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ETHNOMEDICINAL PLANTS USED AS ANTIPYRETIC AND ANTHELMINTIC AGENTS BY THE APATANI TRIBE IN LOWER SUBANSIRI DISTRICT OF ARUNACHAL PRADESH, INDIA

HAGE YANKA, A. P. DAS AND HUI TAG

Introduction

The Apatani Tribe is one of the major ethnic Tribal groups of Eastern Himalaya, inhabiting in a small area called 'Ziro Valley' with central geographical location 27.63°N and 93.83°E (Figure 1). It is situated in the Lower Subansiri District of Arunachal Pradesh, India (Dollo et al., 2009). Altitudinally, Ziro Valley is spanning from an elevation of 1688 m to 2438 m above mean sea level and it experience a humid subtropical to temperate climate with an average of 108.1 cm annual rainfall and the temperature ranging from 30.6° C or more in its different parts in summer days. In winter, temperature comes down to 1.1° C or even less at Ziro (Yanka et al., 2020). The Apatanis are known for their hard work and their close relationship with nature. This tribe is unique in their life style and agricultural practices from the rest of the tribal groups of the state and, therefore, attracted many researchers for various types of studies from far and near

(Srivastava et.al., 2010; Yakang et al., 2013; Kaushalendra 2015; Bipul et al., 2017). Their hamlets are surrounded by dense vegetation with rich flora and fauna and are mostly dependent on natural resources for food and health care systems (Kala, 2005; Srivastava et al., 2010).

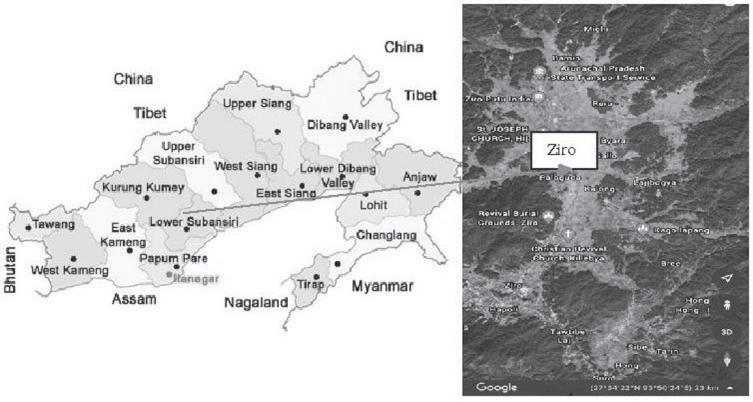

Figure 1: Location map of the study area. [*Source*: Google Earth]

The Apatanis often experiences fever due to variations in climatic conditions, especially due to abrupt changes in diurnal and seasonal temperature regimes. A fever is fundamentally a symptom of another disorder or illness in which body temperature raises higher than 98.7° Fahrenheit.The early generations of the Apatanis were mostly deprived with poverty and had poor sanitation system in every household therefore many of the people often had stomach disorders infected by soil transmitted helminths (STH) like roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*) and the hookworms (*Necato ramericanus* and *Ancylostoma duodenale*), which resulted in morbidity of many infected people. These helminths were commonly called as '*Tader*' in Apatani dialect. According to World Health Organization (WHO) morbidity is directly related to worm burden: the greater the number of worms in the infected person, the greater will be the severity of the disease. It has been reported that more than 880 million children are in need of treatment for these parasites worldwide (https://www.who.int/intestinal_worms/more/en/). Although, today with modern lifestyle, the sanitation system of the Apatani houses, as well as villages, has been much improved and STH infections is generally controlled by periodic administration of synthetic anthelmintic drugs as recommended by WHO. These include

mebendazole, albendazole, levamisole or pyrantel administration. In parallel to this hospital based chemical treatments (Victor *et al*., 2014; Spiegler et al., 2016), the Apatanis uses different traditional herbal formulations for such treatments. Plants are picked from the wild to prepare required medicine that can combat such infections. It is the experience of the local people that many ethnomedicinal plants possess antipyretic and anthelmintic properties and they commonly use those plants. The present study was undertaken in order to document the ethnomedicinal plants used as antipyretic and anthelmintic agent by the people of Apatani tribe of Arunachal Pradesh in North-East India.

Materials and Method

The study was conducted in seven hamlets or villages of Ziro Valley, in Lower Subansiri District of Arunachal Pradesh, India. Firstly, Prior Informed Consents (PIC) was obtained from the local people before the ethnobotanical survey. Total of 84 respondents with an age group of 35 to 50 years and above, both male and female, were subjected for interview with prepared ethnobotanical questionnaires and the plant samples were collected with their help. Field study method by Martin (2008) was followed for the survey. Later on, plant samples were processed into mounted herbarium-sheets in the Plant systematics and Ethnobotanical research laboratory of the Department of Botany, Rajiv Gandhi University following Jain and Rao (1977), Bridson and Forman (1998) and Das (2021). Specimens were identified using available literature including Hooker (1872 – 1897), Grierson and Long (1983 – 2001), Noltie (1994, 2000), Hajra et al. (1996), Giri et al. (2008), and Chowdhery et al. (2009) and with consultation to the experts. For finalization specimens were also matched in various websites like e-flora of India, e-flora of China, etc. and with the specimens in HAU and ARUN herbaria. For updated nomenclature www.plantsoftheworldonline.org and www.theplantlist.org were consulted. The voucher specimens will be submitted to the HAU-Herbarium of Department of Botany, Rajiv Gandhi University, Arunachal Pradesh after completion of the works.

Results and Discussion

The study has revealed a total of 29 plant species belonging to 18 genera from 14 families that are used as antipyretic and anthelmintic agents by the local Apatani people of Ziro (Table 1). Among all the families; Solanaceae with 7 spp. (24.1%) appeared

as the most dominant plant-family followed by Asteraceae with 5 spp. (17.2 %), Amaryllidaceae with 4 spp. (13.79%), Oxalidaceae and Zingiberaceae with 2 spp. (6.89 %) each and Apiaceae, Araliaceae, Poaceae, Rutaceae, Saururaceae, Begoniaceae, Cucurbitaceae, Lauraceae and Taxaceae are represented by single species (3.44%) each (Figure 2). Analysis of the procured data revealed that out of total 29 plants, 13 species are used against soil transmitted helminths (STH) for deworming, 18 plant species were used to reduce fever. So, 2 species are used for both the purposes (Figure 3). Considering the habit diversities, herbs were the most dominant with 22 spp. (75.86%), followed by trees with 3 spp. (10.34%), shrubs with 4 spp. (13.79%) and only one species (3.44%) of climber (Figure 4). Analysis on the plant-parts used, it has been observed that leaves, fruits and whole plants were the most frequently used with 8 spp. (27.5%) each, followed by root, rhizome and stem with 2 spp. (6.89 %) each and for bark and tuber 1sp. (3.44%) each (Figure 5).

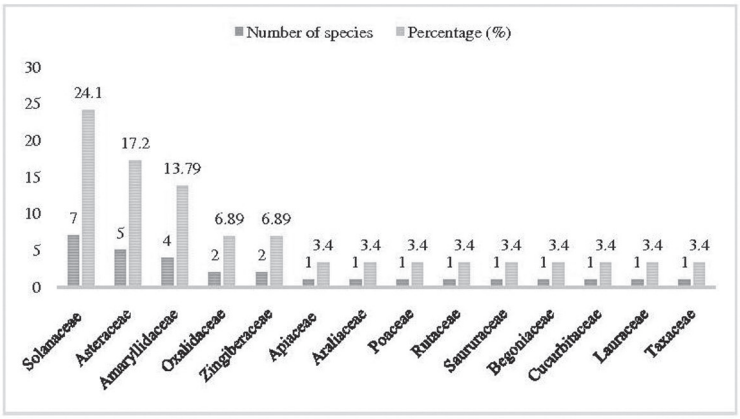

Figure 2: Distribution of frequently used plant families for antipyretic and anthelmintic agents used by the Apatani tribe of Ziro in Lower Subansiri District of Arunachal Pradesh

Against the questions related to the level of cure and satisfaction, *Thladiantha ziroensis* was the most preferred and used plant species with 97.6% satisfaction followed by *Zingiber officinale, Sonchus oleraceus, Sonchus brachyotus* with 95.2% each and *Capsicum annuum* with 95.2 %. Among these *Thladiantha ziroensis* is a recently described species and is extremely rare (Yanka et al., 2017). While using this plant we also need to think seriously for its conservation.

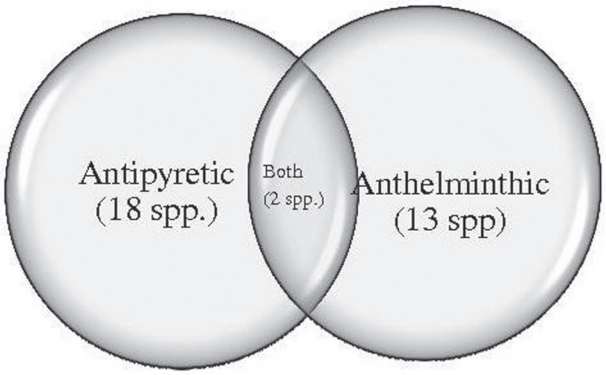

Figure 3: Diagram showing the number of plant species for the purpose of Antipyretic and Anthelmintic Plants used by the Apatani tribe of, Lower Subansiri District of Arunachal Pradesh

Table 1: Checklist of Antipyretic and Anthelmintic Plants used by the Apatani tribe of Ziro, Lower Subansiri District of Arunachal Pradesh, India [*Abbreviations used*: L= Leaf; S= Stem; F= Fruit; WP= Whole Plant; Rh = Rhizome; B= Bark; R=Root; Tu=Tuber]

S. No.	Botanical Name [Family]; Apatani name; Exsiccata	Habits	Part used	Ethnic use	No. of inform-ants	Satisf-action level (%)
1	***Allium chinense*** G.Don [Amaryllidaceae]; *Tale*; HY/HT/HAU/1502/2016	Herb	WP	Eaten as salad and for curing cold, cough and fever	38	45.2
2	***Allium hookeri*** Thwaites [Amaryllidaceae]; *Tale/Lepi*;HY/HT/ HAU/1603/2018	Herb	Tu, L	i. Used as spice & vegetableii. Used to cure Cold, cough & nausea	38	45.2
3	***Allium sativum*** L. [Amaryllidaceae]; *Losung*; HY/HT/ HAU/1505/2016	Herb	WP	Fever, Cold and cough	61	72.6
4	***Allium tuberosum*** Rottler ex Spreng. [Amaryllidaceae] ;*Tale*; HY/HT/ HAU/1502/2016	Herb	L	Eaten as salad and for curing cold, cough and fever	38	45.2
5	***Artemisia indica*** Willd. [Asteraceae]; *Kuklyu*; HY/HT/ HAU/1608/2018	Shrub	L	Inhaling strong smell of leaf relieves nose blockade and headache	29	34.5

S. No.	Botanical Name [Family]; Apatani name; Exsiccata	Habits	Part used	Ethnic use	No. of inform-ants	Satisf-action level (%)
6	***Artemisia nilagirica*** (C.B.Clarke) Pamp. [Asteraceae]; Kuklyu; HY/HT/ HAU/1610/2018	Shrub	L	Young aromatic leaves used in fever and body pain.	29	34.5
7	***Begonia roxburghii*** (Miq.) A.DC. [Begoniaceae]; *Lukhu*;HY/HT/ HAU/1612/2018	Herb	S, R	i. The stem is peeled and eatenii. Root paste is used for deworming	9	10.7
8	***Capsicum annuum*** L. [Solanaceae]; *YobbuTerro*; HY/HT/ HAU/1618/2018	Herb	F	Taken raw with salt to cure fever, cold and cough	78	92.8
9	***Capsicum chinense*** Jacq. [Solanaceae];*Tagin Terro*; HY/HT/ HAU/1622/2018	Herb	F	Taken raw with salt to cure fever, cold and cough	72	85.7
10	***Capsicum frutescens*** L. [Solanaceae];*Tero*; HY/HT/ HAU/1617/2018	Herb	F	Taken raw with salt to cure fever, cold and cough	73	86.9
11	***Centella asiatica*** (L.) Urb. [Apiaceae]; *Ngilyang Khiko hamang*; HY/HT/ HAU/1544/2017	Herb	WP	i. Eaten raw as salad and cooked as vegetable. ii. Cures for gastritis, blood purification; increases appetite.iii. reduce feveriv. Deworming	65	77.3
12	***Curcuma longa*** L. [Zingiberaceae]; *Haldi*; HY/HT/ HAU/1559/2017	Herb	Rh	Paste is used as spice and taken with milk for reducing fever	19	22.6
13	***Cymbopogon citratus*** (DC.) Stapf [Poaceae];*Poh*; HY/ HT/HAU/1648/2019	Herb	WP	The plant is put in between the hair to reduce fever and headache	16	19
14	***Gynura cusimbua*** (D.Don) S.Moore [Asteraceae]; *Kochi Hamang*; HY/HT/ HAU/1613/2018	Herb	L.	Consumed raw for deworming	28	33.3

S. No.	Botanical Name [Family]; Apatani name; Exsiccata	Habits	Part used	Ethnic use	No. of inform-ants	Satisf-action level (%)
15	***Houttuynia cordata*** Thunb. [Saururaceae]; *Siiya Hamang*;HY/HT/HAU/1634/2019	Herb	WP	Eaten raw for insomnia and fever	69	82.14
16	***Hydrocotyle javanica*** Thunb. [Araliaceae]; *Hiibyo Hamang*; HY/HT/HAU/1670/2020	Herb	L, R	Used as Vegetable and also to cure indigestion, deworming	48	57.14
17	***Litsea cubeba*** (Lour.) Pers. [Lauraceae]; *Santutero*; HY/HT/HAU/1639/2019	Tree	F	Fruits is eaten as a remedy to fever, cold and cough.	37	44
18	***Oxalis corniculata*** L. [Oxalidaceae]; *Okhui Hamang*; HY/HT/HAU/1538/2016	Herb	L	Consumed raw against stomach pain	9	10.7
19	***Oxalis debilis*** Kunth [Oxalidaceae]; *Okhui Hamang*; HY/HT/HAU/1541/2016	Herb	WP	Consumed raw against stomach pain	9	10.7
20	***Solanum aethiopicum*** L. [Solanaceae]; *Byako*; HY/HT/HAU/1653/2019	Herb	F	Fruits are boiled and consumed as Chutney or vegetable and believed to have anthelminthic activity	48	57.14
21	***Solanum americanum*** Mill. [Solanaceae]; *Hiiro Hamang*; HY/HT/HAU/1656/2019	Herb	L	Leaves are boiled and consumed as vegetable for curing Diabetes, stomach pain and for the purpose of deworming	42	50
22	***Solanum anguivi*** Lam. [Solanaceae]; *Adi Byako*; HY/HT/HAU/1657/2019	Herb	F	Fruits are cooked and made into paste and consumed as Chutney against diabetes and stomach disorder for deworming purpose as well	48	57.14

S. No.	Botanical Name [Family]; Apatani name; Exsiccata	Habits	Part used	Ethnic use	No. of inform-ants	Satisf-action level (%)
23	***Solanum torvum*** Sw. [Solanaceae]; *Mishang Byako*; HY/HT/HAU/1654/2016	Shrub	F	Fruits are cooked and made into paste and consumed as Chutney against diabetes and stomach disorder for deworming purpose as well	48	57.14
24	***Sonchus brachyotus*** DC. [Asteraceae];*Kochi/ Paku Harbu Hamang*; HY/HT/HAU/1614/2018	Herb	WP	i. Leaves as vegetable. ii. stomach disorder and deworming	80	95.2
25	***Sonchus oleraceus*** L. [Asteraceae]; *Kochi Hamang*; HY/HT/HAU/1602/2018	Herb	WP	i. Leaves as vegetable. ii. stomach disorder and deworming	80	95.2
26	***Taxus baccata*** L. [Taxaceae]; *Talley Noori*; HY/HT/HAU/1595/2017 (Planted).	Tree	B	Bark Oil is extracted from bark and is used in the treatment of cancer and for reducing fever	7	8.3
27	***Thladiantha ziroensis*** Yanka H. & Arup K. Das [Cucurbitaceae];*Riiko*; HY/AKD/HAU/008/2017	Climber	S	Treatment of various ailments viz., fever, stomach problem and deworming	82	97.6
28	***Zanthoxylum armatum*** DC. [Rutaceae]; Yorkhung; HY/HT/HAU/1658/2019	Tree	F	Fruits is dried and consumed against fever, cold and cough	26	30.9
29	***Zingiber officinale*** Roscoe [Zingiberaceae]; *Taki*;HY/HT/HAU/1533/2018	Herb	Rh	i. Used as a condiment ii. Taken raw to cure fever, headache, cold and cough	80	95.2

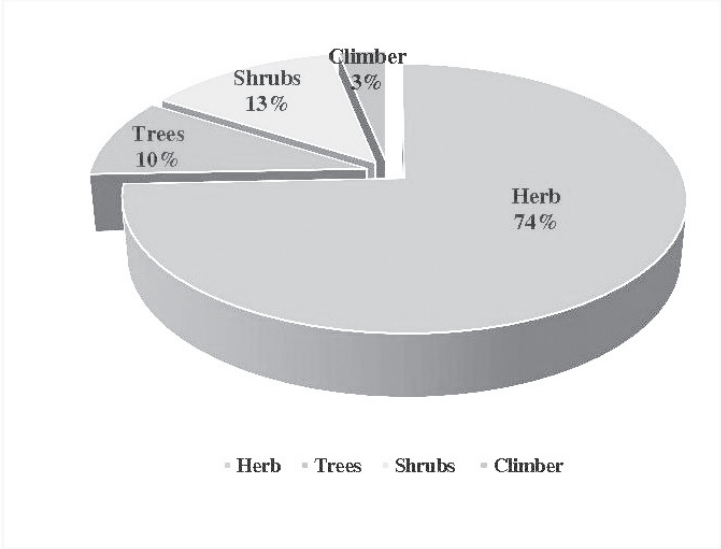

Figure 4: Types of plants used at different rates

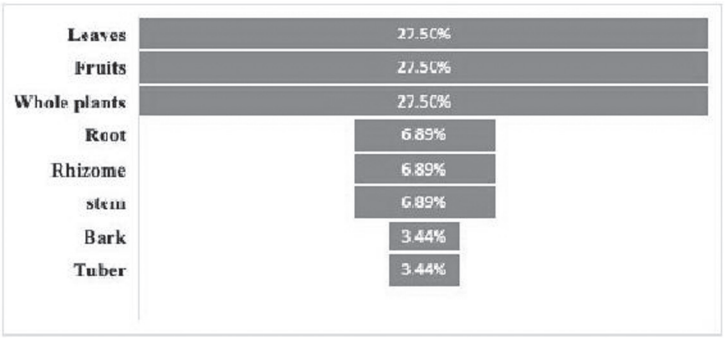

Figure 5: Frequency of different plant-parts used as antipyretic and anthelmintic agents by the Apatani tribe of Ziro in Lower Subansiri District of Arunachal Pradesh

Conclusion

The survey has revealed the fact that with the gradual inroad of modernity in life style including the use of synthetic medicines, the uses of these medicinal plants has been reduced considerable as compared to the earlier generations. Through this survey it has been found that now synthetic drugs are mostly used for the instant relief from fever and helminths infestation but it was interesting to

note that Apatani people are still using above medicinal plants in their day-to-day life for long term effects. It was also observed that younger generation of this tribe has lesser interest in administering traditional medicinal plants as a source medicine.

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