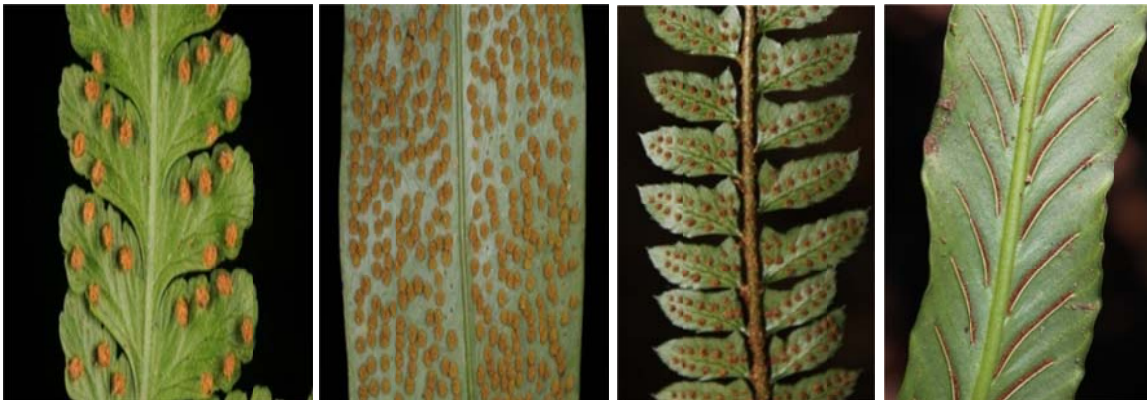


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The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Forest Department



**Preliminary Study on Ethnobotanical Uses and, Phytochemical
analysis of Pteridophyte in Natma Taung National Park,
Southern Chin State**



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Contents

	Page
စာတမ်းအကျဉ်း	i
Abstract	ii
1. Introduction	1-2
2. Literature Review	2-3
3. Materials and Methods	3-6
4. Results	7-
13	
5. Discussions	13-
16	
6. Conclusions	16
7. Acknowledgements	17
8. References	18
Appendix (1)	

နတ်မတောင်အမျိုးသားဥယျာဉ်အတွင်းရှိ ဒရင်ကောက်ပင်များ၏
လူမျိုးစုရုက္ခဗေဒဆိုင်ရာအသုံးချပုံများနှင့် ပါဝင်သောဓါတုဒြပ်ပေါင်းများကိုပဏာမလေ့လာခြင်း

မြင့်မြင့်စန်း(လက်ထောက်သုတေသနအရာရှိ)
စုမြင့်သန်း(သုတေသနလက်ထောက် - ၂)
ထိုက်စံစိုး(တောအုပ်ကြီး)
ယွန်းမီမီကျော်(သုတေသနလက်ထောက် - ၃)

စာတမ်းအကျဉ်း

နတ်မတောင် အမျိုးသားဥယျာဉ်အတွင်းရှိ အမြင့်ပေမတူညီသော နေရာများမှ စုစုပေါင်း ဒရင်ကောက်ပင် မျိုးရင်း (၁၂) မျိုး၊ မျိုးစု (၁၄) မျိုး၊ မျိုးစိတ် (၁၈)မျိုးကို စုဆောင်းရရှိခဲ့ပြီး အဆိုပါ မျိုးစိတ်များနှင့်ဆက်စပ် ပေါက်ရောက်နေသော အပင်မျိုးစိတ် များကိုလည်း ဖော်ပြထားပါသည်။ လူမျိုးစုရုက္ခဗေဒဆိုင်ရာ အသုံးချပုံများကို ကျေးရွာ (၅) ရွာတွင်မေးမြန်းခဲ့ရာ ဒေသခံများသည် နားရောဂါ၊ မျက်စိရောဂါ၊ အားတိုးဆေး၊ အဖျား၊ ခွဲသလိပ်ပျော်ဆေး၊ ဝမ်းပျက်ဝမ်းလျော၊ အရေပြားရောဂါများအတွက် အများဆုံး အသုံးပြုကြသည်ကို သိရှိရပါသည်။ အချို့မျိုးစိတ်များကို သောက်ဆေး နှင့် အပြင်လိမ်းဆေး အဖြစ် အသုံးပြုကြသကဲ့သို့ အချို့မျိုးစိတ်များကိုမူ အစားအစာအဖြစ် အသုံးပြုကြပါသည်။ စုဆောင်းခဲ့သောမျိုးစိတ် (၁၈)မျိုး၏ ပါဝင်သော ဓါတုဒြပ်ပေါင်းများကို ဓါတ်ခွဲစမ်းသပ် ရာတွင် မျိုးစိတ် အများစု၌ ဖီနောလစ်ဒြပ်ပေါင်းများစွာ ပါရှိသဖြင့် အဆိုပါ မျိုးစိတ်များမှ လူသုံးကုန်နှင့် အလှကုန် ပစ္စည်းများကို ထုတ်လုပ်နိုင်ကြောင်း တွေ့ရှိရပါသည်။ အဆိုပါ အပင်များ၏ ရုက္ခဗေဒအမည်၊ မျိုးရင်း၊ မျိုးစိတ်၊ အသုံးပြုသော အပင်အစိတ်အပိုင်းနှင့် အသုံးပြုပုံများကို တင်ပြထားပါသည်။

**Preliminary Study on Ethnobotanical Uses and, Phytochemical analysis of
Pteridophytes in Natma Taung National Park, Southern Chin State**

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Abstract

A total of 18 fern species, belonging to 14 genera and 12 families were observed in the study area and their associated plant species were described. According to ethno botanical survey in 5 villages, local people mostly used the Pteridophytes for the treatments of diseases such as earache, eye disease, tonic, fever, expectorant, diarrhoea dysentery, skin, ulcer, febrifuge, cough, stomachache etc. Moreover, some of the species are used for medical purpose (taken orally and external application) whereas some are also used for food, fodder and housing material. And, most of the species contain the phenolic compound in the phytochemical analysis, which is largely used in making cosmetics though other products are made by ferns. In this paper, ethno-medicinal uses of 18 Pteridophytes plants are presented botanical name, family, plant parts and mode of ethno-medicinal uses.

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Key Words: Pteridophytes, Associated plant species Ethnobotany, Phytochemical analysis

Preliminary Study on Ethnobotanical Uses and, Phytochemical analysis of Pteridophytes in Natma Taung National Park, Southern Chin State

Introduction

Pteridophytes are one of the most ancient plants. They are non-flowering, vascular and spore-bearing plants, which include ferns and fern-allies. Benjamin & Manickam (2007) reported over 12,000 taxa belonging to 204 genera, 40 families of Pteridophytes in the world. They are growing in varied climatic zones of different phyto-geographical regions.

In Myanmar, Pteridophytes are particularly distributed in the Hill land and coastal regions, and make an important contribution to the earth's plant diversity. Pteridophytes prefer shady, moist habitats with moderate temperature but also occur throughout very diverse range of habitat.

The flora of Myanmar was extensively documented by British botanists and plant hunters in the early nineteenth century. Dickason (1946) reported 460 species of lycophytes and ferns belonging to 104 genera, and listed 140 species as first records for Myanmar. Before that time, only a few lycophytes and ferns had been collected in Myanmar and enumerated sporadically as part of the exploration of flowering plants.

Thet Yu Nwe (2009) studied the fern diversity of Kyaik-Hti-Yoe Wildlife Sanctuary, reporting 68 species belonging to 46 genera and 19 families. These included 12 species new to Myanmar. However, the lycophytes and ferns of Thailand and Vietnam, each of which has in excess of ca. 600–700 species (Alston 1939-195, Taga and Iwatsuki, 1979, 1985, 1988, and Boonkerd et al, 2004) that many more than the 599 species reported by Fraser-Jenkins (unpubl. data) occur in Myanmar (Thet Yu Nwe, 2009).

Chowdhary (1973) mentioned that Pteridophytes are used in Homeopathic, Ayurvedic, and Unani medicines, and provided insecticides, antibiotics, food and ornamentation. And also Ethnic communities depend upon the forest flora for their livelihood such as food, fuel, fibre, oils, medicines and shelter. Moreover, they are utilizing rhizome, stem, fronds, pinnae and spores of fern and fern allies in different ways for the treatment of various ailments in the world (Copela, 1932).

Konoshima (1996) also discussed that traditional medicine and ethno-botanical information play an important role in scientific research. All over the world, there has been an increasing interest in the scientific study of man-plant interaction in the natural environment. Therefore, ethno-botanical studies have attracted a number of field workers in

recent years and they have supplied a lot of information about different uses of plants prevalent among the various ethnic groups of Myanmar.

###Zhang & Luo (2004) noted that many traditional medicinal ferns were analyzed and reported to have various bioactivities, such as anti-oxidant, antitumor and anti-HIV, antimicrobial, anti-inflammatory, and antiviral.

Natma Taung (NMT) National Park was declared Protected Area Sanctuary in 1994. It is very diverse floristic composition and ample sources of habitats for wild animals. Moreover, NMT is being situated in remote areas, where local communities living in or nearby are relatively poor and highly dependent on forest resources for their livelihood (Bryant, 1994).

Pteridophytes research has been conducted by ASEAN countries such as Indonesia, Malaysia, Thailand, Singapore, and Philippine. Pteridophytes training and workshop have been held by experts of fern in ASEAN regions. Therefore, ethno-botanical studies have attracted a number of field workers in recent years and they have supplied a lot of information about different uses of plants prevalent among the various ethnic groups of Myanmar.

Ferns species are widely distributed in Myanmar. In hilly region, ethnic communities are utilizing not only medicine but also food, culture and housing materials for their livelihood. Nowadays, local people are applying the most popular form of traditional medicine for herbal treatments in these regions.

Ethnobotany of Pteridophytes has been published in some region of Myanmar, but enough attention has not been paid towards their medicinal useful, ethno-botany and also chemical compounds aspects (Dixit, 1975). Therefore, survey was conducted to record ethno-botanical uses in this area.

2. Objectives

The objectives of the study are:

- To identify fern species and their associated species
- To describe ethno-botanical uses of fern species
- To conduct phytochemical test including medicinal values and cosmetic etc.

3. Literature review

Shin & Lee (2010) discussed that Chinese people in different areas have developed various methods to make fern dishes and food varieties. The most common dish is made of stir-fried fresh or dry fern fronds of *Pteridium aquilinum*. There are various stir-fried dishes

created by adding other food to the fern fronds. For example, chili peppers, Chinese leeks (*Allium tuberosum*), ham, or chicken can be stir-fried with fern fronds.

According to Copela (1942) noted that as early as the 1940s, *Athyrium esculentum*, *Ceratopteris siliquosa*, *C. pteridoides*, *Dryopteris prolifera*, *Pteretis nodulosa*, *P. esculenta*, and *Helminthostachys* sp. were reported as consumed by the indigenous Filipino.

Pteridophytes also show medicinal utilities, and many of them are being used medicinally since ancient time. As far as trade of medicinal plants is concerned, only species of *Adiantum* is exploited and the entire plant of this species is used as medicine in Ayurveda, Sidha and Unani (Khullar & Pangtey, 1999).

Both young fronds and underground stems of *Asplenium ensiforme* are used for food in the Himalayas. In Malaysia, the fronds of *Diplazium esculentum* are used as vegetables. The rhizome and young shoots of *Nephrolepis biserrata* are edible (Shin & Lee, 2010).

Zhang & Luo(2004) described that both in local markets and supermarkets, there are a lot of fern food products in China. These products can be stored or preserved for long term. Common products include dried fronds, salted fronds, packaged fronds, fern starch, fern starch noodles, fern starch cakes, and fern leaf tea.

Rao *et al.* (2007) reported the ethno-medicinal importance of *Marsilea* species, *Aspidium* species, *Tectaria* sp., *Lycopodium* spp., *Osmunda* spp; *Davalia* spp.; *Adiantum* spp.; *Athyrium* spp; and *Blechnum* spp are usually used in medicine.

In Hunan Province only, the dry fronds of *Pteridium aquilinum* var. *latiusculum* (“juecai”) reached 1200 tons in 2011, with a value of 70 million RMB (ca. 1 million in US dollars (Zhang, 2007).

Zhang (2007) mentioned that China has 196 edible fern species, including the potentially edible species (144 spp.) which are traditionally used as food (52 spp.). Only 10% of these fern species have been studied phyto-chemically.

Dixit (1975) described that *Selaginella doederleinii* (Shi Shang Bai) is used as an anti-cancer drug. Many researchers have reported the chemical constituents of different edible ferns.

4. Materials & Methods

4.1 Study area

Natma Taung National Park is located at 21°12' N, 93°35'E, close to the border with India and Bangladesh. Natma Taung (also known as Mt. Victoria and locally as Khaw nau sone), situated at 3053 m above sea level, the highest mountain called Chin Hill, in Chin State, west-central Myanmar. The national park encompasses 722.6 km² of rugged and verdant mountainous terrain (Fig. 1).



4.1.2 Climate

Natma Taung has diverse vegetation resulting from the combined effects of geography, elevation, and human activities. The ridge around the Kanpetlet Township at an altitude of 1200 m mostly, support the local human population and a secondary forest consisting mainly of fast growing trees with wind-dispersed seeds such as pine and alder.

Slopes lower than 1000 m are dominated by species of *Dipterocarpus* and *Shorea* in a so-called *Dipterocarp* forest. Extensive pines forests appear on dry ridges up to about 1800 m. Oak forests occupy moist valleys on the southern slopes further up. As the stature of the oak forest diminishes above 2700 m, the canopy thins and *Rhododendron* becomes increasingly prominent. The northern slopes up to about 2500 m are dominated by laurel and stone oak forest (Fujikawa, 2009).

4.1.3. Climatic condition

The climatic of the Kanpetlet Township in the southern part of Chin State is characterized by its mild temperatures, high rainfall and humidity. From May to November are the rainy months, with this area getting more rain than other areas due to the monsoon storms come in from the Bay of Bengal. An annual rainfall is >1,000 mm; a cold dry season, maximum temperature varies between 4°C (December- January) and a hot dry season with temperatures up to 20°C (Fujikawa, 2009).

4.2 Data collection, identification & preparation of plant samples

Field survey was conducted from November 2015 to February 2016 at Natma Taung National Park. The specimens were randomly collected, identified, described, and nomenclature checked with the help of the relevant literatures and matched, and all the voucher specimens have been deposited at the herbarium of Botany Section, Forest Research Institute, Yezin. Descriptions of species and identification were done with the help of literature Khullar, S.P. (1994 and 2000), Khullar et al 1991, Pande, 2002, and Herbarium sheets of MBK & NIBR(2012 & 2014). All the species were arranged systematically with botanical names, family name, habitat, local distribution and uses.

Ethno-botanical information was gathered from the local and ethnic people, and semi-structure interview was conducted with the local people such as elder men and women in five selected villages. The collected information about mode of preparation (i.e., decoction, paste, powder and juice), form of usage either fresh or dried and mixtures of other ingredients like honey, water and warm water has been enumerated.

Phytochemical analysis was tested at the Wood Chemistry Section, Forest Research Institute, Yezin.

The plant (stem, leaves and rhizomes) was thoroughly washed off water to get rid of all debris and soil, and others, and then air-dried at room temperature because phytochemicals in freshly harvested plant foods may be degraded by processing techniques, including cooking. The main cause of phytochemical loss from cooking is thermal decomposition. The air-dry plant samples are crushed and packed in polythene bags for further use.

The powdered material (leaves and rhizomes) of fern were poured into the beaker containing methanol and acetone for cold extraction. All the solvents were used based upon

their increasing polarity index. The various crude extracts so obtained were analyzed qualitatively for various components.

4.3 Phytochemical analyzing

Chemical tests are performed on different organic and aqueous extracts of each plant with standard methods by James (2012).

Test for Alkaloids

2ml of the methanolic filtrate was mixed with 2ml of 1% HCl and kept over steam for 5mins. And 1ml filtrate was added 6-7 drops of Mayer's/Wagner's reagent appearance of creamish/brown/ red orange colour indicates that presence of alkaloids in this extract.

Test for Tannins

0.2g of powdered sample of each plant was mixed with 10ml of distilled water for 10minutes. Then 1ml of 5% FeCl_3 is added to 2ml the filtrate samples and observed for yellow brown coloration which shows the presence of tannins.

Test for Saponins

1ml of the filtrate sample is mixed with 5ml of distilled water in a test tube and shaken vigorously to obtain a stable persistent froth. The formation of emulsion which indicates the presence of saponins.

Test for Flavonoids

A few chop of 1% NH_3 solution is added to 2ml of the aqueous extract of each plant sample in a test tube. A yellow coloration is observed if flavonoids compound is present.

Test for Terpenoids

2ml of aqueous extract of each plant sample is mixed with 5ml of CHCl_3 and 2ml acetic anhydride in a test tube followed by 1ml of concentrated H_2SO_4 is carefully added to the mixture to form a layer. An interface with a reddish-brown coloration is formed if terpenoid constituent is present.

Test for Glycosides

1ml of concentrated H_2SO_4 is prepared in test tube 5 ml of aqueous extract from each plant sample is mixed with 2ml of glacial $\text{CH}_3\text{CO}_2\text{H}$ containing 3-4 drops of FeCl_3 . The above mixture is carefully added to 1ml of concentrated H_2SO_4 so that the concentrated H_2SO_4 is underneath the mixture. If cardiac glycoside is present in the sample, a brown ring will appear indicating the presence of the cardiac glycoside constituent.

Test for Phenolic compounds

200 mg of crude powdered sample of each plant of was dissolved in 5 ml of distilled water. To this, few drops of neutral 5% ferric chloride solution were added. A dark green colour indicated the presence of phenolic compounds.

Test for Fats and Oils

Treat all the four extracts with 0.5N alcoholic potassium hydroxide with a drop of phenolphthalein separately and heat on water bath for 1-2 hours. There is formation of soap or partial neutralization means fixed oils and fats are present in these extracts.

5 .Results

During the survey, the research activities were implemented in the national park forests above sea level between from 5300ft to 9500ft. Because of within those levels, fern species are more abundant than others. The total of ferns belonging to 12 families, 14genera and 18 species of Pteridophytes are collected in that area (Figure.2)

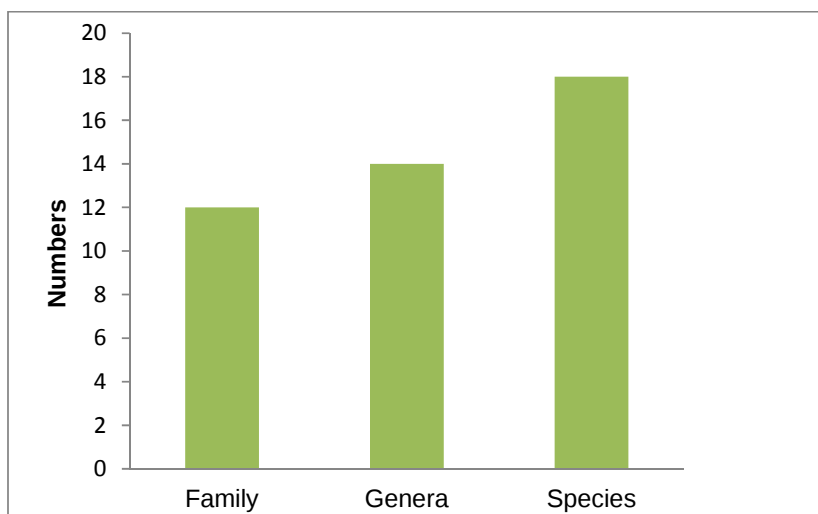


Fig.2, List of Fern Species

5.1.1 Enumeration

According to my survey, 18 species of Pteridophytes are encountered in the Natma Taung. We divided the ethno-botanical plants into 6 categories according to their utilization such as food, medicine, culture, cosmetic, religion and housing materials in five villages. They are 6 species for food, 11 species for medicine, 11 species for culture , 1 species for cosmetic, 1 species for religion and 5 species for housing materials used in that area. However, some species overlapped among these categories. And also, botanical names,

family name, habitat, ethno-botanical uses, common name, plant parts used by localities and associated of fern species are given below:

1. Scientific Name - *Adiantum philipinense* L.

Common Name- Philippine maidenhair fern

Family Name - Adiantaceae

Habitat - Terrestrial

Localities - Evergreen Hill Forest, on the rock, 7430ft.

Associated fern species; *Onychium japonicum*, *Drynaria propinqua*, *Thelypteris caudipina*, *Adiantum philipinense*

Uses The dry leaves are used with warm water for tuberculosis, cough, asthma, and hair falling. Frond extract mixed with honey is used as an eye ointment. The dried powder of the whole plant used as shampoo to clean hair.

2. Scientific Name - *Asplenium ensiforme* Wall.ex Hook. & Grev.

Family Name - Aspleniaceae

Habitat - Epiphyte

Localities - Evergreen Forest, 6300ft

Associated fern species; *Microsorium scolopendria*, *Selaginella involvens*, *Vittaria elongate*, *Lycopodium phlegmaria* L.

Uses - The decoction of fronds is given in fever also used in scorpion bite.

3. Scientific Name - *Asplenium tenuifolium* D. Don

Family Name - Aspleniaceae

Habitat - Lithophyte

Localities - Evergreen Hill Forest, 8000ft

Associated fern species; *Colysis elliptica*, *Pteris wallichiana*, *Equisetum spp*;

Uses - Fresh rhizome and rachis powdered mixed with water is used in diarrhea. This is a laxative medicine. The leaf is smoked for colds in head and chest, used as an expectorant.

4. Scientific Name - *Acrophorus nodosus* C.Presl

Family Name - Dryopteridaceae

Habitat - Terrestrial

Localities - Evergreen Forest, 6500ft

Associated fern species; *Microsorium punctatum*, *Goniophlebium persicifolium*,
Diplazium cognatum, *Lycodium flexuosum*

Uses Rhizome are used to treat eczema and stomach ache; fronds are used to treat menstrual disorders.

5. Scientific Name - *Athyrium mackinnoni* (C.Hope)C.Chr.

Family Name - Athyriaceae

Habitat - Terrestrial

Localities - Evergreen Hill Forest, 7200ft.

Associated fern species; *Adiantum philipinense*, *Selaginella involvens*, *Pyrrosia adnascens*

Uses - Young fronds are eaten as vegetables after cooking and are commonly sold in the local market in high price. The rhizome is prescribed in dysentery.

6. Scientific Name - *Davallia trichomanoides* Blume.

Common Name - black rabbit's foot fern

Family Name - Davalliaceae

Habitat - Epiphyte

Localities - Evergreen Hill Forest, 6000ft

Associated fern species; *Onychium japonicum*, *Thelypteris caudipina*, *Drynaria quercifolia*, *Lycopodium phlegmaria*

Uses - Rhizome is used in typhoid and anthelmintic, leaves are used for ikebana flowering arranged.

7. Scientific Name - *Drynaria quercifolia* L.J.Sm

Common Name - Oakleaf basket fern

Family Name - Polypodiaceae

Habitat - Epiphyte

Localities - Evergreen Hill Forest, along the stream. 6310ft
Associated fern species; *Cryptogramma stelleri*, *Goniophlebium persicifolium*
Uses - Young rachises are eaten after boiling. Fronds are used for thatching the roofs and house walls.

8. Scientific Name - *Diplazium esculentum* (Retz.) Sw.

Common Name -Vegetable fern

Family Name - Athyriaceae

Habitat -Terrestrial

Localities - Evergreen Hill Forest, on the slope, 8815ft.

Associated fern species- *Asplenium ensiforme*, *Thelypteris caudipina*, *Hymenophyllum polyanthos* (Sw.) Sw

Uses - Young fronds are used as green vegetables and also used as salad or cooked as vegetables. The leaf powder is mixed with butter and used for controlling the internal burning of the body.

9. Scientific Name - *Halopteris flexuosa* (Fee) E.H.Crane

Family Name - Pteridaceae

Habitat - Epiphyte

Localities - Pine Forest, near roadside. 5300ft

Associated fern species- *Microsorium membranifolium*, *Thelypteris caudipina*,
Nephrolepis multiflora,

Uses - Plant powder mixed with honey is used as an incense to keep off fear in children.

10. Scientific Name - *Hymenophyllum polyanthos* (Sw.) Sw.

Common Name - Membranous leaf fern

Family Name - Hymenophyllaceae

Habitat -Epiphyte

Localities - Pine Forest, Rhododendron forest. 6000ft.

Associated fern species- *Selliguea enervis*, *Selaginella involvens*, *Lepisorus nudus*

Uses - Fronds are used as fodder as well as thatching the huts.

11. Scientific Name - *Lepisorus nudus* (Hook.) Ching

Family Name - Polypodiaceae

Habitat - Epiphyte

Localities - Pine Forest (*Lithocarpus collettii*), 5500ft.
Associated fern species- *Goniophlebium persicifolium*, *Microsorium membranifolium*
Uses - Plant used as decoration. The decoction of leaves is taken for bronchitis and fever.

12. Scientific Name - *Microlophia speluncae* (L.) Moore
Family Name - Dennstaedtiaceae
Habitat - Terrestrial
Localities - Evergreen Hill Forest, (*Quercus semicarpifolia*), 9300ft.
Associated fern species- *Adiantum capillus veneris*, *Onychium japonicum* *Thelypteris caudipina*
Uses - The plants are used as cushion for cattle shed.

13. Scientific Name - *Microlophia firma* Mett.ex.Kuhn
Common Name - Upside Down Fern
Family Name - Dennstaedtiaceae
Habitat - Terrestrial
Localities - Evergreen Hill Forest, (*Castanopsis tribuloides*), 9000ft.
Associated fern species; *Haplopteris flexuosa*, *Microsorium punctatum*
Uses - Leaves used in worship at the time of illness. Fronds are largely used as cushion for cattle sheds.

14. Scientific Name - *Microsorium punctatum* (L.)
Common Name - Fishtail Fern
Family Name - Polypodiaceae
Habitat - Terrestrial
Localities - Evergreen Hill Forest, *Mahonia spp*;, *Castanopsis spp*, 8500ft.
Associated fern species- *Goniophlebium persicifolium*, *Microsorium membranifolium*
Uses - Leaf juice is used as a tonic.

15. Scientific Name - *Nephrolepis pectinata* Willd. Ladder ferns
Common Name – Sword fern
Family Name - Nephrolepidaceae
Habitat - Epiphyte
Localities - Evergreen Forest, on the tree trunk, *Castanopsis spp*;, 6602ft.

Associated fern species- *Polypodium vulgare*, *Lepisorus nudus*, *Nephrolepis furcans*

Uses - The dried plant along with tobacco, are smoked by tribal people. Paste of the leaves is applied as wound to check bleeding.

16. Scientific Name - *Polystichum semifertile* (C.B. Clarke) Ching

Common Name - rock-dwelling ferns

Family Name - Dryopteridaceae

Habitat - Terrestrial

Localities - Pine Forest, Rhododendron forest, 7000ft.

Associated fern species; *Polypodium vulgare*, *Lepisorus nidus*, *Pyrrosia adnascens*

Uses - Young fronds are steamed and eaten as a flavoring material. Juice is stated to possess astringent properties. Its leaves are used for decoration.

17. Scientific Name - *Pteridium aquilinum* L.

Common Name - Bracken fern

Family Name - Dennstaedtiaceae

Habitat - Terrestrial

Localities - Evergreen Forest(*Butula* spp.)5000ft.

Associated fern species- *Selliguea heterocarpa*, *Pyrrosia adnascens*, *Selaginella tenuifolia*

Uses - The young fresh tender fronds and shoots are eaten cooked as vegetable.

18. Scientific Name - *Selaginella tenuifolia* Spring

Family Name - Selaginellaceae

Habitat - Epiphyte

Localities - Evergreen Forest, near the slope, 8200ft.

Associated fern species- *Dryopteris cristata*, *Onychium japonicum*, *Microsorium membranifolium*, *Nephrolepis multiflora*

Uses -The paste of plant is applied on burns as cooling agent and bone fracture. The extract of leaf is also used in the preparation of tonic used as vulnerary and as remedy for wound. The ladies use powder of the spore as a substitute to powder.

5.1.1 Phytochemical analysis

Preliminary Phytochemical analysis for alkaloid, flavonoid, glycoside, phenolic compound, saponin, reducing sugar terpene and tannin were carried out by the standard methods of Gupta & Thakur (2013).

Table.1 Preliminary Phytochemical Test of the Ferns

No.	Species Name	Parts	Pheno	Flavo noids	Alka loids	Tann in	Sapo nin	Terpe noid	Glyco sides
1.	<i>Lepisorus nudus</i>	Leaf	-	+	-	+	-	+	+
		Rhizome	-	+	-	+	-	+	+
2.	<i>Haplopteris flexuosa</i>	leaf	+	+	-	-	-	+	+
		Rhizome	+	+	-	-	-	+	+
3.	<i>Hymenophyllum polyanthos</i>	leaf	+	+	-	-	-	-	+
		Rhizome	+	+	-	-	-	-	+
4.	<i>Asplenium ensiforme</i>	leaf	-	+	-	-	-	+	+
		Rhizome	+	+	-	-	-	+	+
5.	<i>Acrophorus nodosus</i>	leaf	+	+	-	-	-	+	+
		Rhizome	+	+	-	-	-	+	+
6.	<i>Pteridium aquilinum</i>	leaf	+	+	+	-	-	+	+
		Rhizome	-	-	-	-	-	-	-
7.	<i>Polystichum semifertile</i>	leaf	+	+	+	-	-	+	+
		Rhizome	-	+	+	-	-	+	+
8.	<i>Microlophia speluncae</i>	leaf	+	+	-	-	-	-	+
		Rhizome	+	+	+	-	-	+	+
9.	<i>Microlophia firma</i>	leaf	+	+	-	-	-	-	+
		Rhizome	+	+	+	-	-	-	+
10.	<i>Microsorium punctatum</i>	leaf	-	+	-	-	-	-	-
		Rhizome	+	+	+	-	-	+	+
11.	<i>Davallia trichomanoides</i>	leaf	+	+	-	-	-	+	+
		Rhizome	+	+	+	-	-	+	+
12.	<i>Asplenium tenuifolium</i>	leaf	+	+	+	-	-	-	+
		Rhizome	+	+	+	-	-	+	+
13.	<i>Adiantum philipinense</i>	leaf	+	+	-	-	-	-	-
		Rhizome	+	+	-	-	-	-	-
14.	<i>Drynaria quercifolia</i>	leaf	-	+	-	-	-	+	+

		Rhizome	+	+	-	-	-	+	+
15.	<i>Selaginella tenuifolia</i>	leaf	+	+	-	-	-	-	-
		Rhizome	-	-	-	-	-	-	-
16.	<i>Nephorolepis pectinata</i>	leaf	+	+	-	-	-	-	-
		Rhizome	-	+	-	-	-	+	+
17.	<i>Diplazium esculentum</i>	leaf	+	+	-	-	+	-	-
		Rhizome	+	+	-	-	+	+	+
18.	<i>Athyrium mackinnoni</i>	leaf	+	+	-	-	-	-	-
		Rhizome	-	-	-	-	-	-	-

(+) sign indicates the presence of the constituent

(-) sign indicates the absence of the constituent

All the data are the mean of duplicates.

6. Discussions

Nowadays, Chin ethnic communities and rural people are heavily dependent upon the natural resources from the surrounding forest regions for treatment of various diseases. They used several methods to prepare medicines traditionally from Pteridophyte. Local people used different parts of the plant in both dried and fresh forms. The plant materials are used singly as well as sometimes in combination with honey, butter, water, warm water and other plant parts. All plant parts such as fronds, rhizomes, leaves, spores, young rachises, and whole plant are used as food, medicine, fodder, cosmetic, religion and for decoration,

Local people use many of the Pteridophytic medicinal plants traditionally for treating their common ailments like ear ache, eye disease, fever, check bleeding as tonic, expectorant, diarrhea, skin problems, etc. The data showed that the remedies are taken orally and external application. Local people use these plants in different form such as juice, extract, decoction, paste, etc.; generally, the people of the study area still have a strong belief in the efficacy and success of herbal medicine.

Mannan &Marida (2008) mentioned that rhizome, juice of leaves and spores of *Adiantum phillippense* L. are used for dysentery, ulcers, leprosy and skin disease in India. But in Myanmar, dry leaves, frond are used for tuberculosis, cough, asthma, and hair falling, eye ointment and shampoo.

Mannan &Maridas (2008) showed that rhizome of *Drynaria quercifolia* (L.) is used for typhoid and hectic fever. In NatmaTaung, local people are using young rachises and fronds are used for edible, thatching the roofs and house walls.

Shweta (2012) described that fresh young shoots of *Diplazium esculentum* (Retz.) SW is eaten by pregnant women as agent's difficult childbirths common. Young shoots and leaves of *Pteridium aquilinum* are used for cancer, diuretic, refrigerant and vermifuge, arthritis and edible (www.vekepedia). Local people are used for tender fronds and shoots as edible in NMT. Benjamin,(2008),found that leaves juice of *Microsorium punctatum* (L.) are used for purgative and diuretic. In Myanmar, leaves juice of above species are used only tonic.

Similarly, plants, leaves and spores of *Selaginella tenuifolia* Spring are using for bone fracture, tonic and powder in this area. Benjamin (2008) mentioned that juice of this species is used for antibacterial.

Like in other hilly areas, Pteridophytes can be divided as ferns and fern-allies and they grown on ground (Mesophyte), on rocks and walls (Lithophyte), on tree trunks (Epiphyte) and in the water (hydrophytes). These habitats are several micro habitats like shady, exposed, humid and dry places, along rivers and rivulets, in open forests, dense forests, grasslands, rocks, forest margins etc.

Besides ferns in the form of mesophytes and epiphytes are also very rich in Natma Taung, due to the high rainfall and humidity. Almost all the epiphytic ferns and fern-allies can also grow as lithophyte in humid areas of Natma Taung. Ferns reproduce by spores which live in sporangium on the underside of the fertile leaves. The spores and the reproductive process are thus hidden from view.

In Natma Taung, moist temperate and dense forests occur between 1000m - 3200 m altitude. The forest of Natma Taung is mostly mixed forests, oak, rhododendron forests and pine forests. They are the treasurer house of ferns and fern-allies. These forests contained different types of Pteridophytes depending upon their specific habitats and altitudinal range.

Moreover, *Quercus* forest provides suitable environmental conditions for a large number of ferns within its surrounding. Measures should be taken for conserving *Quercus* forests. As ferns produce numerous spores, mass propagation and production of edible ferns for commercial production should be studied.

In Natma Taung National Park, the main courses of threats to the ferns flora are developmental activities, encroachment on habitat, overexploitation of important plant, landslides and forest fire, deforestation, habitat loss, expanding urbanization, excessive grazing, shifting cultivation and eutrophication of water bodies.

This study revealed that the presence of medicinally active constituents in 18 species investigated, suggesting that several pteridophyte species have the potential to synthesize useful

metabolites. According to report from Monika Gupta (2013), numerous evidences gathered in earlier studies also confirmed the presence of bioactive phytochemicals in pteridophytes. Some ferns were qualitatively analyzed on rhizomes and leaves separately and the results are presented in the Table. In these screening process alkaloids, tannins, saponins, flavonoids, terpenoids, glycosides and phenols show different types of results which support the reason for its wide range of biological activities.

In the present study, 17 species showed the presence of phenol. Phenol is absent in the leaf of *Asplenium ensiforme*, *Microsorium punctatum* L, *Dryanasia parishii* and the rhizomes of *Polystichum semifertile* Don. According to Jaishee and chakraborty (2015), phenolic compounds possess a variety of biological properties such as anti-oxidant, anti-carcinogenic, anti-inflammatory, anti-atherosclerosis, cardiovascular protection as well as inhibition of color, taste and aroma . Therefore most of tested ferns are used for economic and medicinal values.

Buvaeswari (2011) showed that flavonoids exhibited anti-allergic, anti-inflammatory, anti-microbial, anti-cancer, anti-neoplastic, anti-oxidant and vasodilator activities. Moreover, they are able to regulate the activity of enzymes and affected the behavior of many cell systems. Therefore most of tested ferns are used for economic and medicinal values. In this study, all species contained flavonoids.

Among the 18 species studied, only 2 species of *Polystichum semifertile*, and *Asplenium tenuifolium* and *Microlophia speluncae*, *M. firma* Mett., *Microsorium punctatum* (L.), *Pteridium aquilinum*, and *Davallia trichomanoides* of the rhizome and Leaves have shown the presence of alkaloid. Alkaloid act on the nervous system stimulators or sometimes as poisons (Buvaeswari, 2011). tannins were detected only in *Lepisorus nudus* species. Saponins were also present only in *Diplazium esculentum* Ritz species.

In the present study, 7 species and the rhizomes of 5 species have revealed the presence of terpenoids. As shown in nature, Amin & Sawhney (2013) stated that terpenoids played a crucial role in plant-environment interactions including plant-plant, plant-pathogen, plant-insect and plant-animal interaction. Terpenoids are commercially employed in an immense number of industrial products such as flavoring agents, pharmaceuticals, insecticides, perfumes and anti-microbial agents.

In this research, the glycosides were present in 15 species studied, but the leaf of *Diplazium esculentum* Ritz and *Nephrolepis pectinata* Willd., were absence. Buvaeswari (2011) mentioned that glycosides play crucial roles in combating a number of dreadful

diseases, especially heart diseases. Therefore most of tested samples are useful for medicinal values.

7. Conclusions

In this study, totally about 18 species of ferns were collected. Their associated tree species and fern species are growing in the evergreen hill forest, pine forest, evergreen forest each above sea level. Mostly ferns are epiphyte. In Ethno-botanical study, Chin people utilize for not only health care but also food and housing materials.

Preliminary phytochemical test, 18 species of ferns has contained terpenoids, flavonoids, glycosides and phenols were almost contained in the rhizomes and leaves. Therefore, they are medicinally important constituents.

The information gathered from the ethnic groups is useful for further research in the fields of ethno-medico-botany, taxonomy and pharmacology. This finding will gain knowledge of medicinally important Pteridophytes which are growing in Myanmar and it will also help in the further study of pharmacognosy of medicinal plants.

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Annex (1)

<i>Asplenium ensiforme</i> Wall. ex Hook. & Grev.	
	
Habit	Sori
<i>Adiantum philipinense</i> L.	
	
Habit	Sori
<i>Asplenium tenuifolium</i> D. Don	
	
Habit	Sori

<i>Acrophorus nodosus</i> C.Presl	
	
Habit	Sori
<i>Athyrium mackinnoni</i> (C.Hope)C.Chr.	
	
Habit	Sori
<i>Drynaria quercifolia</i> L.J.Sm	Oakleaf fern
	
Habit	Sori

<i>Davallia trichomanoides</i> Blume	
	
Habit	Sori
<i>Diplazium esculentum</i> (Retz.) Sw	
	
Habit	Sori
<i>Halpopteris flexuosa</i> (Fee) E.H.Crane	
	
Habit	Sori

<i>Hymenophyllum polyanthos</i> (Sw.) Sw	
	
Habit	Sori
<i>Lepisorus nudus</i> (Hook.) Ching	
	
Habit	Sori
<i>Microlepia speluncae</i> (L.) T. Moore	Limpleaf
	
Habit	Sori

<i>Microlepia firma</i> Mett.ex.Kuhn	
	
Habit	Sori
<i>Microsorium punctatum</i> (L.)	
	
Habit	Sori
<i>Nephrolepis pectinata</i> Willd	
	
Habit	Sori

<i>Polystichum semifertile</i> (C.B.	
	
Habit	Sori
<i>Pteridium aquilinum</i> L.	
	
Habit	Sori

