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Ethnomedicinal Plants on Home Gardens of the Nyishi Tribe of Papum Pare District of Arunachal Pradesh, India

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ABSTRACT
Arunachal Pradesh is a tribal inhabited area where most people are directly or indirectly dependent on forest resources for their sustenance. The present study was carried out in Deb, Lakang, Leporiang, Ompuli, and Parang villages of Papum Pare district of Arunachal Pradesh from June to December 2021. The *Nyishi* tribes mostly inhabit the study area. The *Nyishi* people have a long history of using ethnomedicinal plants for the treatment of various ailments. They also use these plants as a source of food. With time, the demand for such plants has increased rapidly leading to a declining population in the wild. Concerned about the diminishing population in the wild, the local people have ventured to grow them in the home gardens to meet their needs. The study found 21 ethnomedicinal plant species belonging to 16 families cultivated by the people in their kitchen gardens. Of these, 52% were herbs, 24% were shrubs, 19% were trees and 5% were climbers. Quantitative indices like Relative Frequency of Citations (RFC) and Fidelity Level (FL) of the plants have been also calculated. While the RFC ranged between 0.13 to 0.97 and FL between 51.1 to 96.7%. The study reveals the importance of ethnomedicinal plants as a source of food as well as curing a variety of ailments by the *Nyishi* tribes. Cultivation of ethnomedicinally and economically important plants in the home gardens is a useful strategy for conservation. It will also contribute towards the preservation of associated traditional ecological knowledge of the people. Therefore, the farmers should be encouraged and motivated for more such efforts to ensure the conservation of plants and food security in light of the changing climate.

Key words: Ethnomedicinal Plants; *Nyishi* Tribes; Home Gardens; Quantitative Assessment; Conservation.

INTRODUCTION

Mother nature has provided abundant resources to human beings and from those resources one of the precious gifts is the wild edible plants. Wild edible plants refer to a group of plants that are consumed by human beings. Since time immemorial, plant resources from the forests have been extracted and collected for human consumption. Various parts of plants like stems, roots, leaves, flowers, and fruits containing seeds have been consumed in different parts of the world. Most of the ethnic communities residing near the forests are dependent on the available wild plants for their day-to-day life activities. Generally, tribal people inhabit the hilly and other less accessible tracts and wild edible plants give articles of diet to them (Arora and Pandey 1996). Wild edible plants are not only a source of food and nutrition but they are also used as medicines for the treatment of major and minor ailments. Till today, the traditional systems of medicine have been a potential source of medicine. It provided mankind with large food products and a large variety of drugs. With the discovery of many new drugs or lead compounds through study and documentation of ethnic knowledge, today almost 80% of the global population have a direct dependency on plants as a primary source of medicine (Farnsworth et al. 1985, Fabricant and Farnsworth 2001). To fill the gap between the growing population and food production, modern scientific researchers are attempting to acknowledge traditional food items. However, thousands of plant species could not be identified till now.

Home gardens are a popular micro land-use system and are socioeconomically linked with people for their livelihood (Pala et al. 2019). Home gardens are becoming a promising land-use system in many parts of the tropics that endow important ecosystem functions and ensure sustainability (Panwar and Chakravarty 2010, Gao et al. 2012). Recent studies have unveiled the significance of home gardens as areas of *in-situ* genetic diversity including ethnomedicinal plants (Panwar and Chakravarty 2010, Subha et al. 2018). Home gardens managed by the indigenous people involve traditional

knowledge which is a cultural heritage as well as valuable for the sustainability of medicinal plant diversity (Ninez 1987, Fujisaka and Wollenberg 1991, Martin 1995, Vogl-Lukasser and Vogl 2002). Arunachal Pradesh is one of the Northeast Indian states endowed with large numbers of endangered and rare flora. The state is inhabited by several ethnic people with rich ethnomedicinal practices and knowledge. The *Nyishis* are one of the major tribes of the state. They possess immense knowledge of many named and unnamed valuable ethnomedicinal plants to treat various ailments. However, in recent decades there has been a rising concern about the declining population of ethnomedicinal plants in the wild. Thus, some of the local people have volunteered to cultivate them in home gardens to meet their needs. Traditional home gardens of the *Nyishi* tribe are rich in biological diversity harboring many local crops including medicinal plants (Tangjang and Arunachalam 2009). Although cultivation of ethnomedicinal plants in home gardens is at its nascent stage in the study area it would be a viable solution for sustainable utilization of such valuable plants in the coming days. Hence, an attempt has been made to explore and document the cultivation status of ethnomedicinal plants in the home gardens of the Papum Pare district of Arunachal Pradesh.

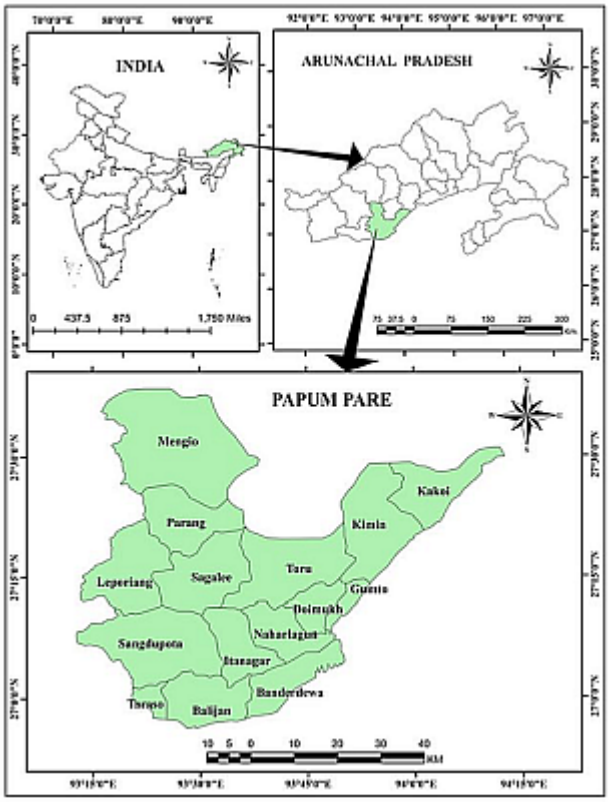

Figure 1. Location map of the study area.

MATERIALS AND METHODS

Study area

A detailed phytogeographic survey was carried out in five villages falling under four circles namely Deb and Ompuli (Sagalee circle), Lekang (Mengio circle), Leporiang (Leporiang circle), and Parang (Parang circle) of Papum Pare district (Fig. 1). The district covers a geographical area of 3462 km² (District Census Handbook, 2011). The hills range approximately from 45 to 1200 meters above mean sea level (AMSL). The local inhabitants possess good knowledge of wild edible plants including ethnomedicinal plants.

Field survey and data collection

The survey covered 15 randomly selected home gardens through stratified sampling in each of the five villages (n = 75). The key informants were farmers, healers, and elders. Personal interviews have been carried out to gather relevant information about home gardens, ethnomedicinal plants, and their various utility. Interactions with the local people and field observations were also made to derive logical conclusions. The collected plants have been identified by consulting the taxonomists of the Department of Botany, Rajiv Gandhi University, relevant taxonomic literature, and the website www.theplantlist.org.

Quantitative analysis

Various quantitative techniques such as Relative Frequency citation (RFC) and Fidelity Level (FL) were used to generate an idea of the usage of the plants in a particular ailment and their utility for ailments. The RFC was calculated using the formula suggested by Vitalini et al. (2013):

$$RFC = FC/N$$

Where RFC = importance of each species in the study area, *FC* = the number of local informants who reported the uses of plant species, and *N* = total number of informants. The FL was calculated using the formula suggested by Friedman et al. (1986):

FL (%) = (Np/N)X100

Where *Np* is the number of use reports cited for a given species for a particular ailment category and *N* is the total number of use reports cited for any given species.

RESULTS AND DISCUSSION

The study recorded a total of 21 ethnomedicinal plants cultivated in 15 home gardens of the study area namely *Achyranthes aspera* L., *Acmella paniculata*, *Artemisia nilagirica*, *Begonia roxburghii*, *Begonia* sp., *Centella asiatica* L., *Citrus medica*, *Clerodendrum glandulosum*, *Eryngium foetidum*, *Fagopyrum esculentum*, *Hedyotis scandens*, *Houttuynia cordata*, *Litsea cubeba*, *Magnolia champaca*, *Molineria capitulata*, *Pouzolzia hirta*, *Rubus ellipticus*, *Saurauia* sp., *Solanum americanum*, *Zanthoxylum armatum* and *Zanthoxylum rhetsa*. These ethnomedicinal plants belong to 16 different families. Out of which, Rutaceae was the largest family having 3 species, followed by Apiaceae, Asteraceae, and Begoniaceae (2 species each), and remaining families with one species each (Table 1).

The ethnomedicinal plants are mostly used for the treatment of major and minor ailments such as cough & cold, stomachache, toothache, blood pressure, diabetics, diarrhea, constipation, insect bite, blood clotting, heel crack, snake bite, headache, and for increasing immunity. Some of the important cultivated ethnomedicinal plants in the home gardens are *Begonia roxburghii*, *Clerodendrum glandulosum*, *Hedyotis scandens*, *Molineria capitulata*, *Rubus ellipticus*, and *Zanthoxylum armatum* (Fig. 2). The quantitative analysis of the ethnomedicinal plants shows the value of RFC between 0.13 to 0.97. The highest RFC value was recorded by *Clerodendrum glandulosum* (0.97), followed by *Begonia roxburghii* (0.94), *Zanthoxylum rhetsa* (0.88), and *Litsea cubeba* (0.85) while *Achyranthes aspera* (0.13) reported the lowest (Table 1). A higher value of RFC means the use of reports of the plant species is higher than the other plants for target ailments. On the other hand, *Zanthoxylum armatum* (96.70%) recorded the highest value of FL, followed by *Clerodendrum glandulosum* (95.80%), *Acmella paniculata* (93.75%), *Begonia roxburghii* (92.90%), *Zanthoxylum rhetsa* (92.40%) and *Centella asiatica* (92%) while *Citrus medica* (51.10%) showed the lowest FL value (Table 1). The highest FL value indicates the frequency and high use of a species to treat a particular ailment.

The study reveals that the *Nyishi* people have immense knowledge of ethnomedicinal plants. They use ethnomedicinal plants to meet their needs in the form of food as well as for the treatment of major and minor ailments. The ethnomedicinal plants cultivated in the home gardens were measured using quantitative indices based on the frequency of plant species mentioned by the informants for various treatments of aliments (Tardo and Pardo-de-Santayana 2008) and plant species used for a particular ailment (Friedman et al. 1986). As per the available literature, the *Nyishi* tribes have been reported to use various ethnomedicinal plants for the treatment of different ailments (Gangwar and Ramakrishnan 1990, Medak and Singha 2016, Tripathi et al. 2017, Das et al. 2018). The use report of *Begonia roxburghii* for stomachache and *Clerodendrum glandulosum* for high blood pressure are in agreement with the previous study (Jeri et al. 2011). Further, the use report of *Houttuynia* for the treatment of high blood pressure and *Acmella paniculata* for toothache has been reported previously (Das et al. 2011). The use of *Artemisia nilagirica* by the *Nyishi* people for wounds and cuts has been also reported in past studies (Bushi et al. 2021).

The *Nyishi* tribes of Arunachal Pradesh practice traditional home gardens that are rich in biological diversity such as local crop species including medicinal plants (Tangjang and Arunachalam 2009). Home gardens maintain a substantial number of species with medicinal values and act as conservation centers for many such species (Pala et al. 2019). The study observed a gradual rise in the awareness of the importance of medicinal plants among the *Nyishi* people of the study area. Also, an increasing effort for the cultivation of ethnomedicinal plants with higher use reports in their home gardens in recent decades.

CONCLUSIONS

Table 1. Ethnomedicinal plants cultivated in home gardens of the study area

Taxonomic name/ family	Local name (*Nyishi*)	Habit	Parts used	Therapeutic indications	Quantitative indices				
					FC	RFC	Np	N	FL (%)
Clerodendrum glandulosum Lindl. Lamiaceae	*Photo Aoh*	Shrub	Leaves & flower	High blood pressure.	73	0.97	73	70	95.80
Eryngium foetidum L. Apiaceae	*Mosol*	Herb	Leaves	Constipation, stomachache, and diarrhea.	20	0.26	20	17	85.00
Fagopyrum esculentum Moench. Polygonaceae	*Wukuwooru Aoh*	Herb	Leaves, stem & flower	High blood pressure and diarrhea.	37	0.49	37	32	86.40
Houttuynia cordata Thunb. Saururaceae	*Haya*	Herb	Whole part	High blood pressure and body immunity.	57	0.76	57	50	87.70
Acmella paniculata (Wall. ex DC.) Asteraceae	*Marshang*	Herb	Flower, stem & leaves	Toothache, throat, and gum infection.	48	0.64	48	45	93.75
Solanum americanum Mill. Solanaceae	*Hor aoh*	Herb	Stem &leaves	Appetite.	17	0.22	17	13	76.47
Zanthoxylum rhetsa (Roxb.) DC. Rutaceae	*Honyir*	Tree	Stem, leaves, &fruit	Cough & cold and stomachache.	66	0.88	66	61	92.40
Centella asiatica L. Apiaceae	*Manimuni*	Herb	Leaves & stem	High blood pressure and body immunity.	63	0.84	63	58	92.00
Begonia sp. Begoniaceae	*Sudum Lepya*	Herb	Stem& leaves	Blood clotting and killing leeches.	25	0.33	25	21	84.00
Pouzolzia hirta Hassk. Urticaceae	*Dhuse Aoh*	Herb	Leaves, stem &roots	Blood clotting and heel crack.	16	0.21	16	13	81.20
Magnolia champaca L. Magnoliaceae	*Selyo Shawn*	Tree	Fruit	Cough & cold and stomachache.	33	0.44	33	27	81.80
Zanthoxylum armatum DC. Rutaceae	*Pata Nyarkam*	Shrub	Fruit & Bark	Cough & cold and headache.	61	0.81	61	59	96.70
Artemisia nilagirica (C.B.Clarke) Pamp. Asteraceae	*Tapin Yamin*	Shrub	Leaves	Fresh wound and blood clotting.	47	0.62	47	39	82.90
Hedyotis scandens Roxb. Rubiaceae	*Takin Tamin*	Climber	Root	Toothache, burn, and stomachache.	27	0.36	27	19	70.30
Citrus medica L. Rutaceae	*Naayo*	Shrub	Fruit & root	Stomachache.	43	0.57	43	22	51.10
Litsea cubeba (Lour.) Pers. Lauraceae	*Tayir*	Tree	Fruit	Insomnia.	64	0.85	64	51	79.60
Begonia roxburghii A. DC. Begoniaceae	*Babrai*	Herb	Stem & roots	Cough & cold and stomachache.	71	0.94	71	66	92.90
Saurauia sp. Actinidiaceae	*Yerr Ninch*	Tree	Leafy buds	Quench thirst.	16	0.21	16	14	87.50
Molineria capitulate (Lour.) Hypoxidaceae	*Doye*	Herb	Fruit, stem & leaves	Blood clotting.	24	0.32	24	22	91.60
Achyranthes aspera L. Amaranthaceae	*Sebe Amch*	Herb	Leaves & stem	Toothache, stomachache, and diabetes.	10	0.13	10	09	90.00
Rubus ellipticus Smith. Rosaceae	*ChijiNigreh*	Shrub	Whole part	Stomachache and insect bites.	16	0.21	16	14	87.50

Figure 2. Some important ethnomedicinal plants cultivated in the home gardens.

The study reported 21 species of ethnomedicinal plants that are cultivated in 15 home gardens from a cluster of villages. The plants are used for the treatment of various ailments and are also consumed as vegetables by the local inhabitants. The findings are important in the context of conservation and sustainable management of ethnomedicinal plants. Since the availability of ethnomedicinal plants in the wild is decreasing day by day due to increasing demand in the local markets and overharvesting, the local farmers have ventured to cultivate such useful plants in their home gardens very recently. Such sound efforts are a useful strategy for the conservation of important plants and also the preservation of associated traditional knowledge of the people. Therefore, the farmers should be encouraged to cultivate ethnomedicinal plants along with other economically important plants in their home gardens to ensure the conservation of biodiversity and food security in light of the changing climate.

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