effective for hair loss (16) & stem is used for fencing (10).	28	0.43
57	<i>Kingiodendron pinnatum</i> (Roxb. ex DC.) Harms. (1900)	C	Kulavu	Tree	Plant extract/gum is used in medicines for troubles in urino-genital tracts; along with <i>Saraca</i> (24) or as a supplement for <i>Saraca</i> (9).	33	0.5
58	<i>Lablab purpureus</i> (L.) Sweet. (3257)	P	Avara	Shrub	Used as vegetables, cultivated in homestead gardens (42).	42	0.64
59	<i>Leucaena leucosephala</i> (Lam) de Wit. (3249)	M	Vellavelam	Tree	Grown as a honeybee foraging plant (12). The powdered bark and gum are used for boils (13).	25	0.38
60	<i>Mimosa pudica</i> L. (3253)	M	Thottavadi.	Creeping herb	Root paste used against snake venom (21). Leaf paste is used for speedy wound healing (20).	41	0.63
61	<i>Mucuna gigantea</i> (Willd.) DC. (3529)	P	Kattavally	Woody climber	Seeds are used for sexual disorders (43) and boiled seeds are taken as pulses (4). The flour made from heated seeds is eaten after cooking with coconut (15).	62	0.95
62	<i>Mucuna pruriens</i> (L.) DC. (3250)	P	Naikkuruna	Woody climber	Plant extract is toxin antagonist for various snakebites (11) & it is a forage crop (5) and used against ectoparasite in cattle (34).	50	0.76
63	<i>Pongamia pinnata</i> (L.) Pierre. (3237)	P	Pongam/Ungu	Tree	Seeds used against skin inflammations and piles (13).	13	0.2
64	<i>Pseudarthria viscida</i> (L.) Wight & Arn. (3018)	P	Moovila	Shrub	Boiled water with crushed leaves is used for bathing to reduce rheumatic complaints and swellings (6).	6	0.09
65	<i>Pterocarpus marsupium</i> Roxb. (3010)	P	Venga	Tree	Water kept overnight in vessels made of the heart wood is taken in empty stomach for 3 months to cure diabetes or illness in old ages (28).	28	0.43
66	<i>Pueraria phaseoloides</i> (Roxb.) Benth. (2053)	P	Nelamkezhangu	Climber	Boiled/Cooked tuberous roots are eaten (18). A decoction made from the plant is applied to ulcers and boils, especially in children (6). Very young pods and flowers are eaten as vegetables (27).	51	0.78
67	<i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC. (1167)	P	Nelamkezhangu	Climber	Cooked roots/ tubers are edible (35).	35	0.53
68	<i>Saraca asoca</i> (Roxb.) Willd. (3252)	C	Ashokam	Tree	Whole plant is used for curing scorpion sting (2), piles (3), body pain (12) and used especially for uterine diseases (27). Leaf paste is applied against skin problems (12).	56	0.86
69	<i>Senna alata</i> (L.) Roxb. (1892)	C	Takarasoppu/ Atuthakara	Shrub	Seed paste is used against bovine mastitis in cattle (17). The seed paste is applied to reduce the inflammation and pain in mammary gland of cattle (20).	37	0.56

(Contd.)

Table 2 — List of Leguminosae species recorded from the study area (Contd.)

SI No	Plant Name (Accession No.)	Sub family	Local name	Habit	Traditional uses	TUR*	Use value (UV)
70	<i>Sesbania sesban</i> (L.) Merr. (2516)	P	Nellithali, Shempathali	Shrub	Plant parts are used as a cattle feed (8) and thick branches as fuel wood (5) or are used for house hold utilities (12). The fiber from stem is also used along with fibers of <i>Crotalaria</i> spp as ropes (19).	44	0.67
71	<i>Tamarindus indica</i> L. (1903)	C	Valanpuli	Tree	Leaves used against cold, cough and rheumatism (24). Fruit pulp & Roasted seeds are edible (40).	64	0.98
72	<i>Tephrosia purpurea</i> (L.) Pers. (3435)	P	Kaatukolingi	Shrub	The Whole plant is used to cure skin eruptions (2).	2	0.03
73	<i>Teramnum labialis</i> (L. f.) Spreng. (3446)	P	Kaatuzhunnu	Twining herb	Boiled/Cooked seeds are eaten (3) & Plant extracts are especially used to treat fever and headache (3).	6	0.09
74	<i>Uraria picta</i> (Jacq.) DC. (3447)	P	Moovila	Under shrub	Leaf paste is applied on cuts and wound (4).	31	0.47
75	<i>Vigna dalzelliana</i> (Kuntze) Verdc. (3448)	P	Kaatupayaru	Climber	Raw or cooked young pods (19), cooked leaves (16) and seeds are edible, along with other greens (28).	51	0.78
76	<i>Vigna mungo</i> (L.) Hepper. (3449)	P	Kaatuzhunnu	Herb	Young pods are vegetables (20). Seeds are used as pulse (22).	42	0.64
77	<i>Vigna radiata</i> (L.) R. Wilczek. (3450)	P	Kollipayaru	Climber	Boiled/Cooked seeds are eaten as pulse (52).	52	0.8
78	<i>Vigna trilobata</i> (L.) Verdc. (1019)	P	Kaatupayaru	Climber	Seeds, leaves and Immature seed pods are eaten as vegetable along with other edible greens (54).	54	0.83
79	<i>Vigna vexillata</i> (L.) A. Rich. (2518)	P	Kaattuvelipayaru	Climber	Roots/ tubers (13), young leaves, young pods and seeds are edible (40).	63	0.96
80	<i>Xylia xylocarpa</i> (Roxb.) Taub. (3433)	M	Irul	Tree	Very young fruits were consumed directly (16) and the seeds are used as pulse (18). The oil from the seeds is used in the treatment of rheumatism (3).	37	0.56

\* Total use reports

part, such as leaves, flowers, pods, seeds etc. Major Medicinal uses of these plants are related to problems with digestive system, skin itching/inflammations, rheumatic joint pain, fever, cough, allergic disorders, gonorrhoea, hair fall etc. Many plants such as *Abrus precatorius*, *Kingiodendron pinnatum* were popularly used in some problems of reproductive system and seeds of *Abrus precatorius* are also used to prevent pregnancy.

*Dalbergia sissoides*, *Dalbergia lanceolaria*, *Dalbergia latifolia*, *Erythrina variegata*, *Albizia odoratissima*, *Albizia amara*, *Archidendron monadelphum* are some of the timber yielding members of Leguminosae. While the plants such as *Bouhinia purpurea*, *Clitoria ternatea*, *Bouhinia phoenicea*, *Bauhinia variegata* etc., were used to increase beauty of home gardens. At the same time ornamental trees like *Delonix regia*, *Cassia fistula* and many species of *Acacia* were extensively used for

providing shade. Apart from providing shade and ornamental beauty, many members of the family leguminosae were extensively used for forage and grazing and many are known for manuring purposes. Since ancient times plants from leguminosae were accepted for crop rotations because of its nitrogen fixing capacity and their immense role in increasing soil fertility.

#### Use value (UV)

*Tamarindus indica* possessed the highest use value (UV) equal to 0.98 with 64 use reports. Hence it is relatively more important species followed by *Vigna vexillata* (UV= 0.96), *Mucuna gigantea* (UV= 0.95) and *Canavalia cathartica* (UV= 0.90). Use value of *Alysicarpus bupleurifolius*, *Crotalaria calycina* and *Tephrosia purpurea* are least among the selected species of legumes, that is 0.03; indicates that these plant species are not popularly used by the tribal communities (Table 2).

**Factor informant consensus ( $F_{ic}$ )**

In order to determine the total usage of plant species according to cultural applicability and to calculate the  $F_{ic}$  value of relatively important plants, several interviews had been conducted with informants from two major tribal communities of the study area. A total of 3620 actual use reports were recorded though interviews/discussions conducted with 65 informants. Actually people of this region use hundreds of plants from the family fabaceae, but here tabulated the details of only eighty plants (Table 2) in order to consider the homogeneity of usage of the plants.

Major utility concerns of the plant species were categorized into five groups for convenience and also for calculating the  $F_{ic}$  on our data. High  $F_{ic}$  value are obtained when only restricted number of plants are reported to be used by a high proportion of informants under a specific category, whereas low  $F_{ic}$  value indicates that informants disagree over which plant is to be used. So that, by knowing the  $F_{ic}$  value, it's easy to understand whether the informants are having a homogenous or heterogenous knowledge about the plants under study. Analysis of *Informant consensus factor* reveals that the homogeneity of knowledge is more for the plants with medicinal importance (Table 3) ( $F_{ic}$  0.97); whereas maximum heterogeneity ( $F_{ic}$  0.92) was found in the opinion among the informants about agricultural utilities of plants.

**Direct Matrix Ranking (DMR)**

*Direct Matrix Ranking (DMR)* was calculated only on plants that are having a high demand and relative importance among the people. Hence the plants selected for *DMR* are having a *Use Value* above 0.74 (Table 4). *DMR* implemented on the data revealed that timber yielding trees with medicinal properties were facing more threat due to exploitation.

According to the results *Dalbergia latifolia* ranked first, *Dalbergia lanceolaria* ranked second and *Tamarindus indica* reached on the third rank. This results showed that these plants coming on top ranks were actually been more exploited, because these were highly preferable for all five categories studied under *DMR* analysis. Edible herbs are also under pressure in the study site, because most of them are also used for forage/grazing and manuring purposes widely.

Table 3 — Informant consensus factor ( $F_{ic}$ ) by various utilities of plants

S.No.	Category	No. of taxa used	No. of total use reports	$F_{ic}$
1	Agricultural uses	8	98	0.92
2	Household utility	26	365	0.93
3	Food/Fodder/Forage/ Grazing	56	1125	0.95
4	Timber/Shade providing/Fuel	7	153	0.96
5	Medicinal plant	48	1879	0.97

Table 4 — *DMR* score of legume species with highest *Use Value* above 0.74

Plant name	Agricultural uses	Household utility	Food/Fodder/Forage /Grazing	Timber/Shade providing /Fuel	Medicinal plant	Rank
<i>Cajanus cajan</i> (L.) Millsp.	0	0	5	0	0	5
<i>Cajanus scarabaeoides</i> (L.) Thouars.	0	0	5	0	4	9
<i>Calopogonium mucunoides</i> Desv.	4	1	4	0	0	9
<i>Canavalia cathartica</i> Thouars.	0	0	5	0	0	5
<i>Canavalia rosea</i> (Sw. ) DC.	0	0	5	0	0	5
<i>Cassia fistula</i> L.	0	2	4	1	4	11
<i>Centrosema pubescens</i> Benth.	3	0	2	0	0	5
<i>Clitoria ternatea</i> L.	0	5	0	0	4	9
<i>Dalbergia lanceolaria</i> L. f.	5	5	5	5	3	23
<i>Dalbergia latifolia</i> Roxb.	5	5	5	5	4	24
<i>Erythrina stricta</i> Roxb.	5	5	2	5	0	17
<i>Mucuna gigantea</i> (Willd.) DC.	0	0	3	0	5	8
<i>Mucuna pruriens</i> (L.) DC.	0	0	2	0	4	6
<i>Pueraria phaseoloides</i> (Roxb.) Benth.	3	0	4	0	3	10
<i>Saraca asoca</i> (Roxb.) Willd.	0	0	0	4	5	9
<i>Tamarindus indica</i> L.	4	4	5	4	5	22
<i>Vigna dalzelliana</i> (Kuntze) Verdc.	2	0	5	0	0	7
<i>Vigna radiata</i> (L.) R. Wilczek.	4	0	5	0	0	9
<i>Vigna trilobata</i> (L.) Verdc.	3	0	5	0	0	8
<i>Vigna vexillata</i> (L.) A. Rich.	5	0	5	0	0	10

## Discussion

In general, the collection and consumption of wild edible foods are increasingly stigmatized as symbols of poverty and 'tribalness'<sup>34</sup>. Since ancient times, plants and its derivatives have been traditionally used as medicine for the treatment of various diseases<sup>35</sup>. Many plants such as *Teramnus labialis*, *Pseudarthria viscida*, *Pongamia pinnata*, *Erythrina variegata* etc. are used for the treatment of common health problems such as fever, cold, joint pain etc. A wide range of herbal traditional medicines are used to regulate the menstrual cycle and to enhance fertility or as either abortifacients/anti abortifacients<sup>36</sup>.

Tribal people infer us, how to utilize the wild food reserves and how to eliminate the toxins from various plant species. The tribals have established their own pharmacopoeia of their traditional information<sup>37</sup> about the medicinal uses of plants by trial and error methods<sup>38</sup>. For example the preparation of food stuffs from *Mucuna gigantea*, *Pueraria phaseoloides* and *Adenantha pavonina* really need exclusive expertise; otherwise this may cause poisoning. Even the washing, cleaning and cutting also require special training<sup>39</sup>.

Among the tribal communities focused in this study, the Paniya community is really successful in exploring all the available edible plant groups from all types of vegetation ranging from dense forest to even on plain grazing land areas<sup>40</sup>. But the actual forest dwellers are Kattunaikkas<sup>41</sup>. They were residing and forage completely inside the forest. The other major communities like Adiya, Kuruma and Kurichya were forage outside the forest areas and they are more exposed than Kattunaikkas and have access for plantations<sup>42</sup>.

## Conclusion

Actually hundreds of legume species were directly or indirectly related to the daily life of tribal man. But the present study summarized with the popular and most homogenous data of eighty plants. Majority of the plants included in this study were collected from the exact wild habitats, while some edibles like *Lablab purpureus*, *Cajanus cajan*, *Arachis hypogea* were collected from the homestead gardens. All the data about the plants were gathered through interviews/discussions with randomly selected 65 local informants (40% from Paniya community and 60% from Kattunaikka community). *Tamarindus indica* possessed highest Use Value followed by

*Vigna vexillata*, *Mucuna gigantea* and *Canavalia cathartica*. High UV indicates the high acceptance or relative importance of those plants among the local people. Then the plants with lowest UV are *Alysicarpus bupleurifolius*, *Crotalaria calycina* and *Tephrosia purpurea*. According to  $F_{ic}$  analysis, it is found that apart from edible properties plants with medicinal properties are getting more exploited. Then DMR Rank determines that dependence on tree species were getting emphasized more among the tribals under this present investigation.

Several documentations were previously done by eminent researchers about the traditional knowledge and diversity of wild plants<sup>43</sup> used for food, fodder, medicine, timber etc.<sup>44,45</sup> by the major tribal communities of Wayanad district, Kerala. This present study may also serve as indigenous information for future sustainable utilization and conservation.

## Conflict of Interest

No potential conflict of interest was reported by the authors.

## Author Contributions

VA: Conceptualization, Methodology, Investigation, Data curation and Original draft; AKA: Supervision, Resources and Formal analysis.

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