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Research Article

EVALUATION OF GARHWAL HIMALAYA WILD EDIBLE TUBER *DIOSCOREA DELTOIDEA*

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ABSTRACT
The Uttarakhand is highly enriched with edible wild tubers. Such tubers are highly potential with medicinal value and nutritional value due to the presence of bio-actives. These tubers are consumed by local inhabitants to play a significant role as supplementary food. The present study is aimed at evaluating the nutritional value, successive extraction, thin layer chromatography of medicinal plant, *Dioscorea deltoidea*. It is a popular wild edible tubers bearing plant of Indian Himalaya having good nutritional and medicinal potential. These will be the best source of the nutraceuticals. Since tubers are richer in micronutrients and bioactive secondary metabolites, The medicinal plant tuber contain ash value, (total ash 3.34 ± 0.15%), moisture 58.92±0.10%, crude fat 0.60±0.20% and crude fiber 7.50±0.14%, the successive extractive values were studied fresh part weight. The preliminary phytochemical analysis test showed the presence of carbohydrates and glycosides, alkaloid, flavonoids, saponins, tannins, unsaturated triterpenoids and sterol, resin.

Key Words: - *Dioscorea deltoidea*, Nutritional value, Successive value and Phytochemical Screening.

INTRODUCTION

India has great wealth of medicinal plants and their traditional uses. Uttarakhand region covers the new state of India which comprising the major divisions of Garhwal and Kumaon[1]. The use of medicinal plants as a source for relief from illness can be traced back over five millennia to written documents of the early civilization in India. The potential of higher plants as source for new drugs is still largely unexplored. Plant as sources of medicinal compounds has continued to play a dominant role in the maintenance of human health since ancient times. The Chamoli district region of Garhwal Himalaya is highly enriched with its vegetation including wild edible tubers and fruits due to its varied eco- geographical and eco-climatic conditions. Local inhabitants to play a significant role as supplementary food consume wild tubers and fruits[2]. They cover a wide range of pesticides, insecticides, fertilizers and other poisons. Such wild tubers are ingredients, which are gathered, grown or produced locally and prepared into dishes, which often represent local specialties. *Dioscorea deltoidea* tubers commonly known as wild yam. *Dioscorea deltoidea* tubers are horizontal and ginger like shaped. *Dioscorea deltoidea* tubers used for the treatment of different diseases such as digestive disorder, sore throat for struma, diarrhea, irritability, abdominal pain, wounds burns and anemia. The tubers are also believed to possess activities such as antimicrobial, antioxidant, stomachic and hypoglycemic activities[3, 4]. Furthermore traditionally *Dioscorea deltoidea* is used prophylatically for chronic liver pain diseases. The best health and nutrition results can be achieved not only from the consumption of cultivated tubers and fruits with high antioxidant capacities, but also from medicinal herbs and plants. Several studies indicated that some Indian wild medicinal plants possess more potent antioxidant activity than common tubers and fruits and phenolics compounds were a major contributor to the antioxidant activity of these plants.

MATERIAL AND METHODS

Material

The fresh parts of tuber of *Dioscorea deltoidea* was collected from adjoining area of Langasu village Dist- Chamoli, Uttarakhand in the month of September-November 2011. The plant was authenticated by botanist Dr. R. D. Guar, Department of Botany H. N. B. Garhwal (A Central University) Srinagar Garhwal, Uttarakhand India.

Preparation of plant Extract

The plant material was separated into its selected parts (tuber and leaf) air dried ground to moderately fine powder and Soxhlet extracted with increasing polarity solvent (Petroleum ether, chloroform, ethyl acetate, acetone, methanolic, ethanolic and water)[5]. Each extract was evaporated to dryness under reduce pressure using rotary evaporator. The coarse powder of tuber and leaf was subjected to successive hot continuous extraction with various solvent each time before extracting with next solvent the powdered material will be air dried (weight of crude extract 100gm). The various concentrated extracts were stored in air tight container for further studies.

Nutritional & Mineral assay

The edible portion of tubers was analyzed for moisture, ash, fat[6]. Fiber as per method reported in AOAC. Total nitrogen was analyzed by microkjeldhal method[7]. And for crude protein the value was multiplied by 6.25. Total carbohydrates were obtained by subtracting the value moisture, crude protein, crude fat crude fiber and ash from 100%[8]. The total energy value equal to addition of fat, protein and sugars calorie, each gram of fat give 9 kcal, protein and sugar give 4 kcal energy. The minerals analyzed were Potassium using atomic absorption spectrophotometer, Calcium and Phosphorus by flame photometer. Ascorbic acid in tubers was estimated[9].

Successive value

Accurately weighed 500gm coarse and air dried drug material were subjected to hot successive continuous extraction in Soxhlet apparatus with different solvents with increase in

polarity petroleum ether, benzene, chloroform, methanol, ethanol and finally with water. The extracts were filtered in each step concentrated and the solvent was removed by vaccum distillation. The extracts were dried in the vaccum dessicator and the residues were weighed[10]. Which contain maximum chemical compound are these categories as depend upon solvent nature and types.

Detection of chemical compound through TLC

Thin layer chromatography (TLC) is a chromatography technique used to separate mixtures. Thin layer chromatography is performed on a sheet of glass, plastic, or aluminum foil, which is coated with a thin layer of adsorbent material usually silica gel, aluminium oxide, or cellulose. This layer of adsorbent is known as the stationary phase. After the sample has been applied on the plate, a solvent or solvent mixture (known as the mobile phase) is drawn up the plate via capillary action. Thin Layer Chromatographic plates are prepared by spreading silica gel G on glass plate using Distill water as solvent these plates are activated in oven at $110^{O}C$ for half hour. All six extracts are applied separately and run in different solvent system of varying polarity. These plates are developed in Iodine chamber, UV chamber and spraying reagent for different spot of constituent chemical[11].

Phytochemical analysis

Preliminary phytochemical analysis extract was prepared by weighing and the dried powdered tuber was subjected to hot successive continuous extraction with different solvents as per the polarity petroleum ether, benzene, chloroform, methanol, ethanol and finally with water. The extracts were filtered in each step concentrated and the solvent was removed by vacuum distillation. The extracts were dried over desiccators and the residues were weighed. The presence or absences of the primary and secondary phytoconstituents were detected by using standard methods[12].

RESULT AND DISCUSSION

Plants are important source of potentially bioactive constituents for the development of new chemotherapeutic agents. The first step towards this goal is the nutritional profile, TLC analysis, successive extraction and phytochemical screening. The results of nutritional profile, TLC analysis, successive extraction and phytochemical screening as table 1, 2, 3 and 4, 5.

Nutritional value

The level of nutrients such as crude protein, carbohydrates, crude fiber, and ash content (2.13%, 27.51%, 7.50% and 3.34%) and also minerals as calcium, magnesium, potassium and phosphorus (0.78, 0.92, 0.80 and 0.43 mg/gm) respectively.

Successive value

Dioscorea deltoidea tubers contain significant value 25.38%, 16.17% and 9.74% against water, methanolic and ethanolic solvent with 500gm plant sample.

Phytochemical screening

The phytochemical screening for the presence of glycosides, flavonoids, phenols, resin and tannins. However alkaloids were absent. This analysis revealed that, the tubers contained higher value of fat, protein, fiber and minerals as compared to the cultivated tubers with carrot and 500 gm tubers contain sufficient amount of nutrients, required per day by a person.

CONCLUSION

The tubers of *Dioscorea deltoidea* contain phytoconstituents like alkaloids, steroids, fats & fixed oil, flavonoids, tannins, proteins and carbohydrates. The TLC results of the petroleum ether extract and methanol extract show that at least three different phytoconstituents were present in each extract of *Dioscorea deltoidea* tuber. More detailed study must be done for farther isolation leading to the pure compounds.

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Table 1 Nutritional value of *Dioscorea deltoidea* plant tuber.

Nutrients	Value	Nutrients	Value
Moisture (%)	58.92 ± 0.10	Insoluble ash (%)	2.46 ± 0.10
Ash (%)	3.34 ± 0.15	Soluble ash (%)	2.54 ± 0.10
Crude fat (%)	0.6 ± 0.20	Oxalic acid (mg/100gm)	190.4± 0.20
Crude fibre (%)	7.50 ± 0.14	N (mg/100gm)	0.34± 0.12
Total nitrogen (%)	0.34 ± 0.05	Ca (mg/100gm)	0.78 ± 0.13
Total protein (%)	2.13 ± 0.08	Mg (mg/100gm)	0.92± 0.15
Carbohydrate (%)	27.51± 0.10	K (mg/100gm)	0.80 ± 0.20
Organic matter (%)	96.66± 0.15	P (mg/100gm)	0.43 ± 0.02
Citric acid (mg/100gm)	210.5 ± 0.35		

Table 2 Observations of thin layer chromatographic (TLC) studies of tuber of *Dioscorea deltoidea,* W: C: M, (Water: Chloroform: Methanol, 10:64:28-36).

Extract	Mobile phase	No. of spot	Rf. value	hRf. Value
Pet. Ether Extract	(C:M:W) 64:28:10	1	(0.15)	(15)
Benzene Extract	(C:M:W) 64:28:10	1	(0.17)	(17)
Chloroform Extract	(C:M:W) 64:28:10	1	(0.32)	(32)
Methanolic Extract	(C:M:W) 64:28:10 (C:M:W) 64:30:10	2 3	(0.54,0.59) (0.54, 0.59, 0.67)	(54, 59) (54, 59, 67)
Ethanolic Extract	(C:M:W) 64:28:10 (C:M:W) 64:30:10	4 6	(0.17, 0.32, 0.40, 0.51) (0.17, 0.32, 0.40, 0.51, 0.76, 0.97)	(17, 32, 40, 51) (17, 32, 40, 51, 76, 97)
Water Extract	(C:M:W) 64:30:10	-	-	-

Table 3 Extractive values of *Dioscorea deltoidea* plant tuber.

Method of extraction	Values of three replicates (%w/w)	Mean (% w/w) ± SEM
Cold maceration:		
1) Water soluble	(21.30, 20.95 & 21.20)	21.15 ± 0.20
2) Alcohol soluble	(5.85, 5.60 & 5.20)	5.55 ± 0.12
Hot Extraction:		
1) Pet. Ether soluble	(0.91, 1.10 & 1.25)	1.08 ± 0.05
2) Benzene soluble	(1.90, 2.42 & 1.89)	2.07 ± 0.18
3) Chloroform soluble	(1.22, 1.30 & 1.16)	1.23 ± 0.34
4) Methanol soluble	(16.10,15.90 & 16.53)	16.17 ± 0.50
5) Ethanol soluble	(9.95, 9.70 & 9.58)	9.74 ± 0.85
6) Water soluble	(25.35, 25.60 & 25.20)	25.38 ± 0.90

Table 4, Phytochemical screening of wild edible tuber *Dioscorea deltoidea* (+) – Present, (-) – Absent,

Test	Pt. ether Extract	Benzene Extract	Chloroform Extract	Methanolic Extract	Ethanolic Extract	Water Extract
Carbohydrates/ glycosides						
(1) Molish test	(-)	(-)	(-)	(+)	(+)	(+)
(2) Fehling test	(-)	(-)	(+)	(+)	(+)	(+)
(3) Benedict test	(-)	(-)	(+)	(+)	(+)	(+)
Alkaloid						
(1) Mayer's test	(-)	(-)	(-)	(-)	(-)	(-)
(2) Dragondroff test	(-)	(-)	(-)	(-)	(-)	(-)
Flavonoids						
(1) Shinoda/pew	(-)	(-)	(-)	(-)	(-)	(-)
(2) Ammonia	(-)	(-)	(-)	(-)	(-)	(-)
Saponins	(-)	(-)	(-)	(-)	(-)	(-)
Tannins						
(1) Pyrogoll & catechol	(-)	(-)	(-)	(+)	(+)	(-)
(2) Gallic acid	(-)	(-)	(-)	(+)	(+)	(-)
Unsaturated sterol/triterpenes						
(1) Liebermann Burchard test	(+)	(+)	(+)	(+)	(+)	(+)
(2) Salkowiskis test	(+)	(+)	(+)	(+)	(+)	(+)
Resin	(-)	(-)	(-)	(-)	(-)	(-)
Phenolics compound						
(1) Ferric chloride	(-)	(-)	(-)	(+)	(+)	(-)
Protein and amino acid						
(1) Xanthoprotien	(-)	(-)	(+)	(+)	(+)	(+)

Table 5 Qualitative estimation of *Dioscorea deltoidea* tuber amino acid screening.

Amino acid test	*Dioscorea deltoidea* tuber
L- Hydroxy proline	(.)
DL Serine	(-)
DL Iso-leucine	(-)
DL Valine	(+)
DL-2-Aminobutyric acid	(+)
L-Ornithin	(-)
L-Cystein hydroxyl	(+)
DL-Nor-leucine	(-)
DL-Tryptopham	(+)
DL-Alanine	(+)
L-Glutamic acid	(-)
Glycine	(-)
L –Proline	(-)
L- Arginine	(+)
DL – Aspartic acid	(+)
L –Cystein hydroxychloride	(+)
L- Histidine	(-)
L – Leucine	(+)
L –Lysine monochloride	(+)
DL – Methionine	(-)
DL – β-Phenyl alanine	(-)
DL – Threonine	(+)
L – Tyrosine	(+)
3-C-3-4Dihydroxy phenyl	(-)

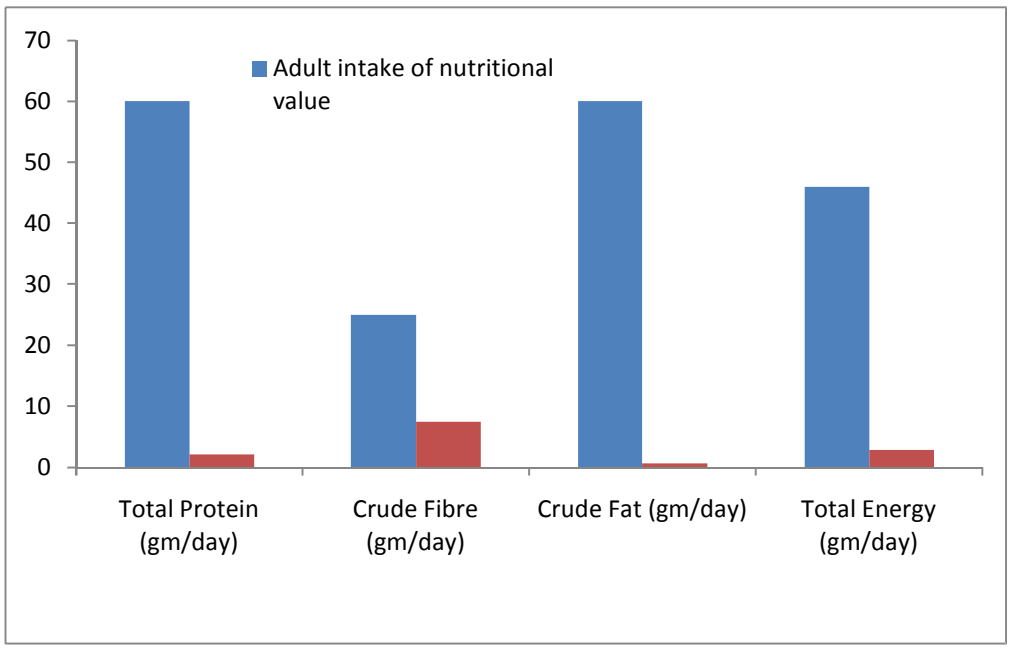

Figure 1.1 Comparison of per day intake of nutrients by Adults with the nutrients present in the tuber of *Dioscorea deltoidea*.

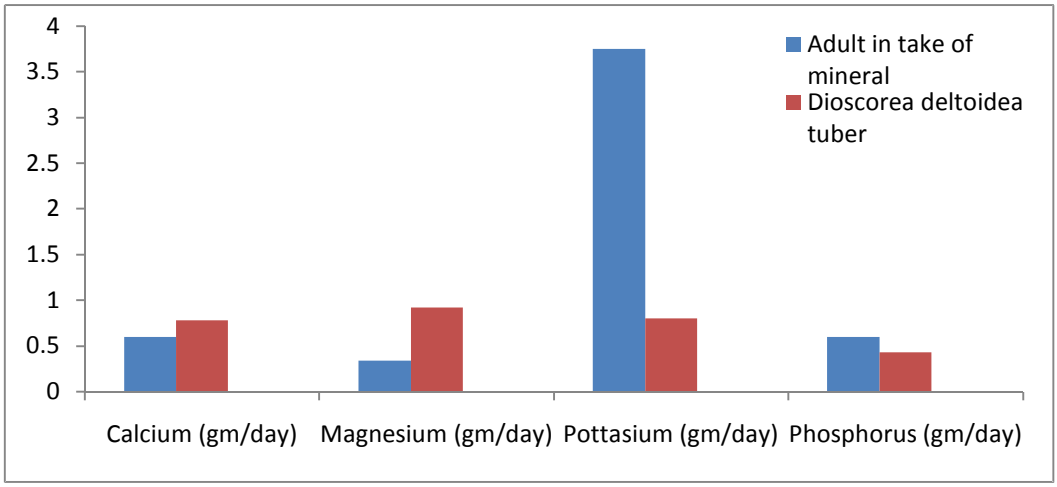

Figure 1.2 Comparison of per day intake of minerals by Adults with the mineral present in the tuber of *Dioscorea deltoidea*.



Figure 2.1 Thin layer chromatography qualitative analyses of six fractions against *Dioscorea deltoidea* plant tuber extract.

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