

Determination of Nutritional Values, Antioxidant Activity and Elemental Contents of *Allium hookeri* Thw. (Ju-Myit)

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Abstract

This research deals with determination of nutritional values and elemental contents of *Allium hookeri* Thw. (Ju-Myit). The sample was collected from Pyin Oo Lwin Township, Mandalay Region. Preliminary phytochemical tests indicated the presence of glycoside, phenolic compound, carbohydrate, saponin, alkaloid, reducing sugar, flavonoid and steroid but starch and tannin were not detected in sample. In addition moisture, ash, fibre, fat, protein and carbohydrate content in (Ju-Myit) were determined by AOAC methods. In vitro antioxidant activities of crude extracts from Ju-Myit were investigated by using DPPH free radical scavenging assay method. Vitamin C content was determined by spectrophotometric method. Mineral contents of *Allium hookeri* Thw. (Ju-Myit) were determined by EDXRF and AAS techniques.

Keywords : *Allium hookeri* (Ju-Myit), phytochemical investigation, nutritional values, antioxidant activity

Introduction

Allium hookeri Thw. of Liliaceae family, locally known as "maroi napakpi" is a wild herb growing in a wide range of soils. Unlike onion or any other *Allium* species, *A. hookeri* has hardly any bulb; instead a much reduced underground rhizome produces fibrous roots. Edible parts of *A. hookeri* are different from onion, and instead of the fleshy scale leaves born on the axils of the underground reduced stem (bulb) of onion, the thick, flat, green leaves with prominent midrib and the white fibrous roots represent their edible parts.

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It is strongly believed that regular consumption of the plant derived phytochemical may drift the balance towards the adequate antioxidant status in the body as many medical plant contain large amounts of antioxidants, such as polyphenols, vitamin C, vitamin E, Selenium, β -carotene, lycopene, lutein, carotenoids and important trace minerals which play important roles in adsorbing and neutralizing free radicals, quenching singlet and triplet oxygen, or decomposing peroxides. In addition to this plant secondary metabolites such as flavonoids and terpenoids also play an important role in defence against free radicals. Therefore, consumer should increase their intake of food rich in antioxidant compounds that lower the risk of chronic health problems associated with the diseases.

The present study helps to introduce *Allium hookeri* as a supplementary food and as a better substitute of the famous vegetables like onion. The indigenous food constitutes a group of foods that are produced at homes, and villages at prices within the means of the majority of the consumers constituting the developing world. Examination of these foods may, therefore, provide clues as to how food production can be expanded and thereby contribute to improved nutrition in the developing world in the future. Traditional food plants have numerous advantages, especially in terms of household food security. In addition to broadening the food base, they increase the food supply and add variety to the diet.

Botanical Characteristics of *Allium hookeri* Thw. (Ju-Myit)

Botanical name	: <i>Allium hookeri</i>
Common name	: Hooker Chives
Family name	: Alliaceae
Genus	: <i>Allium</i>
Species	: <i>hookeri</i>
Myanmar name	: Ju-Myit



Figure 1: *Allium hookeri* Thw. (Ju-Myit)

Aim and Objectives

The main aim of the research work is to determine the nutritional values, antioxidant activity and elemental contents of *Allium hookeri* Thw. (Ju-Myit). To fulfill this aim, the following objectives were carried out.

- To collect the samples from Pyin Oo Lwin Township, Mandalay Region
- To investigate the preliminary phytochemical constituents of *Allium hookeri* Thw. (Ju-Myit)
- To determine the nutritional values (moisture, ash, protein, fiber, fat and carbohydrate contents) of *Allium hookeri* Thw. (Ju-Myit)
- To investigate the antioxidant activity of ethanol extract from plant sample by DPPH assay
- To determine the vitamin C content by spectrophotometric method
- To detect the elemental contents by EDXRF and AAS techniques

Materials and Methods

Sample Collection and Sample Preparation

Allium hookeri Thw. (Ju-Myit) were collected from Pyin Oo Lwin Township, Mandalay Region. The collected samples were cleaned, washed and cut into small pieces. The collected samples were dried at room temperature and powdered. Preliminary phytochemical tests indicated the presence of glycoside, phenolic compound, carbohydrate, saponin, alkaloid, reducing sugar, flavonoid and steroid but starch and tannin were not detected in sample. In addition moisture, ash, fibre, fat, protein and carbohydrate content in (Ju-Myit) were determined by AOAC methods. In vitro antioxidant activities of crude extracts from Ju-Myit were investigated by using DPPH free radical scavenging assay method. Vitamin C content was determined by spectrophotometric method. Mineral contents of *Allium hookeri* Thw. (Ju-Myit) were determined by EDXRF and AAS techniques. The field works were carried out at Department of Chemistry, Yadanabon University, Universal Research Center, Yangon University, Department of Physics, Mandalay University.

Results and Discussion

Determination of Nutritional Values of *Allium hookeri* Thw.(Ju-Myit)

Moisture, ash, fat, fibre, protein and carbohydrate contents in sample were determined by using appropriate reagents. The observed data are listed in Table 1. The moisture content was found to be 15.00 %. Determination of moisture is important because the calculation can be made on a dry basic and meaningful comparisons of the result can be made. The ash content was found to be 0.68 %. Determination of ash is a rough measure the amount of inorganic salt present in sample. The fat content was found to be 0.08 %. Determination of fat is the most concentrated source of food energy. The fibre content of *Allium hookeri* Thw. was carried out by digestion with 25 % H₂SO₄. The fibre content was found to be 1.05 %. The fibre content makes the blood cholesterol contents less. The protein content was found to be 1.57 %. Protein can work together to achieve a particular function and they often associate to form stable complexes. The carbohydrate content was found to be 81.62 %. Carbohydrates supply the major portion of the daily energy requirements of the normal individual: on an ordinary diet more than half of the total daily calories usually come from this source.

Table 1: Results of Some Nutritional Values in *Allium hookeri* Thw.

(Ju-Myit)

No.	Principal contents	Observed value (%)
1.	Moisture	15.00
2.	Ash	0.68
3.	Fibre	1.05
4.	Fat	0.08
5.	Protein	1.57
6.	Carbohydrate	81.62

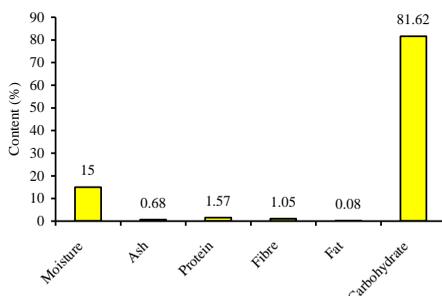


Figure 2: Nutritional Analysis of *Allium hookeri* Thw. (Ju-Myit)

Determination of Phytochemicals in *A. hookeri* Thw. (Ju-Myit)

The phytochemical test was observed in alkaloid, carbohydrate, flavonoid, glycoside, phenolic compound, reducing sugar, saponin, steroid, starch and tannin. So, they also provide health benefits for human in Table 2.

Table 2: Results of Phytochemical Investigation of *Allium hookeri* Thw. (Ju-Myit)

No.	Tests	Extracts	Test Reagents	Observation	Remarks
1.	Alkaloid	1 % HCl	Dragendroff's reagents	Orange ppt	+
2.	Carbohydrate	H ₂ O	10 % α -naphthol, conc: H ₂ SO ₄	Red ring	+
3.	Flavonoid	EtOH	Mg ribbon, conc: HCl	Pink colour	+
4.	Glycoside	H ₂ O	10 % lead acetate solution	White ppt	+
5.	Phenolic compound	H ₂ O	10 % FeCl ₃ , 5 % K ₃ Fe(CN) ₆	Deep blue colour	+
6.	Reducing sugar	H ₂ O	Benedict's solution	Brick-red ppt	+
7.	Saponin	H ₂ O	Distilled water	Frothing	+
8.	Steroid	PE	Acetic anhydride, conc: HCl	Blue colour	+
9.	Starch	H ₂ O	I ₂ solution	No-blue colour	-
10.	Tannin	EtOH	5 % FeCl ₃ solution	No greenish blue colour	-

(+) = presence, (-) = absence, (ppt) = precipitate

Vitamin C Content in *Allium hookeri* Thw. (Ju-Myit)

Vitamin C content *Allium hookeri* Thw. (Ju-Myit) was determined by spectrophotometry using potassium chromate-diphenylcarbazide. The vitamin C content of (Ju-Myint) was (0.088%). Vitamin C is effective antioxidant that protects our bodies from free radicals that cause oxidative stress.

Antioxidant Activity of Crude Extracts of *Allium hookeri* Thw.

(Ju-Myit)

Determination of radical scavenging activity by DPPH method bases on the change in absorbance of crude extract solution in various concentrations. The IC_{50} value was found to be 176.43 $\mu\text{g/mL}$ for ethanol extract of *Allium hookeri* Thw. (Ju-Myit). Figure 3 and Figure 4 show the bar graph of IC_{50} values or ethanol crude extract and standard ascorbic acid. IC_{50} value of (Ju-Myit) is significant anti-oxidative effect.

Table 3: Inhibition of Various Concentration and IC₅₀ Values for Standard Ascorbic Acid

Sample Concentration (µg/ml)	Mean Absorbance	Mean % inhibition	IC ₅₀ (µg/ml)
50	0.297	68.50	17.99
25	0.350	61.61	
12.5	0.483	48.78	
6.25	0.562	40.41	
3.125	0.608	35.52	

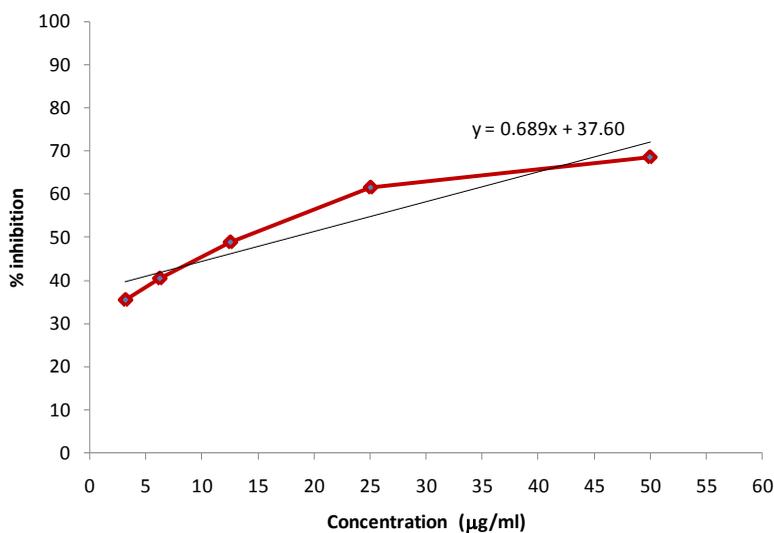


Figure 3: Inhibition Vs Concentration (µg/mL) of Standard Ascorbic Acid

Table 4: Radical Scavenging Activity of Various Concentration of Crude Extract and IC₅₀ Values (Ju-Myit)

Concentration (µg/ml)	Mean Absorbance	Mean % inhibition	IC ₅₀ (µg/ml)
200	0.206	51.52	176.43
100	0.258	39.29	
50	0.318	25.17	
25	0.362	14.28	
12.5	0.399	6.11	

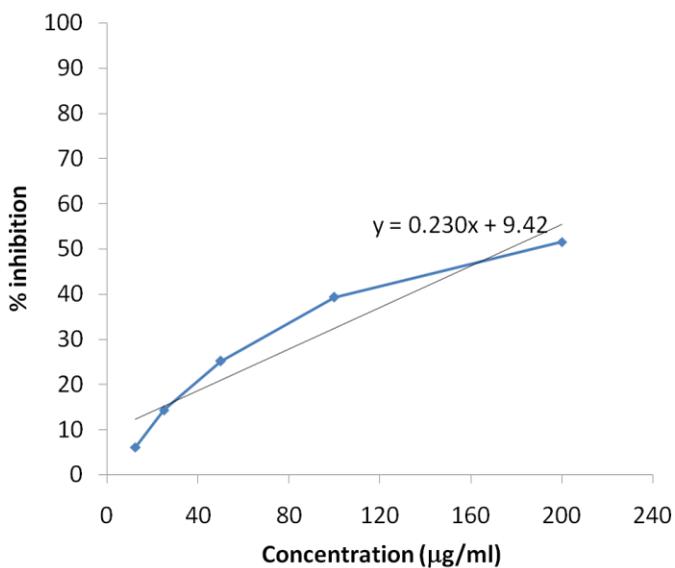


Figure 4: Inhibition Vs Concentration (µg/mL) of Crude Ethanol Extract of (Ju-Myit)

Elemental Compositions in *Allium hookeri* Thw. (Ju-Myit) by EDXRF and AAS

Potassium regulates acidic and alkaline level of body fluid. It is also called alkalizer. Calcium is important to bone growth and formation, blood clotting nerve and muscle functioning. Iron is an essential mineral. Its major function is to combine with protein and copper in marking hemoglobin, the component of the blood carries oxygen from the lungs to the tissues throughout the body. Phosphorus is also a mineral that is obtained from eating certain foods. Phosphorus helps build strong bones and teeth. It also helps convert food into energy and helps with metabolism. Kidneys normally release extra phosphorus into the urine; however, kidney disease can prevent the body from getting rid of the extra and the build-up causes problems with the bones and heart.

Chlorine is required for reproduction of hydrochloric acid in the stomach. Sulphur is healing mineral. Silicon gives strength and support to all the tissues of body. Manganese supports the immune system, blood sugar balance and is involved in the production of cellular energy, reproduction and bone growth. It is also called brain mineral. It indicates that Ju-Myit contains essential nutrients for our body.

Table 5: Relative Percent Abundance of Element in *Allium hookeri* Thw. (Ju-Myit) by EDXRF

No.	Element	Symbols	Relative Abundance (%)
1.	Potassium	K	1.418
2.	Chlorine	Cl	0.3024
3.	Phosphorus	P	0.2168
4.	Calcium	Ca	0.1523
5.	Sulfur	S	0.1045
6.	Aluminum	Al	0.0994
7.	Silicon	Si	0.0934
8.	Iron	Fe	0.02390
9.	Manganese	Mn	0.00678
10.	Copper	Cu	0.00174
11.	Zinc	Zn	0.00135
12.	Lead	Pb	0.00022

Table 6: Result of Some Elements Present in *Allium hookeri* Thw. by AAS

No.	Element	Heavy metal content (ppm)
1.	Fe	6.053
2.	Zn	0.583
3.	Cu	0.252
4.	Pb	0.092

Conclusion

In this research determination of nutritional values and elemental contents of *Allium hookeri* Thw. (Ju-Myit) sample was carried out. From the overall assessments of the present work, the following inferences could be drawn. Glycoside, saponin, phenolic compound, reducing sugar, flavonoid, alkaloid, carbohydrate are present in (Ju-Myit). So, it can be assumed that this contents in (Ju-Myit) provide health benefits for human.

The dried *Allium hookeri* Thw. (Ju-Myit) sample was found to be (15.00 %) of moisture, (0.68 %) of ash, (1.57 %) of protein, (1.05 %) of fibre, (0.08 %) of fat and (81.62 %) of carbohydrates.

Ascorbic acid content of (Ju-Myit) was quantitatively determined by spectrophotometric method. Vitamin C content of (Ju-Myit) was (0.088 %). Vitamin C is an essential vitamin for improving skin health.

The determination of antioxidant activity of ethanol crude extract was performed by DPPH assay. Ascorbic acid was used as standard antioxidant. IC_{50} values was (176.43 $\mu\text{g/mL}$). IC_{50} values of Ju-Myit is significant in anti-oxidative effect.

Allium hookeri Thw. samples have many elements 6.053 ppm of Fe, 0.583 ppm of Zn, 0.252 ppm of Cu and 0.092 ppm of Pb by using AAS. From EDXRF study, it is found that *Allium hookeri* Thw. (Ju-Myit) contains twelve principal elements K, Cl, P, Ca, S, Al, Si, Fe, Mn, Cu, Zn and Pb. It can be concluded that *Allium hookeri* Thw. (Ju-Myit) should be taken daily to get minerals which are beneficial for human health.

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