

NUTRITIONAL VALUES AND ANTIOXIDANT ACTIVITY ANALYSIS OF *MERREMIA EMARGINATA* (Burm.F)

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Abstract

Merremiaemarginata Burm. F. (Convolvulaceae) is a perennial, much branched herb (creeper). It is found to be widely distributed in central Myanmar. *Merremiaemarginata* is also known as *Ipomoea reniformis* Choisy. It is reported to have many important medicinal properties. In the indigenous system of Medicine, *Merremiaemarginata* has been claimed to be useful for headache, cough, neuralgia, rheumatism, inflammation, diuretic, troubles of nose, and fever due to enlargement of the liver and also for treating cancer. The current study describes phytochemical, nutritional compositions and elemental analysis on whole plant of *Merremiaemarginata*. Determination of nutritional compositions was done by the methods described in AOAC, 2000. The amount of protein and fiber were found to be 3.28% and 15.55%. Antioxidant activity of ethanol extract of the whole plant was measured by DPPH assay. The IC₅₀ value of ethanol extract was found to be 6.67 µg/mL.

Keywords *Merremiaemarginata*, phytochemical, nutritional compositions, antioxidant activity.

Introduction

Natural products produced by plants, microorganisms, insects and animals have been isolated as biologically active pharmacophores (Cragg and Newman, 2007, and Wang *et al.*, 2006). Natural products used in traditional herbal medicine can be an important source for search of novel medicinal compounds (Agharkar SP., 1991). Over the last few years, researchers have aimed at identifying and validating plant derived substances for the treatment of various diseases (Ruchika Nanda and Singh H., 2013). There are several reasons for the adaptation of natural and traditional medicine, as these are useful without or less side effect and contraindication (Verma and Singh, 2008).

Antioxidant that scavenge reactive oxygen species may be of great value in preventing the onset and propagation of oxidative stress related diseases such as autoimmune (Willet, 1994), cardiovascular (Vinson *et al.*, 1995) and neurovascular diseases (Aggarwal and Harikumar, 2008). Recently, more attention has been paid to the role of natural antioxidants, mainly phenolic compounds, which may have higher antioxidant activities than those of conventional vitamins C, E and β-carotene (Hafidhet *et al.*, 2009).

The plant *Merremiaemarginata* belongs to Convolvulaceae family. In traditional medical system, different parts of *Merremiaemarginata* have been mentioned to be therapeutically used as deobstruent, diuretic, for cough, headache, neuralgia and rheumatism (Chatterjee and Prakash, 1995). The importance of *Merremiaemarginata* as a biologically potent plant species was proposed the study in vitro antioxidant, α-amylase inhibition and cytotoxicity activities of different solvent extracts of *Merremiaemarginata* is reported. In central Myanmar the whole plant of

Merremiaemarginata was famous for salad which was intended for anti-aging and good eyesight.

Botanical Description

Family	- Convolvulaceae
Scientific name	- <i>Merremiaemarginata</i> (Burm.F.) Hall.
Myanmar name	-Ah-nyar-myin-khwa
Past Uses	-The whole plant



Figure 1. Plant of Ah-nyar-myin-hwa

Material and Methods

Sample collection and preparation

Merremiaemarginata whole plant was collected from Sagaing University Campus. The collected plants were washed thoroughly with water. After washing, they were dried in oven. The dried samples were ground into power by grinding machine. The dried powered samples were stored in air-tight containers to prevent moisture changes and other contamination which were used to investigate for their chemical activities.

Phytochemical Screening

The various solvents extracts of sample were prepared to analyze certain phytochemicals. Tests for alkaloids, flavonoids, glycosides, phenolic, reducing sugar, sponins, steroids and terpenoids were done as described in Pandey O.P, 2010.

Elemental Analysis

The percent concentrations of elemental content were determined by Atomic Absorption Spectrophotometer (AAS) (model-AA 6200).

Determination of Nutritional Composition of Sample

In the present study, some nutritional values such as water, ash, protein, fiber, fat, carbohydrate and energy value of the whole plant of *Merremiaemarginata* was determined by methods expressed in AACC-2000, AOAC-1999, and FAO-2003.

Table 1. Methods and Instruments for Determination of Nutritional Composition

Nutritional Content	Methods / Instruments
Water	Oven drying method
Ash	Muffle furnace
Fat	Soxhlet Apparatus
Fibre	Acid base digestion
Nitrogen and protein	Micro Kjeldahl's method
Carbohydrate	Calculation
Energy	Calculation

Determination of Antioxidant Activity of Ethanol Extract

DPPH (2, 2-diphenyl-1-picrylhydrazyl) free radical scavenging assay was chosen to assess the antioxidant activity of plant materials. This assay has been widely used to evaluate the free radical scavenging effectiveness of various flavonoids and polyphenols in food system. In this experiment, the antioxidant activity of ethanol extracts of selected plant sample was studied by DPPH free radical scavenging assay.

Results and Discussion

Phytochemical Constituents of Sample

Preliminary phytochemical analysis was performed in order to know different types of organic compounds present in sample. These phytochemicals are known to exhibit medicinal as well as physiological activities. According to the experimental data, alkaloids, flavonoids glycosides, phenolic compounds, saponins, steroids and terpenoids are present in the sample.

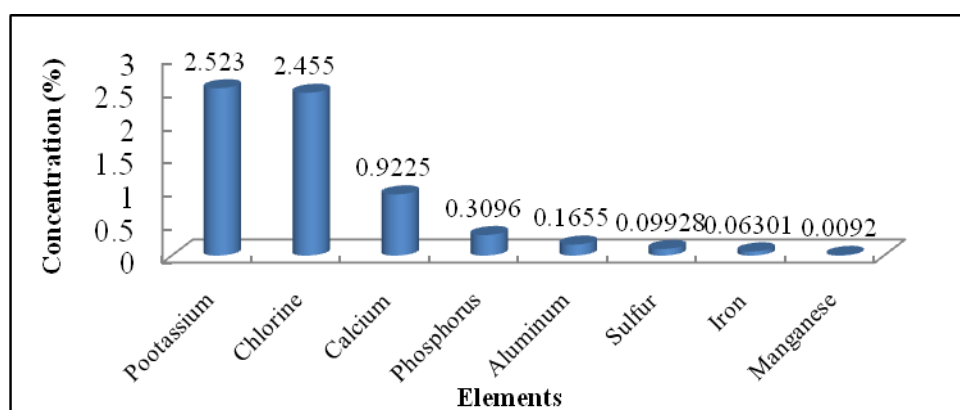
Among them phenolic compounds, flavonoids saponin, and terpenoids are accountable for free radical scavenging activity.

Elemental Composition of *Merremia marginata*

The results of elemental analysis were cited in Table 2 and Figure 2. The highest concentrations of potassium which regulate the acidic or alkaline levels of the body fluids (Zadeh.J.B and Moradikor N., 2014) was found in *Merremia marginata*. The high concentration of calcium, phosphorus, sulfur, iron and manganese reflects their function as essential nutrient elements, often as co-factor activators in metal-ligand enzyme complexes (Valkovic, 1975).

Table 2. Percents Composition of Elements in *Merremiaemarginata*

Element	Concentration (%)
Potassium	2.52300
Chlorine	2.45500
Calcium	0.92250
Phosphorus	0.30960
Aluminum	0.16550
Sulfur	0.09928
Iron	0.06301
Manganese	0.00920

**Figure 2. Elemental analysis of *Merremiaemarginata*****Nutritional Values of Whole Plant of *Merremiaemarginata***

From the results of nutritional values, the moisture content was found to be 9.73% which indicated that the dried sample could be kept for further investigations and discourage spoilage. The total ash is particularly important in the evaluation of purity of samples. It was obtained by burning off the organic matter and measuring the residue of ash. The remaining ashes indicated the total mineral content for each samples. The ash content was found to be 7.29%. Protein content was measured by Micro Kjeldah's method and found to be 3.28%. The main work of protein is to build the body and to repair the tissues, but any protein eaten in excess of the amount required by the body can be used to provide energy. The fat content (1.05%) was obtained using soxhlet extraction of a known weight of sample with petroleum ether. Dietary fats are vital for several health related aspect and for optimal functioning of the body. A diet providing 1-2% of its caloric of energy as fat is said to be sufficient to human beings as excess fat consumption is implicated in certain cardiovascular disorders such as atherosclerosis, cancer and anti-aging. Fiber content was determined by acid-base digestion and found to be 15.55%. Dietary fiber is a physiological and nutritional concept relating to those carbohydrate components of foods that are not digested in the small intestine. Carbohydrate content was 63.10%. Total carbohydrate

content was determined by subtracting the total crude protein, fat, fiber, ash and moisture from the total weight of sample. The energy value estimation was done by summing the multiplied values for crude protein, fat and carbohydrate by their respective factors.

Table 3. Nutritional Values of Whole Plant of *Merremiaemarginata*

Parameters	Contents%
Water	9.73
Ash	7.29
Protein	3.28
Fiber	15.55
Fat	1.05
Carbohydrate	63.10
Energy Value (kcal/100 g)	273

Antioxidant Activity of Ethanol Extracts of *Merremiaemarginata*

Antioxidant compounds in plant play an important role as a health-protecting factor. Scientific evidence suggests that antioxidants reduce the risk for chronic diseases including cancer and heart disease. The antioxidant activity of *Merremiaemarginata* was evaluated by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay as mentioned in Marinova and Batchvarov, 2011. The radical scavenging effects were determined for EtOH extract of selected plant. The extract or its constituents when mixed with DPPH decolorized due to hydrogen donating ability. The radical scavenging activity of crude extract was expressed in terms of % RSA and IC₅₀. According to Figure 3, if the concentration of samples were increased the % RSA was also increased. It can be suggested that one required to scavenge radicals effectively with more concentrated crude extract. From the experimental results, ethanol extract of the sample was found to have antioxidant activity (IC₅₀ = 6.67 µg/mL). The antioxidant potency was concluded to be high in comparison to the potency of standard ascorbic acid (IC₅₀ = 6.52 µg/mL).

Table 4. Radical Scavenging Activity (%RSA) of Ethanol Extract of *Merremiaemarginata*

Concentration (µg/mL)	5	10	20	30	40	50
% RSA	45.94	58.99	61.4	61.73	64.58	69.28

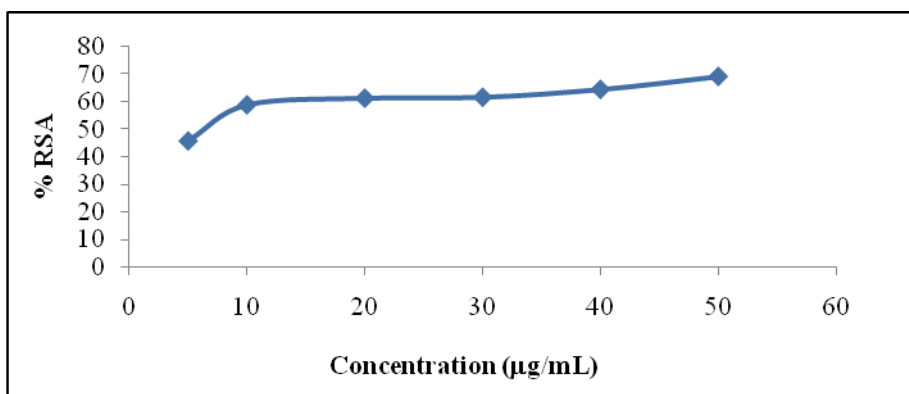


Figure 3. % RSA versus Concentration of Ethanol Extract of *Merremiaemarginata*

Table 4. Radical Scavenging Activity (IC_{50}) of Ethanol Extract of *Merremiaemarginata* and Ascorbic Acid

Sample	IC_{50} (µg/mL)
Ethanol extract	6.67
Ascorbic acid	6.52

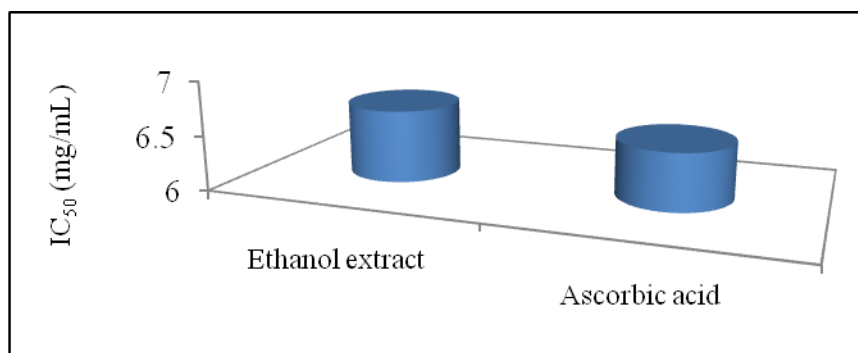


Figure 4. Bar graph of IC_{50} (µg/mL) of EtOH extract of *Merremiaemarginata* and Ascorbic Acid

Conclusion

In this research work, *Merremiaemarginata* was selected for chemical analysis. According to phytochemical screening, alkaloids, flavonoids, glycosides, phenolic compounds, saponins, steroids and terpenoids were found to be present but reducing sugars was absent in selected sample. The whole plant of *Merremiaemarginata* was rich in fiber (15.55%). The protein content (3.28%), the fat content (1.05%) carbohydrate content (63.10%) were found to be present. Furthermore, the high concentration of potassium was found in *Merremiaemarginata*. The noticeable concentration of calcium, phosphorus, sulfur, iron and manganese reflects their function as essential

nutrient elements, often as co-factor activators in metal-ligand enzyme complexes. The antioxidant potency of ethanol extract ($IC_{50} = 6.67 \mu\text{g/mL}$) was concluded to be high compared to the potency of standard ascorbic acid ($IC_{50} = 6.52 \mu\text{g/mL}$). The data obtained in the present work will be useful in synthesis of new herbal drugs with various combinations of plants, which can be used in the treatment of different diseases at global level generally and in Myanmar particularly. Therefore it may be concluded that the *Merremia marginata* Burm. F. is a good source of nutrient and natural antioxidant. According to this study, it can be claimed that consuming of *Merremia marginata* Burm. F. is effective and efficient for good health and can be considered as a promising element for production of antioxidant drug.

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