



## NUTRITIONAL PROFILE AND PHYTOCHEMICAL SCREENING OF GARHWAL HIMALAYA MEDICINAL PLANT *DIOSCOREA BULBIFERA*

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### ABSTRACT

*Dioscorea bulbifera* (Family Dioscoreaceae) possess profound therapeutic potential. It is found throughout the warmer parts of India called as yam or air potato. The present study was undertaken to investigate the nutritional profile, successive value, thin layer chromatography and phytochemical screening of *Dioscorea bulbifera*. The ash value (total ash 2.94%), moisture 62.80%, crude fat 1.20% and crude fiber 7.50%. Extractive values were studied fresh weight. Ash content analysis was showed total crude fiber content Preliminary phytochemical analysis test showed the presence of carbohydrates and glycosides, alkaloid, flavonoids, saponins, tannins, unsaturated triterpenoids and sterol, resin.

**Key Words:** - Medicinal value, Nutritional value, Successive value, TLC and Phytochemical Screening.

### INTRODUCTION

India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants. *Dioscorea bulbifera* have been traditionally used to lower glycemic index, thus providing a more sustained form of energy and better protection against obesity and diabetes. It also has anti-cancer properties. It is widely used in traditional Indian and Chinese medicine in the treatment of sore throat, gastric cancer and carcinoma of rectum, and goiter<sup>1, 2</sup>. *Dioscorea bulbifera* is used in Bangladesh for the treatment of leprosy and tumours<sup>3</sup> and by the native people of the western highlands of Cameroon for the treatment of pig Cysticercosis, though the tubers, after collection during the farming period, are totally destroyed and burnt because of their high bitterness. The roots of *Dioscorea bulbifera* L, although considered poisonous because of cytotoxic activity, have been used in Chinese medicine as a remedy for sore throat and for struma<sup>4</sup>. In Zimbabwe, this plant is used as an infusion to apply on cuts and sores, both for humans and animals while in Cameroon and Madagascar, the pounded bulbs are applied to abscesses, boils, and wound infections<sup>5</sup>. Its bulbs are used in India to treat piles, dysentery, syphilis and are applied to ulcers, pain, and inflammation<sup>6</sup>. Although the plant material has been long used to treat pain and inflammation, no scientific work has been carried out to ascertain the claimed properties. Information regarding the chemical and nutritional content of Indian wild edible tubers, fruit, rhizomes, corns, roots and stems is meager<sup>7</sup>.

### MATERIAL AND METHODS

#### Material

The fresh parts of tuber of *Dioscorea bulbifera* was collected from adjoining area of Dugripan village Dist- Pauri, 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)<sup>8</sup>. 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<sup>9</sup>. Fiber as per method reported in AOAC. Total nitrogen was analyzed by microkjeldhal method<sup>10</sup>. 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%<sup>11</sup>. 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<sup>12</sup>.

#### 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 vacuum distillation. The extracts were dried in the vacuum dessicator and the residues were weighed<sup>13</sup>. 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 distilled water as solvent these plates are activated in oven at 110°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<sup>14</sup>.

#### 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 absence of the primary and secondary phytoconstituents were detected by using standard methods<sup>15</sup>.

#### 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 (3.4%, 27.51%, 7.50% and 2.94%) and also minerals as calcium, magnesium, potassium and phosphorus (0.82, 0.98, 0.53 and 0.38 mg/gm) respectively.

#### Successive value

*Dioscorea bulbifera* tubers contain significant value 60.80%, 22.03% and 8.82% against water, methanolic and chloroform solvent with 500gm plant sample.

#### Phytochemical screening

The phytochemical screening for the presence of glycosides, flavonoids, phenols, resin and tannins. 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 bulbifera* 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 bulbifera* tuber. More detailed study must be done for further isolation leading to the pure compounds.

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

Nutrients	Value	Nutrients	Value
Moisture (%)	62.80 ± 0.15	N (mg/100gm)	0.55± 0.12
Ash (%)	2.94 ± 0.18	Insoluble ash (%)	2.93 ± 0.15
Crude fat (%)	1.20 ± 0.09	Soluble ash (%)	2.07 ± 0.08
Crude fibre (%)	7.50 ± 0.24	Na (mg/100gm)	0.92± 0.20
Total nitrogen (%)	0.55 ± 0.08	Ca (mg/100gm)	0.82 ± 0.15
Total protein (%)	3.40 ± 0.12	Mg (mg/100gm)	0.98± 0.15
Carbohydrate (%)	22.16± 0.05	K (mg/100gm)	0.53 ± 0.20
Organic matter (%)	97.06± 0.10	P (mg/100gm)	0.38 ± 0.02

**Table 2** Observations of thin layer chromatographic (TLC) studies of tuber of *Dioscorea bulbifera*, 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	(0.50)	(50)
	64:30:10	1	(0.61)	(61)
Benzene Extract	(C:M:W) 64:28:10	1	(0.35)	(35)
	64:30:10	2	(0.35, 0.47)	(35,47)
Chloroform Extract	(C:M:W) 64:28:10	1	(0.41)	(41)
Methanolic Extract	(C:M:W) 64:28:10	8	(0.08,0.24,0.50,0.61, 0.70,0.71,0.73,0.76)	(8,24,50,61, 70, 71,73,76)
	(C:M:W) 64:30:10	9	(0.08,0.24,0.50,0.61, 0.70,0.71,0.73,0.76,0.78)	(8,24,50,61,70, 71,73,76,78)
Ethanollic Extract	(C:M:W) 64:28:10	7	(0.08,0.26,0.50,0.60, 0.65,0.76,0.83)	(8,26,50,60, 65,76,83)
	(C:M:W) 64:30:10	8	(0.08,0.26,0.50,0.55, 0.60, 0.65,0.76,0.83)	(8,26,50,55, 60, 65,76,83)
Water Extract	(C:M:W) 64:30:10	2	(0.52,0.70)	(52,70)

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

Method of extraction	Values of three replicates (%w/w)	Mean (% w/w) ± SEM
Cold maceration:		
1) Water soluble	(51.30, 50.95 & 52.10)	51.45 ± 0.20
2) Alcohol soluble	(4.85, 4.60 & 4.20)	4.55 ± 0.15
Hot Extraction:		
1) Pet. Ether soluble	(3.20, 3.15 & 2.29)	3.11 ± 0.15
2) Benzene soluble	(2.40, 2.65 & 2.32)	2.45 ± 0.10
3) Chloroform soluble	(8.80, 8.95 & 8.72)	8.82 ± 0.24
4) Methanol soluble	(22.00,21.95 & 22.13)	22.03 ± 0.30
5) Ethanol soluble	(6.00, 6.23 & 5.95)	6.06 ± 0.15
6) Water soluble	(60.80, 60.92 & 60.69)	60.80 ± 0.93

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

Test	Pt. ether Extract	Benzene Extract	Chloroform Extract	Methanolic Extract	Ethanollic 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 bulbifera* tuber amino acid screening.

Amino acid test	<i>Dioscorea bulbifera</i> 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 – $\beta$ -Phenyl alanine	(+)
DL – Threonine	(+)
L – Tyrosine	(+)
3-C-3-4Dihydroxy phenyl	(-)

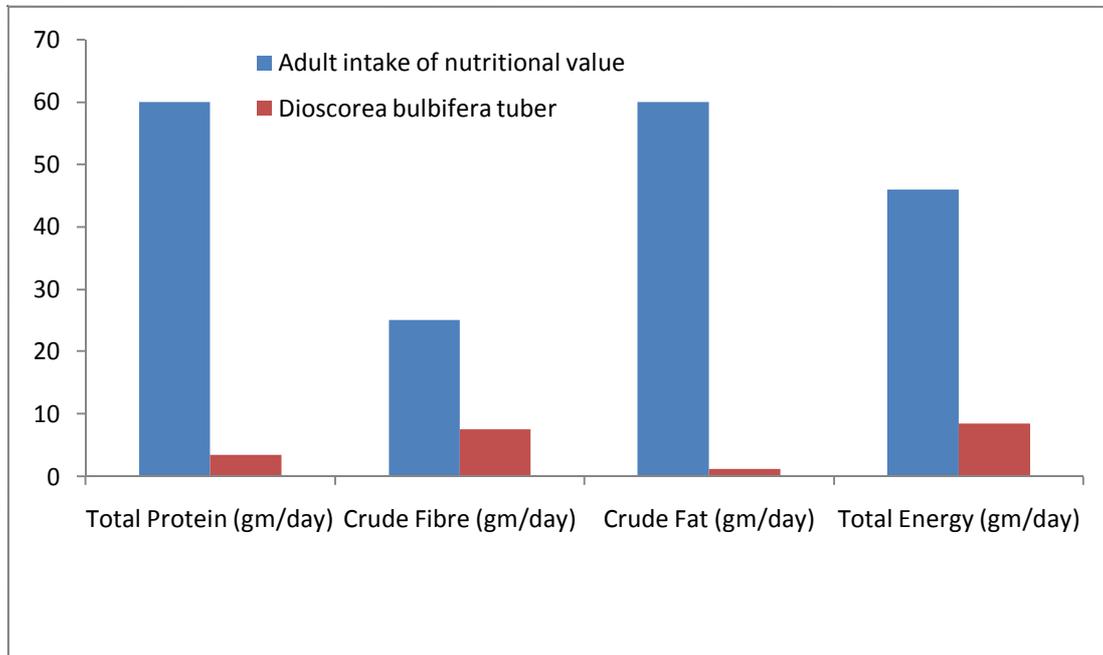


Figure 1.1 Comparison of per day intake of nutrients by Adults with the nutrients present in the tuber of *Dioscorea bulbifera*.

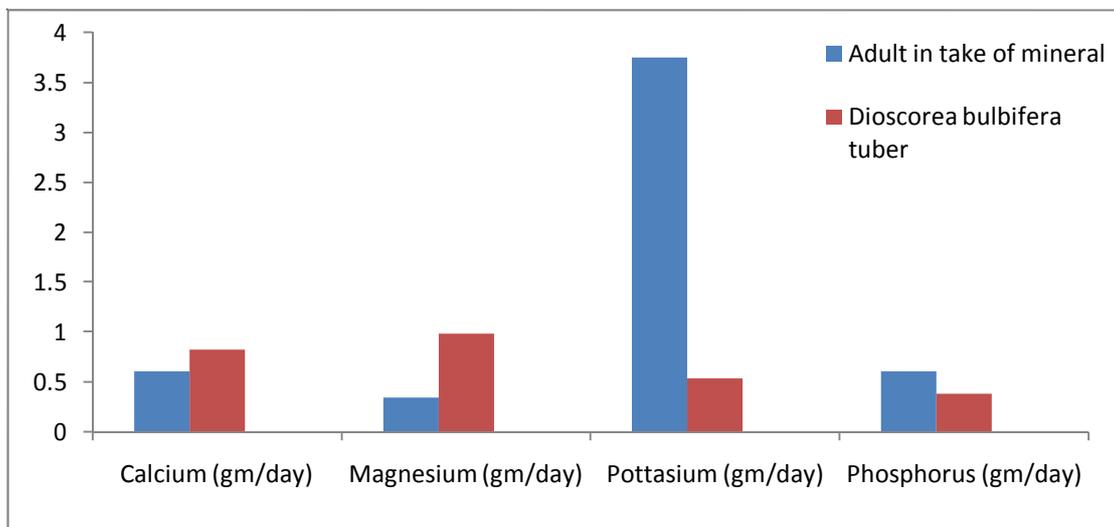


Figure 1.2 Comparison of per day intake of minerals by Adults with the mineral present in the tuber of *Dioscorea bulbifera*.



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

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