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TLC and Nutritional Composition Analysis of *Allium wallichii* Kunth (Himalayan Onion)

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ABSTRACT

Allium wallichii (*A. wallichii*) Kunth, is an underutilized rare medicinal plant species with several beneficial ethnomedicinal health promotion activity. Moreover, being so popular in both ethanobotanicals and traditional herbal system, still the plant is very less studied for phytochemical and nutritional composition analysis. Therefore, phytochemical and nutritional composition analysis of *A. wallichii* leaves are set as the main objective of the current work. In this context powder of *A. wallichii* leaves was subjected for the nutritional analysis and the extract was subjected to thin layer chromatography analysis for fingerprinting of various compounds. In this context, we have found presence of several health promoting nutraceutical bioactives and phytochemicals compounds. In conclusion the traditional utilization of plant in ethnomedicine for nutraceutical and medicinal purpose was attributed due to presence of nutraceutical bioactives and phytochemicals compounds.

Keywords: Nutraceutical composition, TLC, Phytochemical, *Allium wallichii*.

INTRODUCTION

Worldwide, many ethanobotanical and plant-based traditional medicines after extensive research leads to identification of several useful bioactive and nutraceutical leads for the prevention and treatment of several diseases and health promoting action [1-4]. Recently, based on several ethanomedicinal application, *Allium wallichii* Kunth (Family: Amaryllidaceae; Local name: Himalayan onion), was found to be as a high valued nutraceutical underutilized medicinal plant of hilly regions of Himalaya [5-6]. *A. wallichii* has been documented for both culinary with high nutraceutical value and medicinal purposes in both past and current literature. In brief it has been useful remedies for blood cholesterol level, cholera, dysentery, high altitude sickness, hypertension, intestinal pain and liver diseases. In kitchen it has been utilized as condiment for curries, preparation of pickles, and soup by several local communities across the world [7-8]. The plant has been analyzed for presence of flavanoids, glycosides, reducing sugars, steroids and terpenoids specifically 1,2 bis (methylthio) ethene, 2,4 dimethyl thiophene, diosgenin, dimethyl disulfide, tigogenin, and trisulfide during earlier studies [9-11]. Carbohydrate, fat, proteins fibre, minerals and vitamins are majorly detected nutraceutical components of *A. wallichii* [8]. Pharmacologically *A. wallichii* have been validated for antioxidant, antidiabetic, antimicrobial, anti-inflammatory and anticancer activities [11-16]. Evidence suggested that *A. wallichii* established as source of high valued medicinal plant with rich traditional and therapeutic application, however only few studies have been performed to investigate plant for nutraceutical composition and phytochemical analysis in modern science. Therefore, present work has been designed to investigate nutritional composition and phytochemical analysis to validate traditional ethanobotanicals claims and establishment of standardization parameters.

MATERIALS AND METHODS

Plant materials

Plant samples of *A. wallichii* was collected from the outskirts of Pithoragarh (Uttarakhand, India) from August to September, 2021 and identified by Dr. M. C. Bharti (Department of Botany, Hemwati Nandan Bahuguna Central Garhwal University, Srinagar, Uttarakhand, India). Voucher specimens of plant (No. Herbarium/bot./1070) have been deposited at Department of Botany, Hemwati Nandan Bahuguna Central Garhwal University, Srinagar, Uttarakhand, India.

Drugs and chemicals

All solvents and chemicals were of analytical grade and procured from SD fine chemicals, Mumbai, India. Precoated silica gel 60F₂₅₄ TLC plates were purchased from Merck (Darmstadt, Germany).

Nutritional Analysis

The nutritional composition of the powdered leaves sample was analyzed as per standard food analysis methods described in the Association of Official Analytical Chemists (AOAC), Food Safety and Standards Authority of India and similar research study protocols [17-22]. In brief total energy and carbohydrates was determined by calculation method, total, saturated, polysaturated, monosaturated and trans-fat, protein and cholesterol by AOAC methods, Vitamin and chemical analysis by high performance liquid chromatography (HPLC) methods, mineral analysis by atomic absorption spectrophotometry method and amino acids by gas chromatographic methods, respectively.

Preparation of leaves extract

Dried leaves of *A. wallichii* was powdered and subjected for successive solvent extraction using petroleum ether, chloroform, ethyl acetate, methanol, ethanol, hydro-alcohol and water for TLC analysis [23].

Thin layer chromatographic studies of *A. wallichii* leaves extract

Thin layer chromatographic (TLC) studies were performed using various solvent systems as per standard methods [24-25] and finally chloroform, methanol and toluene (7: 2: 1, v/v) was found to be suitable mobile phase for the proper separation of phytoconstituents from hydro-alcohol (HA), alcohol (AL), methanol (M), chloroform (CH), ethyl acetate (EA), and petroleum ether (PE) extract, respectively. Thereafter, TLC plate was visualized and recorded under visible light, UV light (at 254 and 365 nm), after spraying 10% sulfuric acid and 5% ferric chloride solution, respectively.

RESULTS

Nutritional Analysis

Table 1 provides details of various nutritional values parameters, vitamins, minerals, chemicals contents, essential and non-essential amino acid. In brief leaves of *A. wallichii* was found to contains carbohydrate, proteins, vitamins (C, B, D, E and K), minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, selenium, sodium, and zinc), Chemicals (phenolic and carotenoids), essential amino acid (valine, leucine, iso-leucine, threonine, methionine, lysine, phenyl alanine, histidine, tyrosine, arginine, cysteine, and tryptophan) and non-essential amino acid (alanine, glycine, serine, proline, aspartic acid, and glutamic acid).

Thin layer chromatographic studies of *A. wallichii* leaves extract

Figure 1 provides details of TLC fingerprinting pattern of various successive solvent extracts including aqueous, hydro-alcohol, alcohol, methanol, chloroform, ethyl acetate, and petroleum ether of *A. wallichii* leaves. It was found that the methanol extract consists of maximum number of compound and can be used as source for separation and isolation of bioactive compounds.

Table 1: Nutritional composition analysis of whole plant of *Allium wallichii*

Parameters	Value in per 100 g of sample
Nutritional value	
Energy	262 Kcal
Total fat	0 g
Saturated fat	0 g
Polysaturated fat	0 g
Monosaturated fat	0 g
Trans fat	0 g

Total carbohydrate	64.28 g
Protein	1.22 g
Cholesterol	0 mg
Vitamins	
Vitamin A	0 IU
Vitamin C	6.39 mg
Vitamin B Complex	7.28 µg
Vitamin D	1.17 µg
Vitamin E	0.48 µg
Vitamin K	1.29 µg
Minerals	
Calcium	137 mg
Copper	0.24 mg
Iron	9.65 mg
Magnesium	4.69 mg
Manganese	1.27 mg
Phosphorus	6.38 mg
Potassium	175 mg
Selenium	0.03 mg
Sodium	282 mg
Zinc	1.65 mg
Molybdenum	Absent
Barium	Absent
Cadmium	Absent
Tin	Absent
Chemicals content	
Steroids	Absent
Phenolic content	6.48 gm
Carotenoids	3.72 gm
Essential Amino Acid Analysis	
Valine	1.47
Leucine	4.89
Iso-Leucine	11.25
Threonine	2.70
Methionine	0.48
Lysine	0.78
Phenyl Alanine	1.89
Histidine	16.70
Tyrosine	1.78
Arginine	2.89
Cysteine	2.70
Tryptophan	3.67
Non-Essential Amino Acid Analysis	
Alanine	1.65
Glycine	10.13
Serine	7.27
Proline	1.89
Aspartic acid	10.65
Glutamic acid	16.90

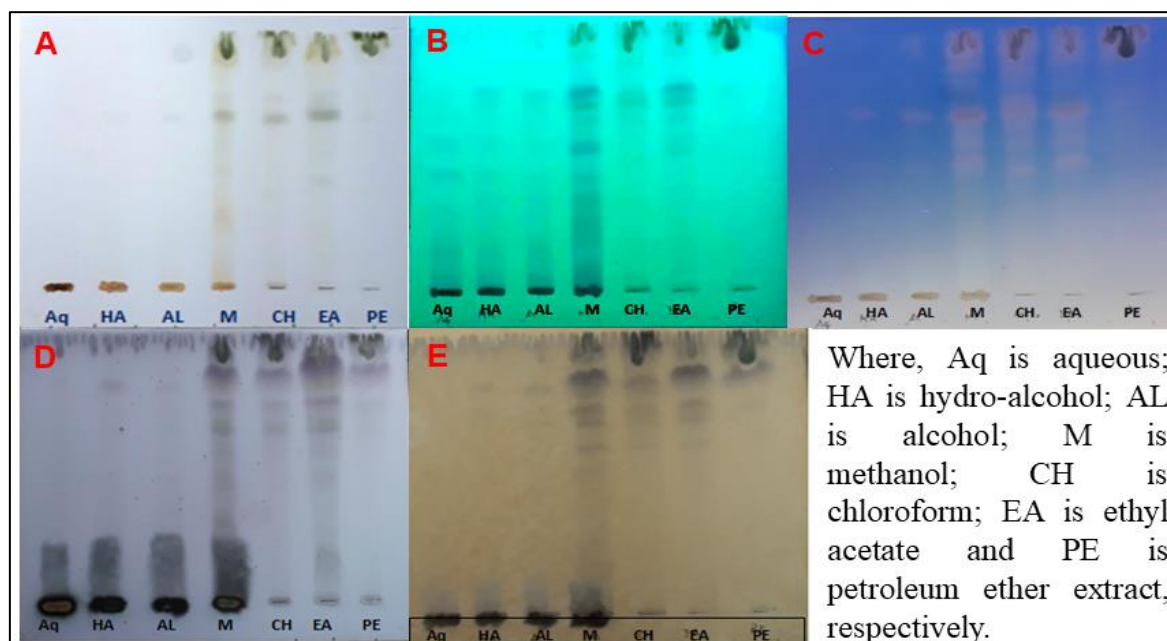


Figure 1: TLC profile of successive solvent extracts of *Allium wallichii* leaves; solvent system is chloroform: methanol: toluene (7:2:1; v/v) and A- Visible light; B- UV 254 nm; C- UV 366 nm; D- after spray with 10% sulphuric acid and E- after spray with 5% ferric chloride reagent, respectively

DISCUSSION

Currently herbs and medicinal plant-based products are gaining significant attention worldwide via several advertising media claiming safe and effective due to long and past historical traditional background of traditional clinical applications [27-31]. Here, we presented similar study on an underutilized traditional plant i.e., *A. wallichii* (Himalayan onion) having wide utility and popularity in ethnomedicine for nutrition, prevention, and treatment of health several related issue [8]. Therefore, in this study we investigated nutraceutical composition and phytochemical analysis of *A. wallichii*. On nutritional analysis we found the presence of carbohydrate, proteins, minerals, phenolics, carotenoids, essential amino acid (valine, leucine, iso-leucine, threonine, methionine, lysine, phenyl alanine, histidine, tyrosine, arginine, cysteine, and tryptophan) and non-essential amino acid (alanine, glycine, serine, proline, aspartic acid, and glutamic acid). Some studies reviewed the nutritional potential of several *Allium* species, which was found to be nearly similar as per our result [32-34]. However, the presence of both essential and non-essential amino acid in sufficient quantity add value over other *Allium* species as per evidence. Further comparative study using similar parameters need to be warranted in future. Interestingly, TLC fingerprints shown more UV active compounds in polar solvent system reveals presence several phenolics and flavanoids as evidence from past literature on other *Allium* species [35-36].

CONCLUSION

This plant is unexplored and highly neglected by scientific communities in past for phytochemicals and pharmacological investigation. However, *A. wallichii* have been established for several traditional and ethnomedicinal application by various communities. Current study may be useful to deliver the scientific validity for the presence of several useful bioactive nutraceutical and phytochemical compounds. Moreover, serious attention towards development of several nutraceuticals and phytochemical based formulation is required after thorough investigation.

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Conflict of Interest

None declared.

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