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Analysis of biactive compounds and inorganic elemental analysis in *Aplotaxis auriculata* rhizomes

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Abstract
In the present study to investigate phytochemicals and inorganic elements in *Aplotaxis auriculata*. The results of this study clearly indicate that the preliminary phytochemical analysis of *Aplotaxis auriculata* (rhizome) revealed presence of flavonoids, polyphenol, steroids, tannin, saponins, glycosides, anthraquinones, steroids, alkaloids, carbohydrate, pholphenol while and protein were absent. Quantitative analysis revealed that *Aplotaxis auriculata* rhizome plant rich amount of total phenol (255.84±17.85mg/gm), alkaloids (40±2.80mg/gm), saponin (20±1.40mg/gm) and flavonoids (225.02±15.75mg/gm) were presented. The vitamin analysis of *Aplotaxis auriculata* rhizome plant showed that the presence of Vitamin C, D and E. Vitamin A were absent. The inorganic elements of *Aplotaxis auriculata* rhizome plant showed that the presence of calcium, sodium, potassium, sulphate, phosphorus, chloride, Nitrate magnesium while and iron was absent. The results of the present study concluded that *Aplotaxis auriculata* may be a good source of phytochemicals, vitamins and minerals. Supplementation of this *Aplotaxis auriculata* rhizome may be useful for human health associated emerging diseases such as cardiovascular diseases, diabetes, hypertension and cancer.

Keywords: *Aplotaxis auriculata,* phytochemical, inorganic elements

1. Introduction
Phytochemicals are a field of increasing attention, both in science and in commerce. As is now generally recognized, many plant compounds and pigments have effects on animals and human beings. There is a great effort now to study and understand at a fundamental level and significant health effects of these compounds. This field is maturing and the health effects of these compounds are now getting the careful study they warrant at both a chemical and a molecular biological level. Identifying bioactive compounds and establishing their health effects are active areas of scientific inquiry. Phytochemicals are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans (Hasler and Blumberg, 1999) [11]. They protect plants from disease and damage and contribute to the plant's color, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack are called as phytochemicals (Gibson *et al.*, 1998: Mathai, 2000) [6, 13]. Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases. There are many phytochemicals fruits and herbs and each works differently (Arora *et al.*, 1998) [1]. The plant kingdom is a rich source of potential drugs. In India, medicinal plants are widely used by all sections of the population, either directly in different indigenous systems of medicine or indirectly in the pharmaceutical preparations of modern medicine. Research on natural resources has been encouraged by the World Health Organization since 1978. Most of the medicinal plants contain a number of chemical constituents such as flavonoids, alkaloids, tannins, saponins, steroids, terpenoids, rotenoids etc. The phytochemical screening of the plants is a preliminary for verification and then these plants may be utilized as new sources of herbal drugs (BNF, 2003) [3].
The mineral elements are separate entities from the other essential nutrients like proteins, fats, carbohydrates, and vitamins. Animal husbandry had demonstrated the need for minerals in the diet. In this century, biological assay methods clarified the significance and importance of mineral elements for human and animal nutrition and modern analytical techniques led to the detection of trace elements as essential nutrients and this is still an active area of current research. Micronutrient deficiencies are a major public health problem in many developing countries, with infants and pregnant women especially at risk (Batra and Seth, 2002) [2]. Infants deserve extra concern because they need adequate micronutrients to maintain normal

growth and development (Rush, 2000)[3] The micronutrient deficiencies which are of greatest public health significance are iron deficiency, causing varying degrees of impairment in cognitive performance, lowered work capacity, lowered immunity to infections, pregnancy complications e.g. babies with low birth weight, poor learning capacity and reduced psychomotor skills (Batra and Seth, 2002) [2].

Recently, it is clearly known that they have roles in the protection of human health, when their dietary intake is significant. More than 4,000 phytochemicals have been cataloged and are classified by protective function, physical characteristics and chemical characteristics and About 150 phytochemicals have been studied in detail. Keeping in view, in the preset study to investigate the phytochemical and inorganic elements in rhizome plant of *Aplotaxis auriculata* (Tamil: Parpatakam). *Aplotaxis auriculata* is considered as stomachic, aperients and antiseptic. Flow and tender shoots are diaphoretic and given in fevers. An infusion of the plant given to promote lochial discharge. Oil in which roots arc boiled is used as application for gout and rheumatism. An alcoholic extract of the plant showed antibacterial activity against *Escherichia coli*. The species is a herbal drug administered orally for the control of orchitis 1 practitioners of the Indian system of medicine. The drug was tested in comparis with synthetic anti-inflammatory drugs. It was found that the plant showed anti-inflammatory activity comparable to that of Indornethac in. It also showed inhibition of certain aspects of the inflammatory process, similar to hydrocortisone (Sadique *et al*., 2000) [20].

2. Materials and methods

2.1 Plant materials

The rhizome plant of *Aplotaxis auriculata* was collected in January 2015 from Kodaikanal, Tamil Nadu, India from a single herb. The rhizome plant was identified and authenticated by Dr. S. John Britto, The Director, the Rabiant Herbarium and centre for molecular systematics, St. Joseph's college Trichy-Tamil Nadu. India. A Voucher specimen has been deposited at the Rabinat Herbarium, St. Josephs College, Tiruchirappalli, Tamil Nadu, India.

2.2 Preparation of alcoholic extract

The rhizome of *Aplotaxis auriculata* was first washed well and dust was removed from the rhizome. The infected and fungus damaged portion of the rhizomes were removed. Healthy rhizomes were chosen and spread out in a plain paper and shade dried at room temperature for about 10 days and ground into fine powder using mechanical grinder. The powder was extracted with 70% methanol for 24 hours. A semi solid extract was obtained after complete elimination of alcohol under reduced pressure. The extract was stored in refrigerator until used.

2.3 Preliminary phytochemicals screening

Chemical tests were carried out on the alcoholic extract using standard procedures to identify the preliminary phytochemical screening following the methodology of Harborne (1973), Trease and Evans (1989) and Sofowara (1993) [9, 22, 21].

2.4 Quantitative analysis of phytochemicals

Determination of total phenols (Edeoga *et al*., 2005) [5]. Tannin was determined by the method of Van-Burden and Robinson, (1981) [23]. Saponin was determined by the method of Obdoni and Ochuko, (2001) [17]. Alkaloid determination using Harborne (1973) [9] method. Flavonoid was determined by the method of Bohm and Kocipai-Abyazan, (1994) [4].

2.5 Qualitative analysis of Vitamins

Qualitative analysis of Vitamin- A, C and Vitamin -D carried out by the method of Pearson (1976).

2.6 Qualitative analysis of inorganic elements

Ash of drug material (500 mg) was prepared and treated with HNO3 and HCl (3:1 v/v) for 1hour. After the filtration, the filtrate was used to perform the following tests (Khandelwal 2006) [12].

3. Results and discussion

Phyto is the Greek word for plant. There are many families of phytochemicals and they help the human body in the variety of ways. Phytochemicals may protect human from a host of diseases. Phytochemicals are known as secondary plant metabolites and have biological properties such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property. There are more than thousand known and many unknown phytochemicals. It is well-known that plants produce these chemicals to protect themselves, but recent researches demonstrate that many phytochemicals can also protect human against diseases (Narasinga, 2003) [15].

An assessment of the previous trends and impact of research into the phytochemistry on medicinal plants of the world is quite desirable before considering recent trends. After centuries of empirical use of herbal preparation, the first isolation of active principles alkaloids such as morphine, strychnine, quinine etc. in the early 19th century marked a new era in the use of medicinal plants and the beginning of modern medicinal plants research. Emphasis shifted away from plant derived drugs with the tremendous development of synthetic pharmaceutical chemistry and microbial fermentation after 1945. Plant metabolites were mainly investigated from a phytochemical and chemotaxonomic viewpoint during this period. Over the last decade, however, interest in drugs of plant and probably animal origin has grown steadily (Hamburger and Hostettmann, 1991) [7].

Utilization of medicinal plants has almost doubled in Western Europe during that period. Ecological awareness, the efficacy of a good number of phytopharmaceutical preparations, such as ginkgo, garlic or valerian and increased interest of major pharmaceutical companies in higher medicinal plants as sources for new lead structures has been the main reasons for this renewal of interest. With the development of chemical science and Pharmacognosy physicians began to extract chemical products from medicinal plants. A few examples of the products extracted from medicinal plants are - in 1920, quinine was isolated from Cinchona by the French pharmacist, Peletier & Caventou. In the mid-nineteenth century, a German chemist, Hoffmann obtained Aspirin from the bark of the willow. With the active principles in medicinal plants identified and isolated, plant-based prescriptions began to be substituted more and more with pure substances, which were more powerful and easier to prescribe and administer (Harvey, 2000) [10].

Phytomedicine almost went into extinction during the first half of the 21st century due to the use of the 'more powerful and potent synthetic drug'. However, because of the numerous side effects of these drugs, the value of medicinal

plants is being rediscovered as some of them have proved to be as effective as synthetic medicines with fewer or no side effects and contraindications. It has been proved that although the effects of natural remedies may seem slower, the results are sometimes better on the long run especially in chronic diseases.

In the present study was carried out on the plant sample revealed the presence of medicinally active constituents. The phytochemical characters of the *Aplotaxis auriculata rhizome* plant investigated and summarized in Table-1. The phytochemical screening *Aplotaxis auriculata* rhizome showed that the presence of flavonoids, terpenoids, steroids, tannin, saponins, phlobatannins, carbohydrate, triterpenoids, alkaloids, Anthraquinones polyphenol while and protein were absent.

Table 1: Phytochemical screening of *Aplotaxis auriculata*

S. No	Phytochemical analysis	Results
1	Tannin	++
2	Phlobatannins	+
3	Saponin	+
4	Flavonoids	++
5	Steroids	+
6	Terpenoids	+
7	Triterpenoids	+
8	Alkaloids	+
9	Carbohydrate	+
10	Anthraquinone	+
11	Polyphenol	++
12	Glycoside	+
13	Protein	-

(+) Presence (-) Absence (++) High concentrations

3.1 Quantitative analysis

Quantitative analysis revealed that the *Aplotaxis auriculata* rhizome plant contain significant amount of phenols, alkaloids, saponin and terpenoids. Significant amount of total phenol (255.84±17.85mg/gm), alkaloids (40±2.80 mg/gm), saponin (20±1.40mg/gm) and flavonoids (225.02±15.75mg/gm) was presented (Table 2). The above phytoconstituents were tested as per the standard methods. This is because of the pharmacological activity of this plant is used to trace the particular compound.

Table 2: Qualitative analysis of *Aplotaxis auriculata* leaf

S. No	Test	Result
1.	Polyphenol	255.84±17.85
2.	Flavonoids	225.02±15.75
3.	Alkaloids	40±2.80
4.	Saponin	20±1.40
5.	Tannin	43±2.03

3.2 Vitamins

Vitamins are organic substances that are essential in tiny amounts for growth and activity of the body. They are obtained naturally from plant and animal foods. Organic in this definition refers to the chemistry and molecules of vitamins. The word organic means that the molecules of the substance contain the element carbon. The term also means that vitamins can be destroyed and become unable to perform their functions in our bodies. Too much heat, certain kinds of light and even oxygen can destroy some vitamins. The amounts of vitamins ingested from food are measured in micrograms or milligrams.

Vitamin C, or ascorbic acid, is one vitamin humans cannot make; they have to get it from food. Vitamin C helps hold the cells together, heal wounds, and build bones and teeth. The best sources for vitamin C are citrus fruits, strawberries, melons, and leafy green vegetables. Vitamin C also helps to absorb and use Iron. It is important to protect the vitamins in fruits and vegetables from being destroyed; simple ways of doing this include refrigeration, washing them before cutting them, storing them in airtight containers, and avoiding high temperatures and long cooking times (Okwu, 2003) [18]. The vitamins of the *Aplotaxis auriculata rhizome* investigated and summarized in Table-3. The vitamin analysis of *Aplotaxis auriculata rhizome* plant showed that the presence of Vitamin C, D, E while and A were absent.

Table 3: Qualitative analysis of Vitamins

S. No	Test	Result
1.	Vitamins A	-
2.	Vitamins C	++
3.	Vitamins D	+
4	Vitamins – E	+ ++

(+) Presence (-) Absence

3.3 Minerals

All human beings require a number of complex organic/inorganic compounds in diet to meet the need for their activities. The important constituents of diet are carbohydrates, fats, proteins, vitamins, minerals and water (Indrayan *et al.*, 2005). Every constituent plays an important role and deficiency of any one constituent may lead to abnormal developments in the body. Plants are the rich source of all the elements essential for human beings. There is a relationship between the element content of the plant and its nutritional status. Some elements are essential for growth, for structure formation, reproduction or as components of biologically active molecules while others have some other beneficial effects (New Wall *et al.*, 1996) [16]. The vitamins of the *Aplotaxis auriculata* rhizome investigated and summarized in Table-4. The inorganic elements of *Aplotaxis auriculata* rhizome showed that the presence of Calcium, Magnesium, Sodium, Potassium, Iron, Sulphate, Phosphate, Chloride and Nitrate.

The following elements were found in *Aplotaxis auriculata* rhizome. They are calcium, sodium, potassium, sulphate, phosphorus and chloride were presented and Iron were absent in *Aplotaxis auriculata* rhizome extract (Table -4).

Table 4: Qualitative analysis of inorganic element in *Aplotaxis auriculata*

Inorganic elements	Result
Calcium	+
Magnesium	+
Sodium	+
Potassium	+
Iron	-
Sulphate	++
Phosphorus	+
Chloride	+
Nitrate	+

(+) Presence (-) Absence (++) High concentrations

Minerals are inorganic substances, present in all body tissues and fluids and their presence is necessary for the maintenance of certain physicochemical processes which are essential to life. Minerals are chemical constituents used by the body in

many ways. Although they yield no energy, they have important roles to play in many activities in the body. Every form of living matter requires these inorganic elements or minerals for their normal life processes. Minerals may be broadly classified as macro (major) or micro (trace) elements. The third category is the ultra-trace elements. The macro-minerals include calcium, phosphorus, sodium and chloride, while the micro-elements include iron, copper, cobalt, potassium, magnesium, iodine, zinc, manganese, molybdenum, fluoride, chromium, selenium and sulfur. The macro-minerals are required in amounts greater than 100 mg/dl and the micro-minerals are required in amounts less than 100 mg/dl. The ultra-trace elements include boron, silicon, arsenic and nickel which have been found in animals and are believed to be essential for these animals. Evidence for requirements and essentialness of others like cadmium, lead, tin, lithium and vanadium is weak (Murray *et al.*, 2000) [14].

4. Conclusion

The results of this study clearly indicate that the preliminary phytochemical analysis of *Aplotaxis auriculata* (rhizome plant) revealed presence of flavonoids, pholphenol, steroids, tannin, saponins, glycosides, Anthraquinones, steroids, alkaloids, carbohydrate, pholphenol while and protein were absent. Quantitative analysis revealed that *Aplotaxis auriculata* rhizome plant rich amount of total phenol (255.84±17.85), alkaloids (40±2.80mg/gm), saponin (20±1.40mg/gm) and flavonoids (225.02±15.75mg/gm) were presented. The vitamin analysis of *Aplotaxis auriculata* rhizome plant showed that the presence of Vitamin C, D and E. The inorganic elements of *Aplotaxis auriculata* rhizome plant showed that the presence of calcium, sodium, potassium, sulphate, magnesium, phosphorus and chloride while and iron were absent. The results of the present study concluded that *Aplotaxis auriculata* rhizome may be a good source of phytochemicals, vitamins and minerals. Supplementation of this *Aplotaxis auriculata* rhizome may be useful for human health associated emerging diseases such as cardiovascular diseases, diabetes, hypertension and cancer.

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