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## Biochemical and mineral analysis of *Vetiveria zizanioides* Roots

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### Abstract

Medicinal plants are the most exclusive source of life saving drugs for majority of the world's population. The medicinal plants play a pivotal role in the pharmaceutical industry. Herbal medicines are recently in request and the state is increasing day by day. *Vetiveria zizanioides* fits to the grass family, *Vetiveria zizanioides* has wide ecological amplitude and this trait of the species must be exploited foreco-development of the regions devoid of biodiversity. The grass with its tuft-forming habit and thick root system greatly helps in checking soil erosion. This grass stem are tall, the leaves are long and slim. The flowers is brownish purple hued, the *Vetiveria zizanioides* root can growing down up to 2 to 4 meters in depth. In this study, we investigated the biochemical and minerals profiles of various extracts of *Vetiveria zizanioides* roots, such as aqueous, methanol and chloroform. The biochemical composition such as total carbohydrates, total proteins, total cholesterol, and Minerals such as Iron, calcium and phosphorus, were estimated using the standard procedure in plant material. Results of this present study, Addition the use of the studied plant which belonging numerous bioactive compounds and used as food and medicine. And the estimated mineral composition of the roots of *Vetiveria zizanioides* were found in good amounts which can suggest that the established role of essential dietary elements in the physiology of human life and the effect of *Vetiveria zizanioides* on health and hazards.

**Keywords:** *Vetiveria zizanioides*, biochemical profile, mineral profile, carbohydrate, iron

### Introduction

India is the botanic garden of the world because they produced largest medicinal herbs, the herbal plants in the Western Ghats holds rich mega biodiversity due to abundant plants species with significant biological properties that acts as a possible source of phytoconstituents [1]. Medicinal plants need be there used as a traditional form of medicine since time ancient [2]. Vetiver (*Chrysopogon zizanioides*, previously *Vetiveria zizanioides*) is a perpetual grass and inborn to India. Vetiver can cultivate toward 1.5 meters tall and form clusters as wide. The shoot are high and the grasses are lengthy, thin, and rather rigid, Vetiver's roots grow down, 2-4 meters in depth [3]. Vetiver consumes several uses, such as aromatic, antifungal, cooling, antiemetic, diaphoretic, haemostatic, expectorant, hysteria, diuretic, stimulant, insomnia, asthma, skin diseases, amentia, kidney problems, amenorrhea, gall stones, antispasmodic, mosquito repellent, tonic and antioxidant [4-7].

The biochemical parameter of plant extracts is the utmost significant profiles used for the characterization of plants. Carbohydrate is one of the chief components for metabolism and it transports the energy wanted for respiration and other best important processes. Proteins have vital roles in all the biological processes by enzyme catalysis, transportation and storing, mechanical sustentation, growth and cellular differentiation control. Lipids are rich in -C=O-bonds, providing much more energy in oxidation processes than other biological compounds and constituted a convenient storage material for living organism [8].

Mineral elements though usually form a small portion of total composition of most plant materials and of total body weight; they are nevertheless of great physiological importance particularly in the body metabolism. Besides several organic compounds, it is now well established that many trace elements play a vital role in general well-being as well as in the cure of diseases [9, 10]. Macro and microelements influence biochemical processes in the human organism. Active constituents of medicinal plants i.e. metabolic products of plant cells and a number of mineral elements play an important role in the metabolism [11]. Some mineral elements remain chelated with organic ligands and make them bioavailable to the body system [12]. Plants are the rich source of all the elements essential for human beings.

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The use of medicinal plants in therapeutics or as dietary supplements goes back beyond recorded history but has increased substantially in the last decades [13, 14].

Iron is also an essential micro-nutrient for almost all organisms. Its essentiality is largely based on its ability to exist in two redox states ( $\text{Fe}^{2+}/\text{Fe}^{3+}$ ), which makes it ideal to act as a catalytic molecule in numerous biochemical reactions. The transport of oxygen in the blood and its storage in tissues, the transfer of electrons in the electron transport chain to supply cells with energy, and DNA synthesis, all require iron [15].

Calcium is one of the mineral believed to be a vital factor leading fruit storage quality [16]. Calcium is the chief integral of the skeleton and is significant for bendable numerous energetic cellular activities such as nerve and muscle function, hormonal actions, blood clotting and cellular mortality [17]. Calcium is crucial for healthy bones, teeth and blood [18, 19]. The health of the muscles and nerves depends on calcium. It is necessary for the absorption of dietary vitamin B, for the synthesis of the neurotransmitter.

Phosphorus is a major element and implements vital functions for nourishment, growth and development of plants. It is involved in several key plant functions, including energy transfer, photosynthesis, transformation of sugars and starches, nutrient movement within the plant and transfer of genetic characteristics from one generation to the next. Phosphorus is also involved in controlling important enzyme reactions and in the regulation of metabolic pathways [20].

Hence, the present work was aimed to screen and evaluate the biochemical and mineral profile of *Vetiveria zizanioides* root. The roots are a good source of various bioactive compounds and its importance being much unaware among the society. The present study has been framed to estimate the biochemical and mineral elements in the root of *Vetiveria zizanioides*.

## Material and Methods

**Collection and preparation of plant extract:** The roots of Vetiver was collected from Kollihills, which was located at Namakkal, Tamil Nadu, India. The shade dried samples were

grounded to fine powder using mechanical grinder. The powder was stored in a labeled air tight container for further studies. The *Vetiveria zizanioides* root powder were exposed to soxhlet extraction by using different solvents such as Aqueous, Methanol and Chloroform.

**Biochemical Analysis of *Vetiveria zizanioides* Root:** The biochemical parameters carried by using different solvents extracts followed by standard procedures to identify the biochemical parameters like Total carbohydrates (Hedge and Hofreiter, 1962) [21], Total protein (Lowry *et al.*, 1951) [22], Total cholesterol (Zak, 1977) [23].

**Mineral Analysis of *Vetiveria zizanioides* Root:** The Mineral profiles were determined by using standard protocol which described earlier, The Iron content in *Vetiveria zizanioides* root was estimated by the method of (Raghumula *et al.*, 2003) [24], The most important mineral calcium was titrated by using method of (Raghumula *et al.*, 2003) [24] and the mineral like phosphorus was estimated by the method of (Fiske and Subbarow, 1935) [25].

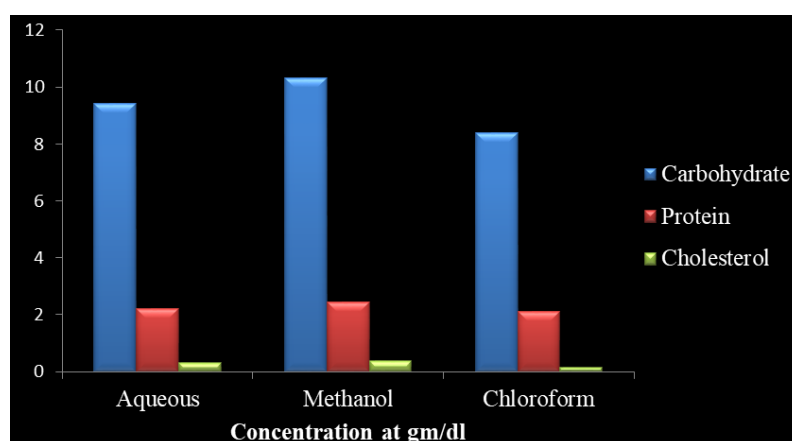
## Results and Discussion

**Biochemical analysis *Vetiveria zizanioides* Root:** The result of biochemical analysis in various root extracts of *Vetiveria zizanioides* (Table-1, Figure-1) showed the presence of Carbohydrate ( $9.426 \pm 1.156$ ,  $10.32 \pm 1.823$ ,  $8.404 \pm 0.129$ ) Protein ( $2.226 \pm 0.159$ ,  $2.456 \pm 0.145$ ,  $2.127 \pm 0.112$ ) and Cholesterol ( $0.312 \pm 0.013$ ,  $0.383 \pm 0.025$ ,  $0.164 \pm 0.011$ ) respectively, The results were expressed gm/dl.

**Table 1:** Biochemical analysis of *Vetiveria zizanioides* Root

S. No	Extract	Carbohydrate gm/dl	Protein gm/dl	Cholesterol gm/dl
1	Aqueous	$9.426 \pm 1.156$	$2.226 \pm 0.159$	$0.312 \pm 0.013$
2	Methanol	$10.32 \pm 1.823$	$2.456 \pm 0.145$	$0.383 \pm 0.025$
3	Chloroform	$8.404 \pm 0.129$	$2.127 \pm 0.112$	$0.164 \pm 0.011$

Values are expressed by mean  $\pm$  SD of n=3



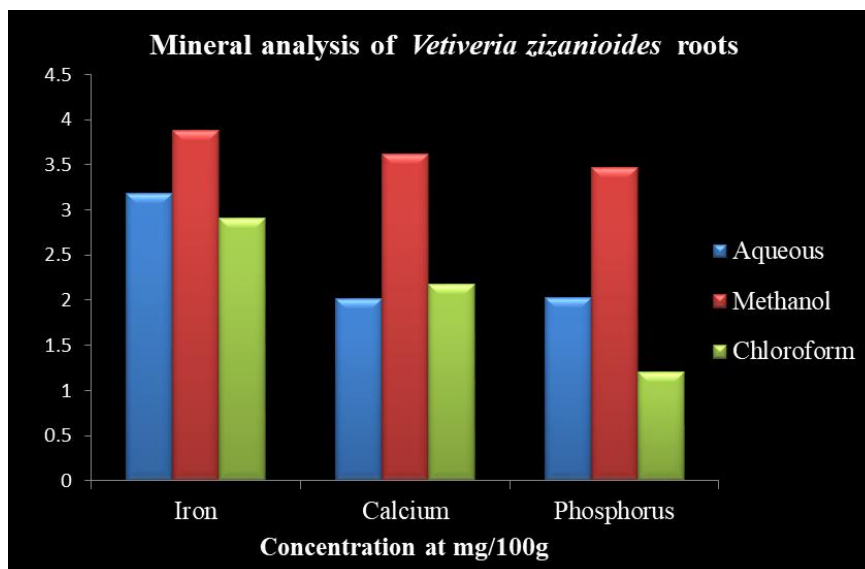
**Fig 1:** Biochemical analysis of *Vetiveria zizanioides* Roots

**Mineral element analysis *Vetiveria zizanioides* Roots:** The minerals namely Iron, phosphorus and Calcium in the extracted root sample were estimated and tabulated in (Table-2, Figure-2). Mineral ions are of prime importance in determining the nutritional value of foods. The results were expressed mg/100g. Iron content found to be higher in extracted sample than Phosphorus and Calcium.

**Table 2:** Mineral analysis of *Vetiveria zizanioides* Roots

S. No	Extract	Iron mg/100g	Calcium mg/100g	Phosphorus mg/100g
1	Aqueous	$3.182 \pm 0.821$	$2.012 \pm 0.321$	$2.033 \pm 0.590$
2	Methanol	$3.885 \pm 0.230$	$3.621 \pm 0.194$	$3.467 \pm 0.149$
3	Chloroform	$2.906 \pm 0.143$	$2.179 \pm 0.086$	$1.205 \pm 0.581$

Values are expressed by mean  $\pm$  SD of n=3



**Fig 2:** Mineral analysis of *Vetiveria zizanioides* roots

The current study analysed of biochemical and mineral profile of *Vetiveria zizanioides* roots contains more amount of carbohydrate compare to protein and cholesterol (Table-1) and minerals like iron are rich in *Vetiveria zizanioides* roots greater than calcium and phosphorus (Table-2). Biochemical tests are determined to measure the levels of enzymes, reactive oxygen species, chemicals and organic waste products found in body fluids. These tests can find out the functions of a variety of organs whether these organs work properly during chemotherapy or not. For an instance, liver function tests can detect the extent of liver damage due to chemotherapy. Abnormal findings of biochemical profile can detect the possible drawbacks of chemotherapy and the progression of the cancer.

Reported that (Suganya *et al.*, 2017) <sup>[26]</sup> the biochemical analysis of Beta Vulgaris, L. root showed the presence of Carbohydrate (5mg/100g), Starch (4.4mg/100g), Protein (14.8mg/100g) and Amino acid (34.4mg/100g) in very less amount.

Revealed that (Garima Gupta *et al.*, 2017) <sup>[27]</sup> The elemental concentrations obtained for the leaf extract of *Vetiveria zizanioides* is presented in Iron (496.875), Calcium (5022.6), Magnesium (4903.10), and Sodium (481.366) are the most abundant elements in the extracts presenting concentrations at the mg/kg levels.

Medicinal plants play a key role in human health care. Scientific studies available on medicinal plants indicate that promising biochemical scan be developed for many health problems. Very no claims regarding biochemical parameters quantification in especially is *Vetiveria zizanioides* roots till date hence this interesting determination of biochemical compounds especially carbohydrates content is noted to be very interesting since *Vetiveria zizanioides* roots of taxonomical origin but the analysis results surprisingly exposed the carbohydrate content to be high which is expected to be known for the fibre properties while the routine analysis of screening the biochemical parameters and the outcome of total carbohydrates content provides an insights look of characterized further and purification process to be carried in future in carbohydrates of *Vetiveria zizanioides* roots extract also holds high content of protein and lower level of lipids. *Vetiveria zizanioides* roots which up holds very high content of this essential mineral which can be

incorporate in the drinking water system were by it will in fuse mineral nourishment to the subject, whereby will serve as an natural nutrients supplement.

### Conclusion

The biochemical and minerals profile of present study suggests that *Vetiveria zizanioides* roots have considerable carbohydrates, proteins, lipids, and minerals such as Iron, Calcium and Phosphorus for the use of food and pharmaceutical industry as a source in preparation of nutrient supplements, medicine and fine chemical synthesis. The knowledge of element concentrations in the plant gives a new insight into their potential use in therapeutics. Proximate analysis and mineral elements estimation of medicinal plants is very important in identifying new sources of nutritionally important compounds. The biochemical and mineral analysis *Vetiveria zizanioides* roots may therefore yield to the conclusion that it may act as a very good source of diet to fight against deficiency disorders of Iron, Calcium and Phosphorus.

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