J. Myanmar Acad. Arts Sci. 2019 **Vol. XVII. No.4**

INVESTIGATION OF TRACE ELEMENTS IN PLANT SPECIES IN TAUNGNITAUNG AREA, MANDALAY REGION

Sandar[1]

Abstract

There are about 74 plants, counted and collected in the study area. Among these plants, nine plant species with are the most abundant, are selected and contents or three elements in selected 9 species are analyzed by atomic absorption spectrophotometery methods. The biogeochemical data of selected 9 species was also investigated with the cooperation of geochemist from the Department of Applied Geology in order to know whether the selected plants were indicator plants or not. Based on the results, the experimental area can be categorized into 5 groups phytophysiogically. It was found that *Hyptis suaveolens* L. was more potent absorber in copper mineralization than other selected plant species. It is concluded *Hyptis suaveolens* L. can be defined as local indicator plant species as it indicates copper mineralization in the area.

Keywords: Soil Samples, Plant samples, Biogeochemial data, Plant community and Local indicator plant.

Introduction

Geobotany involves the visual identification of vegetation. It can also be stated in another way that it involves the visual investigation of particular species of plant communities which may indicate mineralization in the bedrock. Biogeochemical exploration techniques involve chemical analysis of plants have been used in many part of the world to identify mineral deposit. (Brook, 1972)

Geobotany is used to describe a form of mineral prospecting which relies on characteristic of vegetation to identify the location and extent of are bodies.

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[1] Dr., Associate Professor, Department of Botany, Hinthada University

Plants communities indicate either rock types or mineralization. Indicator plants have the advantage over plant communities in that they are likely to enable the mineralization to be located more exactly. Those plants which always indicate the presence of a definite elements are called universal indicators. (Canon, 1960)

Geobotanical investigation of plant cover types or communities indicates mineralization in the bedrock. Some botanical associations with mineralization had been known since at least the 8^{th} or 9^{th} centuries (Karpinsky, 1841)

Therefore, plants and plant associations could be used to characterize the geology of an area as well as they are related to the geologic environment.

The present study, plant collections , soil collections and plant community were studied. Among 74 plants, nine plant species to further investigation of concerning the mineralization and detection of indicator plants.

The aim and objectives of present study is to survey the correlation of soil mineralization and the concentration of accumulation of some mineral in the plant tissues. So as to select which one is the indicator plant in specific experimental area. To support the decision of indicator plants, the structure of plant community, the Biological Absorption Coefficient of different elements from the soil were detected. To study elements distribution in plants along the survey line of the study area. To Observe the plant community. To find different plant species Biological Absorption Coefficient. To determine an indicator plant of Taungnitaung Copper mineralized area.

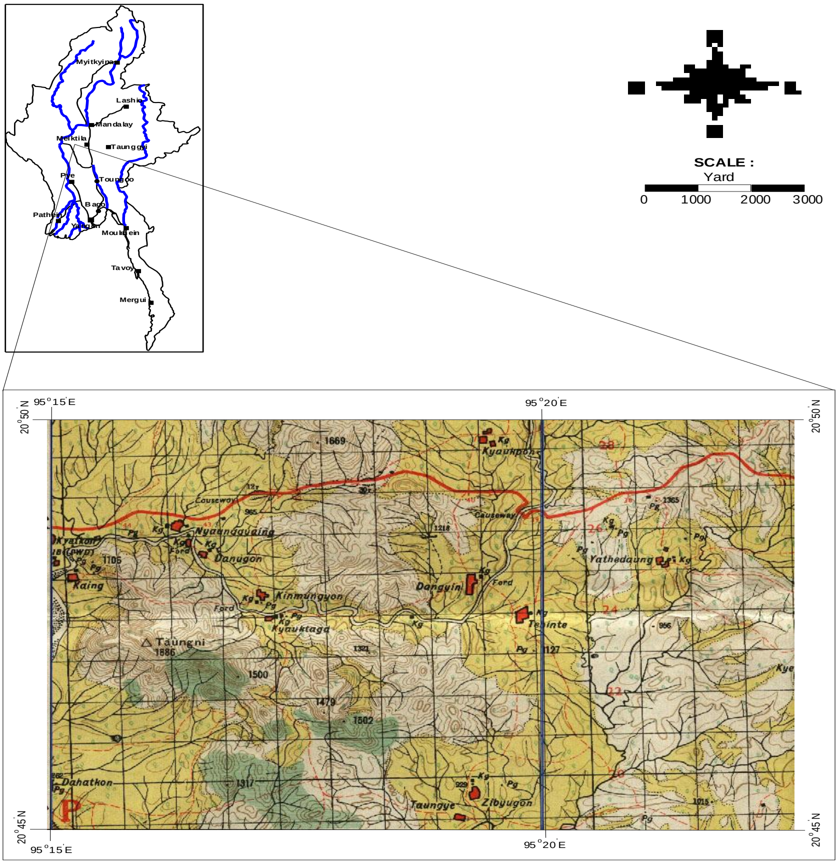

Figure 1. Location Map of Taungni Taung Area

Materials and Methods

Study Area

The study area lies within latitueds N 20° 47' 9" and N 20 ° 48' 12" and longitueds E 95 ° 15' 54" and E 95 ° 16' 48". Taungni Taung area is situated near Kaing village, Kyaukpadaung Township, Mandalay Division. This area is within the boundary of vertical grids 61 to 62 and horizontal grids 23 to 25 and is included partly in the following one inch topographic maps No.84, p/5. The peak elevation of Taungni Taung is about 575m above sea level. (Figure 1).

In the field area, belt transect method are using to carry out transect survey line which is perpendicular to the regional strike of lithologic units of study area. In belt transects consist of continuous serious of quadrats running across the profile of the area. Although the use of quadrats is most usual apporach in indicator plants. (Santra, 1993) Antoher different approach will be needed for studying plants growing over narrow are bodies. And the present study are selected by 23 quadrats for this research. Sample collection point along the mineralized area.

In each 15 m x 15 m quadrat, all plant samples were counted and marked and characteristic of nine plant species were identified among them 74 plant species. Leave samples of nine plant species were washed under running water and air drying is made before preparation for ashing plant specimens in oven. By using an atomic absorption spectrophotometer all geochemical samples were analyzed for Cu elements. Element uptake of plant species data were correlated with soil data.

Statistical Analysis. Box whisker plots are drawn after the nine selected plant species samples have been analyzed. Chemical data, BAC relationship, selected species are calculated and described by using microsoft excel and statistical data analysis software.

Results

Phytosociological Survey Mtheod

As a result of pereliminary phytosociological investigationin Taungni Taung area, the plant community of the study area can be classified into five groups. They are *Terminalia oliveri* Brands. *Tephorisa villosa* Pers. *Azadichrata indica* A.Juss. *Hyptis suaveolens*. L., *Eupatorium adoratum* L. community the following data.

1. *Terminalia oliveri* Brands. Community

   Height - 7 m to 12 m (ree layer)

   Cover% - 75% to 95% (tree layer)

Lithologic Unit - Andesite, Porous argillite, Silica rich

Subunit - Typical subunit

Tephorsia villosa Pers. subunit

Cassia tora L. subunit

Figure 2. *Terminalia oliveri* Brands. (Than) community

1(a). Typical subunit

Height - 7 m to 12 m

Cover % - 80 % to 95 % (tree)

Average No. of Species - 13

Lithologic Unit - Andesite,Porous argillised

1(b). *Tephorsia villosa* Pers subunit

Differential species of subunit- *Tephorsia villosa* Pers

Height - 3 m (shrub layer),

Cover % - 40 % to 80 %, (shrub layer)

Average No. of Species - 13

Lithologic Unit - Andesite, Porous argillised

Figure 3. *Tephorsia villosa* Pers (Me-yaing kalay)sub unit

1.(c) *Cassia tora* L. Sub unit

Differential species of subunit- *Cassia tora* L.

Height	-	2.5 m to 3 m (shrub layer),
Cover %	-	60 % to 80 %, (shrub layer)
Average No. of Species	-	16
Lithologic Unit	-	Porous argillised, Silica Rich

Figure 4. *Cassia tora* L.(Dan-gywe) sub unit

2 .*Tephorsia villosa* Pers. Community

Height	-	3m (shrub layer)
Cover %	-	40 % to 95 %
Lithologic Unit	-	Porous argillised, Silica Rich rock
Subunit	-	Typical,
		Azadirachta indica A.juss.,
		Hyptis suaveolens L. and
		Harrisonia perforata Merr.

Figure 3. *Tephorsia villosa* Pers (Me-yaing kalay) cmmunity

2(a). Typical subunit

Height	-	3 m (shrub layer),
Cover %	-	85 % to 95 %, (shrub layer)
Average No. of Species	-	22
Lithologic Unit	-	Porous argillised rock

2(b). *Azadirachta indica* A.juss Sub unit

Different species of sub unit - *Azadirachta indica* A.juss

Height	-	12 m to 13 m (tree layer)
Cover %	-	80 % to 90 %, (tree layer)
Average No. of Species	-	17

Lithologic Unit - Porous argillised, Silica Rich rock

Figure 5. *Azadirachta indica* A.juss . (Tama)Sub unit

2(c) *Hyptis suaveolens* L. (Taw-pin sein) subunit

Height	-	3 m (shrub layer)
Cover %	-	60 % to 90 % (shrub)
Average No. of Species	-	14
Lithologic Unit	-	Porous argillised rock

Figure 6. *Hyptis suaveolens* L. (Taw-pin sein) subunit

2(d). *Harrisonia perforata* Merr. sub unit

Different species of sub unit	-	*Harrisonia perforata* Merr., *Cassia tora* L.
Height	-	7 m to 15 m (trees layer)
Cover %	-	70 % to 95 %, (tree layer)

Average No. of Species	-	20
Lithologic Unit	-	Porous argillised, Silica Rich rock

Figure 7. *Harrisonia perforata* Merr. (sugyin) sub unit

3. *Azadirachta india* A.juss. Community

Height	-	8 m to 13 m (tree layer)
Cover %	-	80 % to 95 % (tree layer)
Average No. of Species	-	17
Lithologic Unit	-	Porous argillised, Silica Rich rock,

Figure 5. *Azadirachta india* A.juss. (Tama) community

4. *Hyptis suaveolens* L. Community

Height	-	2 m to 3 m (shrubs layer)
Cover %	-	50 % to 95 % (shrubs layer)
Lithologic Unit	-	Silica Rich rock, Andesite rock
Subunit	-	Typical subunit,
		Cassia tora L. subunit

Figure 6. *Hyptis suaveolens* L.(Taw-pin sein) community

4(a). Typical subunit

Height	-	3 m (shrub layer)
Cover %	-	85 % to 90 % (shrubs layer)
Average No. of Species	-	16
Lithologic Unit	-	Andesite rock

4(b). *Cassia tora* L. subunit

Height	-	2 m to 3 m (shrub layer)
Cover %	-	50 % to 95 % (shrubs layer)
Average No. of Species	-	16
Lithologic Unit	-	Silica rich rock, Andesite rock

5. *Eupatorium odoratum* L. Community

Height	-	2.5 m to 3 m (shrub layer)
Cover %	-	40 % to 95 % (shrubs layer)
Average No. of Species	-	9
Lithologic Unit	-	Silica rich rock, Porous argillised rock

Figure 8. *Eupatorium odoratum* L. (Bezat)community

Table 1. Biological Absorption Coefficient of BAC (Cu) in different plant species

Sample No	Hyp	Tec	Bam	Com	Cro	Mil	Tep	Pav	Cas
1	1.030	0.943	1.000	0.526	1.826	0.286	0.769	0.889	0.909
2	1.194	1.514	1.067	1.067	0.833	0.893	0.714	0.857	1.250
3	1.191	0.743	1.200	0.952	1.333	0.476	1.143	1.714	0.800
4	1.019	1.406	1.200	1.071	1.034	1.040	1.029	2.000	0.957
5	1.058	0.766	1.250	1.075	0.323	1.000	1.000	1.042	0.806
6	1.049	0.822	0.709	0.972	0.333	1.000	1.143	1.410	0.767
7	1.074	0.597	1.200	0.826	0.448	1.000	1.154	1.125	0.741
8	1.180	0.607	1.255	0.750	0.576	1.158	1.167	0.727	0.778
9	1.617	0.542							
10	1.915	0.382							
11	1.198	0.431							
12	1.892	0.342							
13	1.804	0.352							
1St Quartile	1.058	0.431	1.050	0.807	0.420	0.789	0.942	0.881	0.775
Median	1.191	0.607	1.180	0.962	0.705	1.000	1.086	1.083	0.803
3rd Quartile	1.617	0.822	1.213	1.068	1.109	1.010	1.146	1.486	0.921
GeoMean	1.251	0.683	1.094	0.883	0.701	0.786	0.999	1.154	0.864

Hyp = *Hyptis suaveolens* L.
Tec = *Tectona hamiltoniana* Wall.
Bam = *Bambusa bambos* L.
Com = *Combretum apetalum* Wall.
Cro = *Croton joufra* Roxb.
Mil = *Millettia brandisiana* Kur.
Tep = *Tephrosia villosa* Pers.
Pav = *Pavonia glechomfolia* A.Rich.
Cas = *Cassia tora* L.

Table 2. Comparison of mean value of BAC (Cu) and different plant species

Maximum	Minimum	Mean	Std.Dev	Std.Error	Index	Species
1.915	1.019	1.325	0.347	0.096	1 =	*Hyptis suaveolens* L.
1.514	0.342	0.727	0.c376	0.104	2 =	*Tectona hamiltoniana* Wall
1.455	0.909	1.185	0.188	0.067	3 =	*Bambusa bambos* L
1.075	0.526	0.905	0.194	0.069	4 =	*Combretum apetalum* Wall
1.826	0.323	0.838	0.535	0.189	5 =	*Croton joufra* Roxb
1.158	0.286	0.857	0.307	0.108	6 =	*Millettia brandisiana* Kur
1.167	0.714	1.015	0.180	0.064	7 =	*Tephrosia villosa* Pers
2.000	0.727	1.221	0.449	0.159	8 =	*Pavonia glechomfolia* A.Rich
1.250	0.741	0.876	0.168	0.059	9 =	*Cassia tora* L

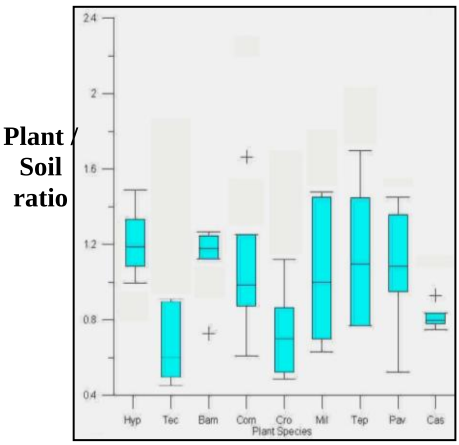

Figure 9. Medium value of Box and Whisker plot (Cu) in different species

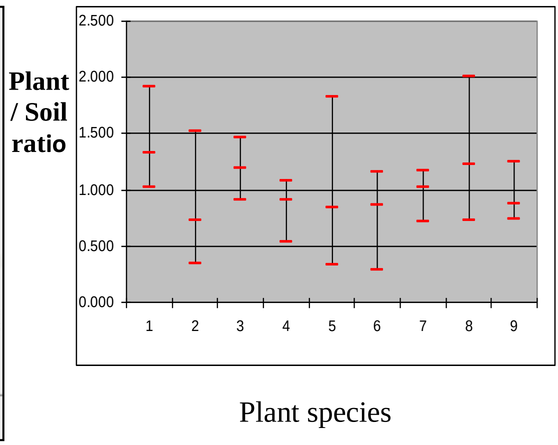

Figure 10. Comparison of mean value(Cu) in different species

Table 3. Atomic Absorption Spectrophotometer data of Nine Plant Species

Species	As (ppm)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	Sb (ppm)
Hyptis suaveolens	0.709	0.986	170.125	31.000	16.875	0.076
Tectona hamiltoniana	0.236	1.154	96.625	48.000	22.000	0.512
Bumbusa bambos	0.005	0.074	29.250	41.375	66.875	0.073
Combretum apetalum	0.470	0.981	94.375	32.250	14.875	0.149
Croton joufra	0.664	0.680	112.500	43.750	17.625	0.253
Millettia brandisiana	0.541	0.558	95.000	32.250	14.625	0.164
Tephorsia villosa	0.536	0.696	68.750	33.750	16.000	0.111
Pavonia glechomifolia	0.854	1.003	47.500	32.875	19.500	0.106
Cassia tora	0.003	0.049	22.000	19.125	65.250	0.069

Discussion

The Study area is composed of three lighologic units, it observed. The lithologic units are observed as porous argillite rock, silica rock and andesite rock unit. (Han Sein, 2005).

Nature of plant community was classified into five groups, (i) *Terminalia oliveri* Brands (Than), which grows on all lithologic unit;(ii) *Tephorsia villosa* Pers, (meyaingkalay) which occurs abundantly on silica rich rock unit and porous argillite rock unit; (iii)*Azadirachata indica.* A Juss. (Tamar) which also occurs on all three lithologic units; (iv) *Hyptis suaveolens* (L.) Poit (Taw Pin Sein), which is observed only an andesite rock unit(v) *Eupatorium odoratum* L (Bezat) which grows on silica rich rock unit and porous argillite rock unit. To find the indicator plant in the study area, nine plant species are selected depending on their the plant communities relative density and uptaking a elements from the biogeochemical classification data, statistical data, Atomic Absorption Spectrophotometer data.

The results of the biological absorption data, it is also found that the Cu value of Mean and Median of *Hyptis suaveolens* L. plant species are highest. Therefore, it can absorb Cu elements more than any other plant species. According to element concentration, biological absorption coefficient data *Hyptis suaveolens* L. is found to be the most uptakable species of all other nine selected species . Besides *Hyptis suaveolens* L. is observed as plant community which abundant develops on Andesite rock unit and absorbs Cu element most.

Amos *et.al* (1981), Shwe Thazin Kyi (1993) and Han Sein (2005) also pointed that Cu mineralization is occurred in the andesite rock unit. From the study of literature reviews, it is described that *Hyptis suaveolens* L. plant species, with their stunted growth, act as an indictor plant for copper rich soil. High copper concentration in some of their organs are observed. (Pal and Sindhupe, 1998).

Therefore, *Hyptis suaveolens* L. plant species is the most absorbent which uptake Cu elements in the study area.

Conclusion

To get the accurate result, nine plant species were selected in the study area. Biological absorption coefficient data *Hyptis suaveolens* L. is found to be the most Cu uptake species of all other nine selected species. The present study area were classified into five plant community group.

According to the laboratory test results, it can be interpreted that *Hyptis suaveolens* L. absorb Cu elements more than any other plant species. Therefore, *Hyptis suaveolens* L.is local indicator plant species in the study area.

Acknowledgements

I wish to express my deep gratitude Dr. Tin Htwe, Rector and Dr. Marlar, Pro-rector of Hinthada University for allowing me to use all the facilities available for this research in Hinthada University.

I am greately indebted to Dr. Moe Moe Khaing, Professor and Head, Department of Botany, Hinthada University for her invaluable advice and kind permission to allow me to use.

My greatest indebtedness to my supervisor, Dr. Myint Aung, Professor Department of Botany, Monya University, for his valuable suggestion and encouragement.

I am very grateful to my co-supervisor Dr. Han Sein, Associate Professor, Department of Applied Geology, for his kind help and supervision.

My gratituade is also due to U Nyo Maung, Professor (Retd), Department of Botany, University of Ma-U-Bin, for suggesting the topic, for his thorough guidance and critical comments at each and every stage of my work.

My sincere thank is also due to U Soe Thein, Professor (Retd), Department of Geology, Dagon University for administrative support to entire period of the research work.

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