Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 4, Issue 3, 2012

Research Article

CHEMICAL ANALYSIS OF PRIMARY AND SECONDARY METABOLITES OF *NARAVELIA ZEYLANICA*

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Received: 18 Feb 2012, Revised and Accepted: 30 Mar 2012

ABSTRACT

Minerals are very essential nutrient for human life. The present study deals with the study of phytoconstituents from the leaves of *Naravelia zeylanica*. The plant *Naravelia zeylanica* was analyzed quantitatively for the primary metabolites -moisture (65%), protein (16.6%) ,fat (2.2%), fiber (24.4 %), carbohydrate (8.8%), vitamin A(0.125ppm), vitamin B (0.648ppm) and vitamin C (0.263ppm).The macro elements such as nitrogen, phosphorus, potassium, calcium and magnesium constitute 16.04% and microelements such as sodium, sulphur, zinc, copper, iron, manganese, boron and molybdenum constitute 98.84ppm. The secondary metabolites such as alkaloid, flavonoid, tannin and glycoside constitute 2.23ppm and trace amount of serpentine, terpenoid, saponin and phenol were estimated. The nutritive value of the plant is 121.4 cal/100g.

Keywords: Metabolites, *Naravelia zeylanica*

INTRODUCTION

Naravelia zeylanica (Ranunculaeae) is a genus of woody climbers distributed in Himalayas. The crushed stem was used as a cure for rhinitis[1]. The crushed roots were found to relieve headache[2]. The antimicrobial activity of bioactive constituents from the leaves of Naravelia zeylanica was studied[3]. The micropropagation of the plant, isolation and characterization of berberine[4] from leaves of *Naravelia zeylanica* were done systematically. Antiulcer activity of the leaf extract of *Naravelia zeylanica* was reported[5]. The quantitative estimation antioxidant studies on aerial parts of *Naravelia zeylanica* were reported[6]. The proximate analysis of *Dendrobium macrostachyum lindl* was reported[7]. The present study aims at the quantitative analysis of the primary and secondary metabolites of *Naravelia zeylanica*.

MATERIALS AND METHODS

The fresh plant samples were obtained locally from the Kolli Hills, Trichy. The plant species was verified with authentic specimen at Rapinat Herbarium, Trichy, Tamilnadu, India. The leaves were washed in tap water; shade dried, crushed and was taken for various phytochemical analyses.

The moisture content was determined by taking the fresh plant samples in petridish and kept overnight in an air oven at 100-110°C till they attain a constant weight. The loss in weight was regarded as a measure of moisture content[8].

$$\text{Percentage moisture} = \frac{\text{Loss in weight of sample}}{\text{Weight of sample taken}} \times 100$$

The plant sample was hydrolyzed with dilute hydrochloric acid and subjected for spectrocalorimetric determination of total carbohydrate content using anthrone reagent at 630nm[9]. The nitrogen content was estimated by Kjeldahl method[10]. The protein content was estimated spectrocalorimetrically by Lowry's method[11] using Folin - Ciocalteau reagent at 660nm. The lipid was determined by direct weight method[12]. For determination of crude fibre, the plant sample (free from moisture and fat) was treated with 1.25% NaOH , filtered, washed with hot water and then treated with 1.25% H_2SO_4. The dry residue obtained at 130°C, was ashed at 600°C. Crude fiber[13] was calculated from the masses of dry residue and the ash content.

$$\text{Crude fiber \%} = \frac{\text{Weight of dry residue - weight of ash}}{\text{Weight of sample}} \times 100$$

The nutritive value was determined by the formulae:

Nutritive value = 4 (%protein) +9 (%fat) + 4 (% Carbohydrate)

The total tannin content was estimated by treating the sample with Folin - Denis reagent[14]. Plant ash was used for quantitative estimation of minerals. The amounts of phosphorus, potassium, sodium, zinc, copper, iron and manganese were estimated by flame photometric method[15]. Calcium and magnesium were estimated by EDTA method. The minerals - sulfur, boron and molybdenum were analyzed by using spectrocolorimeter. Alkaloid was determined by the method of Harborne[16], plant sample was treated with acetic acid, ethanol and concentrated ammonium hydroxide was added for complete precipitation. The residue obtained was alkaloid, which was dried and weighed. Flavonoid was estimated by the method of Bohm and Kocipai-Abyazan[17]. Saponin was estimated following the method of Harborne. Phenol was estimated spectrophotometrically at 505 nm[18]. Estimation of vitamin A was done by spectrocolorimeter at 620nm using trichloroacetic acid and vitamin B was estimated using spectrocolorimeter at 540 nm using ferric sulphate and potassium thiocyanate solution. Estimation of vitamin C was done by Iodometric titration method.

RESULTS AND DISCUSSION

The moisture content in the leaves of *Naravelia zeylanica* is 65%. The leaves contained higher percentage of protein 16.6%. High ash content indicated that the leaves were good source of inorganic minerals. A low fat value (2.2%) was obtained in study confirms that the leaf is not a good source of oil.

Potassium was 4.16% in the leaves of *Naravelia zeylanica*. It is necessary for the formation of sugars, starch, carbohydrates, protein synthesis and cell division in all parts of the plant[19]. Calcium in the leaves of *Naravelia zeylanica* was about 4.56%. Calcium forms the structural component of cell walls, activates enzymes, and influences water movement in cell. Calcium is necessary for cell growth and cell division, bone formation and blood coagulation. Magnesium was the highest in percentage (5.19%) of all the macro elements. It is critical structural component of chlorophyll molecule and is necessary for the functioning of plant enzymes in the production of carbohydrates, sugars and fat[20].

The results of various chemical constituents are presented in Table 1.

Phosphorus was 0.87%, it is necessary for photosynthesis. It plays a vital role in energy metabolism in the formation of sugar phosphates and adenosine di- and tri-phosphates. Iron is an essential element for synthesis of hemoglobin. The quantity of iron is the highest (68.54ppm) of all the micronutrients. Next to iron, manganese is present in about 26.36ppm. Manganese is necessary for the functioning of the pituitary gland and the brain. Zinc and manganese are considered as antioxidant micro nutrients and their presence could therefore boost the immune system[21]. All the other micronutrients such as sodium, sulphur, copper, boron and molybdenum were present in trace amount. The nutritive value of the plant was found to be 121.4 cal/100g.

Flavonoid was present in considerable amount that is 0.87 ppm. Tannin and alkaloid were present in moderate amounts of 0.54 and 0.41ppm respectively. Presence of tannins possesses astringent properties. Alkaloids are reported to have analgesic and anti-inflammatory activities which help to alleviate pains, develop resistance against diseases and endurance against stress. Saponin, phenol and terpenoid were present in trace amount. Saponin is very useful in the management of upper respiratory tract inflammation and cardio tonic in nature. *Naravelia zeylanica* leaves contain higher amount of vitamin B (0.648 ppm) compared to vitamin A (0.125 ppm) and vitamin C (0.263ppm) .Vitamin C protects the vitamin B from oxidation [22]. The present study revealed the presence of various primary and secondary metabolites in the leaves of *Naravelia zeylanica*.

Table 1: Chemical constituents of *Naravelia zeylanica* leaves

S. No.	Phytoconstituents	Quantity	
		%	ppm
	Primary metabolites		
1	Moisture	65	
2	Protein	16.6	
3	Fat	2.2	
4	Fiber	24.4	
5	Carbohydrate	8.8	
6	Vitamin A		0.125
7	Vitamin B		0.648
8	Vitamin C		0.263
	Macroelements		
9	Nitrogen	1.26	
10	Phosphorus	0.87	
11	Potassium	4.16	
12	Calcium	4.56	
13	Magnesium	5.19	
	Microelements		
14	Sodium		0.12
15	Sulphur		0.52
16	Zinc		2.89
17	Copper		0.23
18	Iron		68.54
19	Manganese		26.36
20	Boron		0.12
21	Molybdenum		0.06
	Secondary metabolites		
22	alkaloid		0.41
23	flavonoid		0.87
24	tannin		0.54
25	glycoside		0.39
26	serpentine		0.12
27	terpenoid		0.06
28	saponin		0.02
29	phenol		0.13

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