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COMPARATIVE STUDIES OF PROXIMATE AND MINERAL COMPOSITION IN LEAVES AND FLOWERS OF *CATHARANTHUS ROSEUS* (SADABAHAR)-A MAGICAL HERB

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ABSTRACT

Current study is aimed for determining proximate and mineral composition of the leaves and flowers of *Catharanthus roseus* (*C. roseus*) due to the plant's wide application in the indigenous medicinal system and its chemical constituents' importance. Although overall parts of the plant are found to be beneficial and used as an important medicine but the flower and leaves of *Catharanthus roseus* are widely used as a vital drug from the ancient system of medicine to treat almost every common ailment of the humans. In the present study, the proximate and mineral analysis has been carried out by AOAC methods using atomic absorption spectrophotometer. The *Catharanthus roseus* leaves and flower showed the presence of important elements. The results showed that the leaves of *Catharanthus roseus* have high moisture content (15.72 mg/100g), ash (8.94 mg/100g) and high protein content (4.74 mg/100g) than flowers. The results for mineral analysis showed the presence of Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Iron (Fe) and Zinc (Zn) in both leaves and flowers. The most important finding of the work was that leaves of *Catharanthus roseus* revealed higher concentration levels of all minerals excluding Fe and Zn. The proximate composition in both leaves and flowers of *Catharanthus roseus* were found to be different. Therefore, different parts of this medicinal plant are enriched in some micro and macro nutrients like Iron (Fe), Calcium (Ca), Sodium (Na), Potassium (K) and Zinc (Zn) which are very important for biological metabolic system as well as human health.

KEYWORDS: *Catharanthus Roseus*, Minerals, Proximate, Metabolic System, Nutrition.

INTRODUCTION

Medicinal plants have been used as a traditional medicine from historical times as well as folk medicine. Ethno botanical data on medicinal plants and use of them by indigenous cultures is found to be valuable in the preservation of traditional principles, public well-being and drug development.[1] The reliable knowledge of the usage of these plants was delivered from one generation to next after refining and addition.[2] The folk recipes are those that can be prepared either from the whole plant or from their various parts such as leaf, stem, bark, root, flower, seed and also including their secondary products such as gum, resins and latex.[3] In the human body, medicinal plants are found to have direct or indirect interaction with the body chemistry by the chemical constituents. Once the activated constituents are absorbed into the blood, these develop the needed advantages by circulating and influencing the blood steam.[4] Plants supply minerals, vitamins and certain hormone precursors in addition to protein and energy to the human body.[5] Trace elements are found to have noteworthy roles in combating different human aliments and diseases as observed in the study of elements with reference to indigenous medicinal plants.[6] At the same time, major and trace elements play an important role in building up and restoration phenomenon of health and diseases of human body. The development can be observed in this extent of health sciences in the past few years.

Catharanthus roseus as a medicinal plant popularly known as Madagascar periwinkle is an adequate source of anti-leukemic alkaloids. It is an evergreen subshrub or herbaceous plant that grows up to a height of one meter.[7] This plant is a terpenoid indole alkaloid producing plant[8] which is a significant source of indole alkaloids present in each and every part of the plant. The leaves and stems of the plant are a source of dimeric alkaloids that have vital cancer fighting medicinal properties while roots prevailing antihypertensive properties.[9] Vincristine and vinblastine alkaloids are beneficial in treating different kinds of lymphoma and leukemia. All parts of the *Catharanthus roseus* are used for different medical purposes. The flowers and leaves have anti-diabetic, hypolipidemic and antioxidant properties. It has also been used for treatment of Alzheimer's disease.[10,11]

Besides these medicinal usages, the various parts of the plant were utilized as folk remedy in lowering the blood glucose level in Europe for centuries.[12] In India, the juice of *Catharanthus roseus* leaves was utilized to cure wasp stings and also different parts of the plant was used as antipyretic, antiulcer, antidiabetic and anticancer in Indian herbal

medicine.[13] In Hawaii, boiled plant was used to make a poultice to halt blood loss. In China, it had therapeutic role in astringent, diuretic and coughs. In Central and South America, it was advantageous as homemade cold therapy for easing lung congestion and inflammation. All over the Caribbean, an extract from the flowers was utilized as a solution for the treatment of eye irritation and infections. It was also reputed as a magic plant. It was also observed that the leaves of the plant were used widely in folk medicine to decrease blood sugar level and exhibited a noteworthy antihyperglycemic effect.[7]

Keeping in mind, the wide applications of different parts of *Catharanthus roseus* in traditional medicine and Ayurvedic preparation, proximate and mineral screening of leaves and flowers of *Catharanthus roseus* were carried out by using atomic absorption spectrophotometer.

MATERIALS AND METHODS

Collection of plant material: Fully matured fresh leaves and flowers of *Catharanthus roseus* were obtained from the Botanical garden of Banasthali Vidyapith, Rajasthan, India. The leaves and flowers of *Catharanthus roseus* were separately dried at 100^0C for half an hour till a constant weight was acquired. The dried samples of leaves and flowers were powdered and then used for following analysis.

Reagents and standards: For digestion of our experimental sample, we used nitric acid (69%, Merck India) and perchloric acid (70%, Merck India) without further purification. For standard calibration of respective elements, we purchased Na, K, Ca, Mg, Fe and Zn standard solution (100 mg/ml) from Sigma Chemical Company, Mumbai, India. We prepared the respective desired standard from the stock solution using lab made double distilled water.

Analytical Procedure for Proximate Analysis: The leaves and flower of *Catharanthus roseus* were taken in a clean, dry and weighed crucible. It was oven dried later on at 110ºC and weighed. It was weighed repeatedly until a constant weight was acquired. The crucible was cool down in desiccator every time before weighing. Proximate analysis included the estimation of moisture, ash, fat, protein, crude fiber and carbohydrate of leaves and flower. Crude fat was analyzed through petroleum ether as an extract solvent in Soxhlet apparatus. Total ash was estimated by weighing the furnace incinerated residue at 550ºC for 12 hours. The protein was analyzed by using micro Kjeldahl's distillation method.[14] Percentage carbohydrate was calculated by difference method.

Analytical Procedure for Mineral Analysis

Chemical estimations were carried out for determining sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), zinc (Zn), copper (Cu), iron (Fe). The estimation of aqueous digest was done by using Atomic Absorption Spectrophotometer (Varian, AA 240FS, Australia) for Ca, Mg, Zn, Cu and Fe which was equipped with flame and graphite furnace. Flame photometer was used to determine Na and K. The data recorded for respective elements was done in triplicate measurements for its authentication and used for standard deviation calculation.

RESULTS AND DISCUSSION

Proximate Content: Table 1 reveals amount of estimated moisture, ash, fiber, protein, fat and carbohydrate content in *Catharanthus roseus* leaves and flower. The moisture content of *Catharanthus roseus* leaves was (15.72±1.1) whereas in flower (12.35±1.3), ash content was (8.94±0.6) in leaves whereas in flower (4.76±0.2). The study revealed that the percentage of the fat content was (2.80±1.1) in leaves whereas in flower (3.21±1.2). Fiber content was (17.55±0.6) in leaves and in flower was (19.34±0.1). Protein content was leaves (4.74±0.3) whereas in flower (2.67±0.2). Carbohydrate content was (40.25±2.5) in leaves whereas in flower (56.71±1.6).

Table. 1: Proximate Analysis of *Catharanthus roseus* Leaves and Flower (%).

S. No	Nutrients	Leaves	Flowers
1.	Moisture	15.72 ± 1.1	12.35 ± 1.3
2.	Ash	8.94 ± 0.6	4.76 ± 0.2
3.	Fat	2.80 ±1.1	3.21 ± 1.2
4.	Protein	4.74 ± 0.3	2.67 ± 0.2
5.	Fiber	17.55 ± 0.6	19.34 ± 0.1
6.	Carbohydrate	40.25 ± 2.5	56.71 ± 1.6

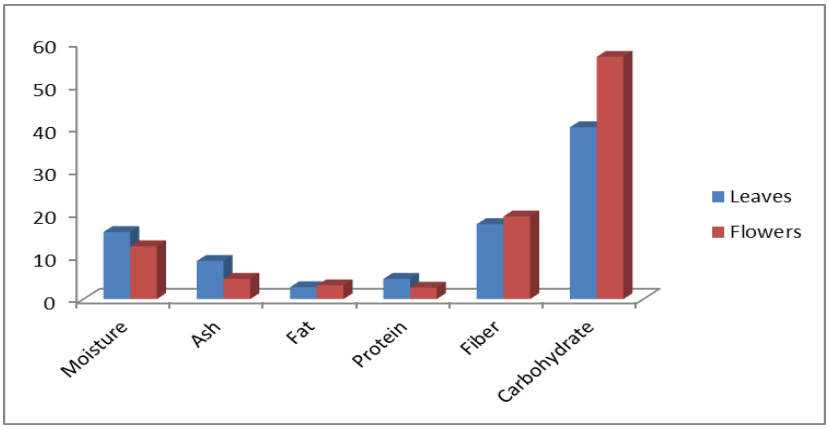

Fig. 1: Proximate Analysis of *Catharanthus roseus* Leaves and Flower.

Mineral Content: The mineral composition of leaves and flowers of *Catharanthus roseus* were determined by using atomic absorption spectrophotometer. A total of 6 minerals i.e. Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Iron (Fe) and Zinc (Zn) were analyzed from both leaves and flowers of the plant which were responsible for curing various diseases. The result of the mineral analysis is presented in Table 2. Each result was an average of at least three independent measurements. These elements had a dynamic role in the development of secondary metabolites that were accountable for pharmacological actions of these minerals in both leaves as well as flowers of the plant.

Table. 2: Mineral Analysis of *Catharanthus roseus* Leaves and Flower.

S. No	Minerals	Leaves	Flowers
1.	Sodium	4.72 ± 0.5	2.3± 0.3
2.	Potassium	23.1 ± 5.0	23.4 ± 5.1
3.	Calcium	36.1 ± 3.0	6.1± 5.1
4.	Magnesium	5.13 ± 0.3	1.7± 0.1
5.	Iron	1.4 ± 0.1	0.55 ± 0.1
6.	Zinc	0.023 ± 0.1	0.048± 0.1

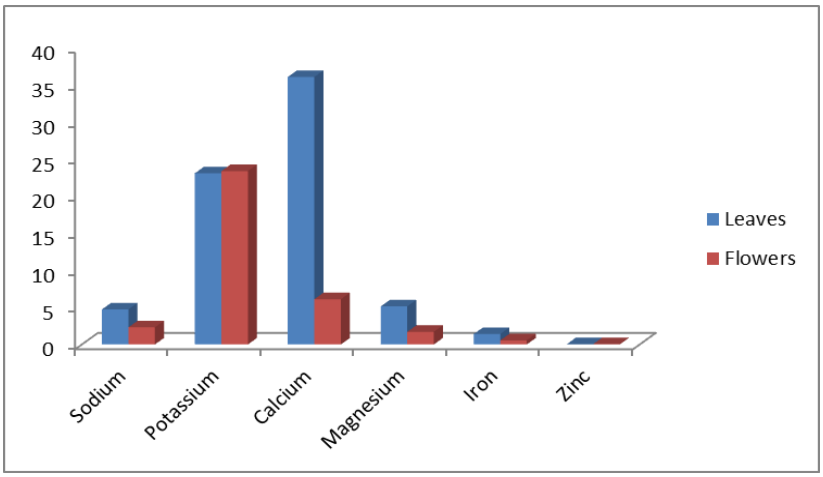

Fig. 2: Mineral Analysis of *Catharanthus roseus* Leaves and Flower.

The present study revealed the presence of higher concentration of Sodium (Na), Calcium (Ca), Magnesium (Mg) and Iron (Fe) in leaves as compared to flowers of *Catharanthus roseus*. On the other hand, flowers had higher concentration of Potassium (K) and Zinc (Zn). Sodium (Na) retains the osmotic equilibrium among the extracellular fluid and tissue cells that helps in maintaining the pH of blood within normal range. It also focuses on the conduction of nerve impulses, muscle contraction and control over heart muscle conduction.[15] The average concentration of Sodium (Na) was (4.72±0.5) for leaves and (2.31±0.3) for flowers.

Some researchers have been reported mineral analysis on this part of plant in India and Pakistan by AAS (Atomic Absorption Spectrophotometer). In Pakistan, it was found that the average concentration of Sodium (Na) was 0.66 mg/g for leaves and 0.38 mg/g for flowers.[16] Potassium (K) is beneficial in decreasing hypertension and upholding the cardiac rhythm.

Among the human body, potassium (K) is found to have an effective role in numerous physiological reactions leading to effect on human health in case of its excessive or deficient levels.[17] The average concentration of potassium (K) was (23.1±5.0) for leaves and (23.4±5.1) mg/g for flowers in the present study whereas in India, it was found that average concentration of potassium (K) was 6.50 mg/g for leaves.[18] Calcium (Ca) overcomes the problem of high blood pressure, heart attack, premenstrual syndrome, colon cancer. It is helpful in maintaining the bones strength and reducing the risk of osteoporosis during old age.[19]

The average concentration of calcium (Ca) was (36.1 ± 3.0) for leaves and (6.1± 5.1) for flowers in the present study whereas in India it was found that average concentration of Calcium (Ca) was 29.09 mg/g for leaves.[18] Magnesium (Mg) improvises the insulin sensitivity that prevents diabetes and related complications along with reducing blood pressure.[2] Magnesium (Mg) comprises many enzymatic reactions of oxidative metabolism of nutrients, synthesis of cell constituents, transmission of nerve impulses, regulating body temperature, detoxification, energy production and healthy bones and teeth formation.[20] The average concentration of magnesium (Mg) was (5.13±0.3) for leaves and (1.75±0.1) for flowers.

Zinc (Zn) is a constituent having diversity of enzymes that include ribonucleic polymerases, alcohol dehydrogenase, carbonic anhydrase and alkaline phosphate. Different animal studies depicted that zinc (Zn) deficient during pregnancy results in the development of disorders in offspring. Zinc (Zn) is among major constituent of viable sperm specifically human sperm. It is essential in the growth and multiplication of cells (enzymes responsible for DNA and RNA synthesis) for maintaining integrity of skin, metabolism of bones, taste and eyesight functioning. Zinc (Zn) deficiency may result in hair loss, detained sexual maturity, and retarded growth, delayed wound healing and emotional disturbance.[21] The mean concentration of zinc (Zn) was (0.023±0.1) for leaves and (0.048±0.1) for flowers. For the formation of oxygen carrying protein, haemoglobin and myoglobin, the human body needs

Iron (Fe). It is a crucial mineral in preventing anemia and cough related with angiotensin-converting enzyme inhibitors.[22] The average concentration of iron (Fe) was (1.4±0.1) of leaves whereas (0.55±0.1) for flowers.

CONCLUSION

Elemental uptake by a plant is influenced by various factors, including types of plant, nature of soil, climate and agriculture practices.[23,24] The concentration of elements is not uniformly distributed throughout the plant. In the current study, different elemental concentrations vary due to those factors. The present investigation will be useful in the production of innovative modernized drugs by using a number of mixtures of plant parts that can be beneficial in treating various diseases ethno medicinally. Also, the different concentration of minerals in different parts of *Catharanthus roseus* leads to the conclusion that the plant will have specific roles in treating various diseases.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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