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A Quantitative Study on Indigenous Medicinal Plants used by Tribes of Kerala

Simi Asharaf[1] and M. Sundaramari[2]

ABSTRACT

A quantitative study of indigenous medicinal plants with detailed documentation among tribal people was carried out in Idukki Wildlife Sanctuary, Idukki District, Kerala State. Nine tribal settlements were selected for the study based on the area and availability of information. Accordingly 120 informants were selected purposively. Direct observation, semi structured interview and group discussion were used to collect the data from the informants. The collected data was analysed using Micro-soft Excel spreadsheet 2010 and summarized using descriptive statistical methods. Five different quantitative statistical tools such as Relative Frequency of Citation (RFC), Use value (UV), Relative Importance Index (RI), Relative Importance Index (RI), Fidelity Level (FL) and Informants' Consensus Factor (ICF) were analysed with score. Acacia caesia (L.) Wild had the highest RFC with rank I,; Adhatoda beddomei C.B. Clarke gave the highest use value with the maximum number of medicinal purposes (four).

A majority of species were found to be most used among the community. The highest level of ICF was obtained for urological ailments (UA) followed by gynaecological ailments (GAA) and Dermatological ailments (DA) in that order.

Keywords : *Indigenous Medicinal Plants, Quantitative factors, Idukki district, Kerala*

INTRODUCTION

Indigenous knowledge is the knowledge, innovations and practices of indigenous and local communities practiced around the world. Developed from experience, gained and tested over centuries and adapted to the local culture and environment, such knowledge is transmitted orally from generation to generation (Pushpangadan et al., 2002). Indigenous medicine is a special type of indigenous knowledge with the integration of information, practices, technologies, beliefs, experimentation, biological resources, human resources and communication. In developing countries, many people (more than 80%) depend on indigenous medicines because they have no access to modern medicines and accepted as it is safe (Runyoro et al., 2006). Traditional healers act as

1. Ph.D.Scholar, Faculty of Agriculture and Animal Husbandry, Gandhigram Rural Institute- Deemed University, Gandhigram-624 302 and 2. Professor (Agricultural Extension), Faculty of Agriculture and Animal Husbandry, Gandhigram Rural Institute-Deemed University, Gandhigram-624 302

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a core of the community, taking more advantages over diverse species of flora and fauna and they are carrying it to next generation. Indigenous medicinal inventories are today recognized as the most effective method of identifying new medicinal plants or refocusing on those plants reported in earlier studies for the possible extraction of beneficial bioactive compounds (Thirumalai et al., 200).

The present study was designed to document the medicinal uses of plants and to determine Relative Frequency Index (RFC), Use Value (UV), Relative Importance (RI), Fidelity Level (FL) and Informants' Consensus Factor (ICF) of such species/ ailments of Kannampadi, part of Idukki Wild Life Sanctuary, in order to evaluate their potential for new drugs of herbal origin.

METHODOLOGY

Study Area and Selection of Respondents

The study was undertaken during 2015-2016, in remote tribal settlements located inside the Idukki Wildlife Sanctuary, Idukki in Kerala, India. It is the natural abode of the aboriginal tribes – such as Malayarayans and Uralis whose main occupation is agriculture. Nine tribal settlements namely Memari, Kannampadi, Kathitheppan, Thekkuthottam, Vakkathi, Kollathikkadu, Keezhukaanam, Mullam and Punnappara were selected after consulting with Integrated Tribal Development Office, Thodupuzha. A list of tribal healers/ elderly persons who have rich knowledge in medicinal plants was prepared with the support of hamlet headman (oorumooppan) and a total of one hundred and twenty respondents were selected purposively.

Method of Data Collection

Taking in to consideration of the scope and objective of the study, direct observation, semi structured interview and group discussion were followed for data collection. The field survey was undertaken with the help of hamlet headman and two local tribal men having through knowledge about the area.

Statistical Tools used : Quantitative analysis

i. Relative Frequency of Citation (RFC)

This index, which does not consider the variable u (use-category), is obtained by dividing the number of informants who mention the use of the species, also known as frequency of citation (FC), by the number of informants participating in the survey (N). Using the same terminology, the numerator can be seen as the summation of the UR of all the informants interviewed for the species without considering the use-category (Tardio & Pado-de Santayana, 2008).

$$RFC_s = \frac{FC_s}{N} = \frac{\sum_{i=i_1}^{i_N} UR_i}{N}$$

For example, Acalypha indica L. was

reported as useful by 72 out of 120 informants; hence, RFC *Acalypha indica L* 72/120=0.600. This index theoretically varies from 0, when nobody refers to the plant as useful, to 1 in the unlikely case that all the informants would mention the use of the species.

ii) Use Value (UV)

The use value (UV) demonstrates the relative importance of plants known locally. It was calculated using the following formula:

$$UV = \sum \frac{U_i}{N}$$

where U_i is the number of uses mentioned by each informant for a given species and N is the total number of informants (Gazzaneo et al., 2005).

iii) Relative Importance Index (RI)

This index takes into account only the use-categories not the subcategories using the following formula.

$$RI = \frac{RFC_{s(max)} + RNU_{s(max)}}{2}$$

where $RFC_{s(max)}$ is the relative frequency of citation over the maximum, i.e., it is obtained by dividing FCs by the maximum value in all the species of the survey ($RFC_{s(max)}$= FC_s/max FC) and $RNU_{s(max)}$ is the relative number of use-categories over the maximum, obtained dividing the number of uses of the species $NU_s = \sum_{U=Ui}^{U_{NC}} UR_U$ by the maximum value in all the species of the survey

$$(RN_{s(max)} = NU_s/Max(NU).$$

(Tardio and Pado-de Santayana, 2008).

iv. The Fidelity Level (FL)

The percentage of informants claiming the use of a certain plant species for the same major purpose was calculated for the most frequently reported diseases or ailments as:

$$FL(\%) = (N_p/N)X100$$

Where, Np = number of informants that claim a use of a plant species to treat a particular disease; N = number of informants that use the plants as a medicine to treat any given disease. (Zashim Uddin, 2014)

v. Informants' Consensus Factor (ICF)

$$ICF = {}^{N_{ur} - N_t}/_{N_{ur} - 1}$$

Where, Nur = number of use reports from informants for a particular plant-use category; Nt = number of taxa or species that are used for that plant use category for all informants (Zashim Uddin, 2014)

FINDINGS AND DISCUSSION

Diversity of Ethnomedicinal Plants

A total of 70 medicinal plants representing 33 families with 57 genera were used to treat various human ailments in the study area. Of the medicinal plants documented in the study area, 71.42% were collected from wild, 18.57% were from cultivated home garden and 10.01% from road side and wasteland. The same

result was also reported elsewhere in Idukki, Kerala (Simon, 2011, Sudeesh, 2012 & Ajesh, 2012).This shows that the culture of biodiversity conservation along with medicinal plants is well established in this area. The analysis of plant habit in the area indicated that, herbs (40%) dominated the domain of medicinal plants reported in the study area followed by trees (35.71%), shrubs with (21.42%) and climbers (2.87%) (Table 1).

Table 1.
Indigenous Medicinal Plants Used by Tribes of Idukki Wildlife Sanctuary

Sl. No.	Scientific Name
1.	*Acacia caesia (L.)Willd.*
2.	*Acacia catechu (L.) Willd., Oliv.*
3.	*Acacia nilotica (L.) Willd. ex Delile*
4.	*Acalypha indica L.*
5.	*Acorus calamus L*
6.	*Achyranthes aspera*
7.	*Adenanthera pavonina L.*
8.	*Adhatoda beddomei C.B. Clarke*
9.	*Adhatoda vasica Nees*
10.	*Aegle marmelos (L.) Corrêa*
11.	*Aerva lanata*
12.	*Aganosma dichotoma (Roth) K. Schum.*
13.	*Alangium salviifolium (L. f.) Wangerin*
14.	*Albizia lebbeck (L.) Benth.*
15.	*Aloe vera (L.) Burm.f.*
16.	*Alstonia scholaris (Lin) R (Brown)*
17.	*Amaranthus spinosus L.*
18.	*Andrographis paniculata (Burm.f.) Wall. ex Nees*
19.	*Artocarpus heterophyllus Lam.*
20.	*Azadirachta indica A.Juss.,*
21.	*Azima tetracantha Lam.*
22.	*Bacopa monniera (L.) Pennel*
23.	*Bambusa bumbos*
24.	*Bauhinia malabarica Roxb.*
25.	*Bauhinia purpurea*
26.	*Biophytum sensitivum*
27.	*Boerhavia diffusa L. nom. cons.*
28.	*Borassus flabellifer L.*
29.	*Bridelia retusa (L.) A.Juss.*
30.	*Butea monosperma (Lam.) Taub.*
31.	*Caesalpinia coriaria (Jacq.) Willd.*
32.	*Caesalpinia crista*
33.	*Caesalpinia pulcherrima (L.) Sw.*
34.	*Caesalpinia sappan*
35.	*Calotropis gigantea (L.) W.T.Aiton*
36.	*Calotropis procera (Aiton) W.T.Aiton*
37.	*Camellia sinensis (L.) Kuntze*
38.	*Capsicum annuum L.*
39.	*Carum carvi L.m*
40.	*Carica papaya L.*

Sl. No.	Scientific Name
41.	*Carthamus tinctorius*
42.	*Cassia tora/ obtucifolia*
43.	*Datura fastuosa*
44.	*Datura metel L.*
45.	*Emilia sonchifolia (L.) DC. Ex Wight*
46.	*Eupatorium adenophorum Spreng*
47.	*Euphorbia antiquorum L.*
48.	*Euphorbia hirta*
49.	*Ficus hispida*
50.	*Ficus religiosa*
51.	*Gliricidia sepium*
52.	*Hyptis suaveolens (L.) Poit.*
53.	*Ixora coccinea L.*
54.	*Jasminum angustifolium*
55.	*Jasminum grandiflorum L.*
56.	*Jatropha curcas L*
57.	*Lantana camara var. aculeate L.*
58.	*Lawsonia inermis L*
59.	*Leucas aspera*
60.	*Melia azedarach L.*
61.	*Mesua ferrea*
62.	*Monochoria hastifolia C.Presl*
63.	*Ocimum basilicum L.*
64.	*Ocimum sanctum*
65.	*Persicaria chinensis*
66.	*Sida acuta Burm.f.*
67.	*Sphaeranthus indicus Linn.*
68.	*Tragia involucrate L.*
69.	*Vernonia cinerea Less.*
70.	*Woodfordia fruticosa (L.) Kurz*

Quantitative Analysis

i. Relative Frequency of Citation (RFC)

Soap bark tree (*Acacia caesia (L.*) Willd) had the highest RFC (0.925) with rank I in study followed by biophytum *(Biophytum sensitivum)* (0.775) and hog weed (*Boerhavia diffusa L. nom. cons.*) (0.766) with rank II and III (See Table 1). This means that this species has been mentioned by maximum of informants and is the most recognized plant in the region having the most diverse use.

ii. Use Value (UV)

The most commonly used species was malabar nut *(Adhatoda beddomei C.B. Clarke*) with 82 use reports by 85 informants, giving the highest use value of 0.683. It is attributed to its use in the treatment of various diseases and it is well recognized by maximum of informants to cure asthma, wound, bleeding, blood heat, piles, cough, stomach pain and phlegm. Hog weed (*Boerhavia diffusa L.* nom. cons.) with 80 use reports by 92 informants scored second highest use value of 0.666 followed by broom weed (*Sida acuta Burm.f.*) with 76 use reports by 87 informants with use value of 0.633, bael (*Aegle marmelos (L.) CorrêaC.B.*) with 75 use reports by 77 informants with use value of 0.625 and holly basil (*Ocimum sanctum*) with 74 use reports by 85 informants with use value of 0.616. It reveals that the informants were found to have high rate of dispersal of knowledge about ethnomedicinal plants and their use.

iii. Relative Importance Index (RI)

The plants with the maximum number of medicinal purposes (four) were found to be soap bark tree (*Acacia caesia (L.)Willd)* followed by neem tree (*Azadirachta indica A.Juss,*) (three). Thee high relative importance index of soap bark tree *(Acacia caesia (L.)Willd)* with RI of 0.833 reported might be an indication of its high availability and affordability in the study area.

iv. The Fidelity Level (FL)

To determine culturally important medicinal species in the society, Fidelity Level (FL) of plants has been calculated based on use reports which have been cited by ten or more informants for being used against a given ailment. The highest FL value was found in soap bark tree *(Acacia caesia (L.)Willd.)* with 92.50% followed by biophytum *(Biophytum sensitivum)* with 77.50% and hog weed *(Boerhavia diffusa L. nom. cons.)* with 76.60% respectively. While selecting the most preferred plant species for each ailment category, the high Fidelity Level (%) in each category of ailment could be used.

v. Informants' Consensus Factor (ICF)

The Informant's Consensus

Table 2.

Informants' Consensus Factor (ICF) for Ailment Categories

Sl. No.	Ailment categories	Number of use reports(N_{ur})	Number of taxa (N_t)	Informant consensus factor (ICF)
1.	Urological ailments (UA)	205	9	0.9607
2.	Ear, nose, throat ailments (ENTA)	45	4	0.9318
3.	General Health Ailments (GHA)	594	30	0.9510
4.	Eye ailment (EA)	60	5	0.9322
5.	Gynaecological/ andrological ailments (GAA)	181	9	0.9555
6.	Fever ailment (FA)	142	8	0.9503
7.	Dermatological ailment (DA)	446	23	0.9505
8.	Respiratory ailment (RA)	167	11	0.9397
9.	Gastro-intestinal ailment (GIA)	298	18	0.9427
10.	Skeleto- Muscular ailments (SMA)	95	7	0.9361
11.	Poisonous bites ailments (PBA)	137	8	0.9485
12.	Lifestyle ailments (LSA)	312	20	0.9389
	Total	**2682**	**152**	

Factor (ICF) of 12 ailments has been represented in Table 2. The urological ailments (UA) were reported to have highest ICF value of 0.9607 followed by gynecological ailments (GAA) with ICF of 0.955, Dermatological ailments (DA) with ICF of 0.950 respectively (Table 2). High ICF value can be used to select interesting species in search of bio active compounds.

CONCLUSION

Findings of the study had indicated that, the study area is rich in knowledge on traditional medicines and their uses which were blended with the culture of local people. Fabaceae was the most used plant family for the treatment of various ailments in the area. Herbs stood first in the plant use for medicinal purpose. Most of the plants were collected from the wild environment and from medicinal gardens.

This indicates that the culture of the people had focused on biodiversity conservation. Various quantitative analyses show that this indigenous knowledge is valuable for the communities and the future generation as a scientific consideration. The study also indicates that the knowledge on indigenous medicinal plants collected and analysed would contribute to a great potential of research and discovery of new drugs to cure various ailments. The professionals involved in Animal husbandry extension have a major role to play in this regard.

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