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Proximate nutrient composition and antinutrient analysis of *Catharanthus roseus* (*Sadabahar*) leaves explore their hypoglycemic potential

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Abstract : Diabetes mellitus can be found in almost every population in the world. Since the Ayurvedic practice started in India, plants are being used in the cure of diseases. Although the *Catharanthus roseus* have been used for their alleged health benefits and avail their hypoglycemic effect, used as medicine by diabetics. This work was carried out to determine the proximate nutrient composition of *Catharanthus roseus (Sadabahar)* leaves. The results from the proximate analysis indicate that the plant contained some important nutrients such as carbohydrate 46.02 ± 0.01%, lipid 19.68 ± 0.01%, crude protein 7.05 ± 0.01%, crude fibre 1.04 ± 0.02% and had Caloric value of 369.37±0.02 kcal. The mineral element analyzed were Calcium (Ca) 232.90 ± 0.01mg/kg, Iron (Fe) 154.39 ± 0.02mg/kg. The anti-nutrient analysis revealed that the plant contained 0.89±0.03mg/100g, hydrocyanic acid, 10.39±0.01mg/100g soluble oxalate and 239 ± 1.4mg/100g total oxalates, while phytate and tannins had a value of 0.06 ± 0.02mg/100g and 0.04±0.02 mg/100 g respectively. Vitamins analysis showed the presence of vitamin C (ascorbic acid) 0.73 ± 0.04mg/100g.

Keywords : *Catharanthus roseus* (*Sadabahar*) *leaves*; Proximate composition; Mineral elements; Anti-nutrients and vitamins.

INTRODUCTION

Catharanthus roseus belong to the family apocynaceae[11] *Catharanthus roseus* is commonly called as *Periwinkle*, *Madagascar periwinkle* and *Sadabahar*. It grows throughout India and found as an escape in waste places and sandy tracts[21]. C. roseus leaves extract made significant changes in each cardiovascular parameter after investigation with hypotensive and hypolipidemic effects in leaves extract treated animals. Hot water extract of dried leaves were taken orally to rabbits was active[2]. More than 130 different compounds have been reported including about 100 monoterpenoid indole alkaloids[17]. As an important medical plant, it has a good antioxidant potential throughout its parts under drought stress[18]. As many

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others herbal plants established in the indigenous system of medicine for their antidiabetic potentials and this plant has to be established in this indigenous system of medicines. Proximate and nutrient analyses of edible plant and vegetables play a crucial role in assessing their nutritional significance[18]. For herbal drug's standardization is concerned, WHO also emphasize on the need and importance of determining proximate and micronutrients composition of the herbal plants. Such herbal formulations must pass through standardization processes[13].

Medicinal plants play a significant role in providing primary health care services to rural people and are used by about 80% of the marginal communities around the world[10,20]. Each medicinal plant species has its own nutrient composition besides having pharmacologically important phytochemicals. These nutrients are essential for the physiological functions of human body. Such nutrients and biochemicals like carbohydrates, fats and proteins play an important role in satisfying human needs for energy and life processes[14].

Diabetes is a metabolic disorder associated with defects in secretion and insulin action[4]. Type 1 diabetes also known as insulin dependent and type 2 diabetes called non-insulin dependent. Both conditions are associated with the formation of free radicals that cause oxidative stress and disease manifestation. Diabetes is associated with health problems such as neuropathy, retinopathy, and erectile dysfunction in men, kidney problems, healing and more Disease[25] because diabetes is a disease of oxidative stress, it is expected that the antioxidants in plants to help combat it. Several studies report that a proper diet that includes antioxidants is important to reduce the risk of diabetes. We have found that various antioxidants present in some foods and plants as antinutrient and can help people prevent disease and for helping diabetics[21]. These substances exert their activity by inhibiting the action of R-amylase enzyme. Amylase is an enzyme produced in the pancreas and salivary glands; their function is to help the digestion of carbohydrates[11]. Over the years, our people have passed down knowledge of the types and applications of medicinal plants from generation to generation, often orally. The compilation of useful drugs derived from medicinal plant is impressive; these include; heart drugs, analgesics, anesthetics, antibiotics, anticancer and anti-parasitic compounds, anti-inflammatory drugs, oral contraceptic hormones, as well as laxative diuretics[12].

There has been a great deal of interest of late in the role of complementary and alternative drugs for the treatment of various acute and chronic diseases. Among the several classes of phytochemicals, interest has focused on the anti-inflammatory and antioxidant properties of the polyphenols that are found in various botanical agents. Plant vegetables and spices used in folk and traditional medicine have gained wide acceptance as one of the main sources of prophylactic and chemopreventive drug discoveries and development. Recently, researches on medicinal plants has drawn global attention; large bodies of evidence have accumulated to demonstrate the promising potential of medicinal plants used in various traditional, complementary, and alternate treatment systems of human diseases[7]. *Catharanthus roseus (Sadabahar) leaves* have been used traditional by many people in Akwa Ibom State, Nigeria, for the treatment of cough, but the report on it nutritive and anti-nutritive composition is scanty. Hence the aim of this work is to determine the proximate composition, mineral element, vitamins and anti-nutrient of this plant in order to ascertain it safety or otherwise to man.

MATERIALS AND METHODS

Collection and treatment of sample

Catharanthus roseus leaves were collected from the Botanical garden of main campus of Banasthali University, Rajasthan, India. The leaves was separated from weeds and dirt, washed and rinsed with distilled water. It was sun-dried for 5 days, ground in a mortar with a pestle into coarse power and packed in an air-tight plastic container for further analysis.

Proximate composition

Proximate composition of a substance constitutes the different classes of nutrients present in the samples such as carbohydrates, protein, fat, crude fibre, ash and moisture as well as caloric value calculated from values of carbohydrate, fat and protein. All the methods used

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in estimating the chemical composition of the plant samples were standard methods of the Association of Official Analytical Chemists (1990), NIN (2003), Sadsaivanm, 1996 except where otherwise stated.

- Moisture content, Ash Content, Crude Protein
- Crude fibre content.
- Estimation of fat by Sox helt Method
- Carbohydrate content was estimated by subtracting the values obtained for fat and protein from organic matter. The percentage of organic matter was calculated by subtracting the percentage of ash from one hundred (100).
- The caloric value of the sample was calculated using "Atwater factor" by multiplying the value of the crude protein, lipid and carbohydrate by 4, 9, 4 respectively and taking the sum of the product[16].

Estimation of mineral element

Mineral elements estimations indicate the amount of inorganic elements present in the sample. The determination was carried out using standard procedures. During the determination, the sample was first ashed and dissolved in a solvent, and the resultant solution aspirated into an air-acetylene flame. The mineral element determined were; Potassium (K), Sodium (Na), Iron (Fe), Phosphorus (P) and Calcium (Ca) and this was done by spectrophotometric methods, using flame emission spectrophotometer for Sodium (Na) and Potassium (K) and atomic absorption spectrophotometer for others. Before determining the concentration of any element in the sample, a calibration curve of the element in the sample, was prepared using prepared standard stock solutions for the elements.

Estimation of vitamin C (Ascorbic acid)

Ascorbic acid reacts with 2, 4-dinitrophenylhydrazine after oxidation of vitamin C to dehydroascorbic acid. Ascorbic acid is oxidized to dehydroascorbic acid by cupric sulphate. The dehydroascorbic acid in a strong acid solution reacts with 2, 4 dinitrophenylhydrazine to form a dinitrophenylhydrazone. The hydrazine in the presence of strong sulphuric acid solution develops a red colour which can be measured spectrophotomertically. Thiourea was added to dinitrophenylhydrazine reagent to prevent its oxidation by interfering substances.

RESULTS AND DISCUSSION

The data obtained in the course of the experiments are shown in the tables below and the discussion of these result are also given.

Proximate composition

The results of proximate composition of *Catharanthus roseus (Sadabahar)* leaves are presented in TABLE 1. The proximate analysis showed the moisture content of *Catharanthus roseus (Sadabahar)* leaves to be 84.89±0.08% (w/w). This result indicated low shelf life of the fresh plant hence long storage would lead to spoilage due to its susceptibility to microbial attack. This supports the practice of storage in dry form by users. Moisture content is among the most vital and mostly used measurement in the processing, preservation and storage of food[16]. Ash content of 3.89±0.01% dry matter (DM) was obtained as a result for *Catharanthus roseus (Sadabahar)* leaves. Ash in food contributes the residue remaining after all the moisture has been removed as well as the organic material (fat, protein, carbohydrates, vitamins, organic acid etc) have been incinerated at a temperature of about 500°C. Ash content is generally taken to be a measure of the mineral content of the original food[16].

Crude fibre in food or plant is an indication of the level of non-digestible carbohydrate and lignin. The crude fibre obtained for *Catharanthus roseus (Sadabahar)* leaves was 1.04±0.02% (DM). This low level is considered appropriate, because it aids absorption of glucose and fat. Although crude fibre enhances digestibility, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage[15].

TABLE 1 : Proximate composition of *Catharanthus roseus* (*Sadabahar*) leaves

Parameter	Composition
Moisture content (%)	84.89 ± 0.08
Ash (%)	3. 89 ± 0.01
Crude Fibre %	1.04 ± 0.02
Crude Lipid (%)	19. 68 ± 0.01
Crude Protein (%)	7.05 ± 0.01
Carbohydrate (%)	46.02 ± 0.01
Caloric value (kcal/100g)	369.37 ± 0.02

Results are mean of triplicate determinations ± SD

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Crude fibre is made up largely of cellulose together with a little lignin which is indigestible in human[16]. The crude lipid content obtained for *Catharanthus roseus (Sadabahar)* leaves was 19.68±0.01% (D. M). Lipid provides very good sources of energy and aids in transport of fat soluble vitamins, insulates and protects internal tissues and contributes to important cell processes[9].

The crude protein of *Catharanthus roseus (Sadabahar)* leaves was 7.05±0.01% (DM). The recommended dietary allowance (RDA) for protein is 56g for individual weighing 70kg and 46g for adult weighing 50kg, children may consume 2kg/day. The plant is a moderate source of protein. Proteins from plant sources have lower quality but their combination with many other sources of protein such as animal protein may result in adequate nutritional value. The carbohydrate content of *Catharanthus roseus (Sadabahar)* leaves was 46.02±0.01%. The plant is a moderate source of carbohydrate when compared with the Recommended Dietary Allowance (RDA) of 130g[17]. The caloric value of *Catharanthus roseus (Sadabahar)* leaves was 369.37±0.02 kcal/100g. An average person requires 2000-3000 kcal per day[9]. The plant can contribute to the caloric requirement of the body.

Anti-nutrients

The result of anti-nutrients of *Catharanthus roseus (Sadabahar)* leaves is presented in TABLE 2. The level of HCN, soluble oxalate, phytate (phytic acid), tannin content in *Catharanthus roseus (Sadabahar)* leaves was 0.89±0.03mg/100g, 10.39±0.01mg/100g, 0.06 ± 0.02mg/100g, and 0.04±0.02 mg/100 g respectively. Cyanide ($CN^?$) concentration of 300 parts per million (ppm) in air will kill a human being within a few minutes. The toxicity is caused by the cyanide ion, which prevent cellular respiration. Blum *et al.*[2] reported the lethal dose of hydrocyanic acid for adult man as 50-60mg/kg. Dietary oxalate has been known to complex with calcium, magnesium, and iron leading to the formation of insoluble oxalate salts resulting in oxalate stones and interferes with utilization of the minerals. The lethal level in man is 2-5g[16]. The level of Phytic acid found in leaves has no known toxicity and is not known to cause mutagenic activity. It may have more therapeutic value when added to water rather than when naturally absorbed in foods as it is difficult to free from fibres. Phytic acid is one of few chelating therapies for uranium removal. Phytic acid has some mineral binding properties[3]. Although the antioxidant activity of tannins has been much less marked, recent researches have shown that the degree of polymerization of these substances is related to their antioxidant activity. In condensed tannins and hydrolysable (ellagitannins) of high molecular weight, this activity can be up to fifteen to thirty times superior to those attributed to simple phenols[23]

Vitamin C (Ascorbic acid)

The content of vitamin C (Ascorbic Acid) was 0.09±0.02 mg/100g Vitamin C, also known as ascorbic acid (enantiomer, L-ascorbic acid) is an antioxidant hydrosoluble vitamin, this due to that it is an electron donor, which explains its being a reducer that directly neutralizes or reduces the damage exercised by electronically disequilibrated and instable reactive species, denominated Free radicals[27]. The recommended dietary allowance of vitamin C is 45mg per day[26].

Mineral element composition

TABLE 4 present the result of mineral element composition of *Catharanthus roseus (Sadabahar)* leaves, in mg/kg dry matter. -The iron content of *Catharanthus roseus (Sadabahar)* leaves was 10.63±0.02 mg/kg.

TABLE 2 : Anti-nutrients composition of *Catharanthus roseus* (*Sadabahar*) leaves

Anti-nutrient	Level
Hydrocyanide (HCN) (mg/100g)	0.89 ± 0.03
Total oxalates (mg/100g)	239 ± 1.4
Soluble oxalates (mg/100g)	10.39 ± 0.01
Phytate (mg/100g)	0.06 ± 0.02
Tannin (mg/100g)	0.04 ± 0.02

Results are mean of triplicate determinations ± SD

TABLE 3 : Level of vitamins in *Catharanthus roseus* (*Sadabahar*) leaves

Vitamin	Level
Vitamin C (mg/100g)	0.09 ± 0.02

Results are mean of triplicate determinations ± SD

TABLE 4 : Mineral element composition (mg/kg, dry matter) of *Catharanthus roseus* (*Sadabahar*) leaves

Minerals	Conc. mg/kg
Iron	10.63±0.02
Calcium	572.90±0.01

Results are mean of triplicate determinations ± SD

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Iron forms part of the organism's antioxidant system because it contributes to eliminating the peroxide groups. However, its capacity to change valence with ease (2+/3+) renders that it can also intervene, depending on the environment, in the formation of Free radicals[5]. *Catharanthus roseus* (*Sadabahar*) leaves can't be used to improve the anaemic condition of a patient. The value obtained for calcium was 572.90±0.01mg/kg. Among all the mineral elements analyzed, calcium exhibited the highest value. The Recommended Dietary Allowance for calcium is 500mg/d[6].

CONCLUSION

This work was carried out to evaluate the proximate and nutrient composition of *Catharanthus roseus (Sadabahar)* leaves. The proximate composition analysis showed much about the nutritive value of the plant. The anti-nutrient such as oxalate, hydrocyanide, tannin and phytate of *Catharanthus roseus (Sadabahar)* leaves can help in curing diabetes by reducing stress which created by free radical in the individual body. Vitamin C content of *Catharanthus roseus (Sadabahar)* leaves also contributed in increasing resistance to disease and healing of wound respectively thereby improving normal growth of the body cells, skin and proper vision. However, Use of *Catharanthus roseus (Sadabahar)* leaves for patients undergoing diabetic treatment is an effective and cost-saving intervention.

REFERENCES

[1] R.B.Asthana, M.K.Misra; Orally effective hypoglycemic agent from *Vinca rosea*, Indian J.Biochem. Biophys., **16**, 30-35 **(1979)**.

[2] M.S.Blum, J.P.Woodring; Secretion of Benzaldehyde and Hydrogen cyanide by the millipede, Pachyesmus crasicutis, **(1962)**.

[3] C.W.Dickie, R.J.Panciera; Javama J., **173**, 73-74 **(2007)**.

[4] M.Friedman, K.R.Lee, H.J.Kim, I.S.Lee, N.Kozukue; Anticarcinogenic effects of glycoalkaloids from potatoes against human cervical, liver, lymphoma, and stomach cancer cells, J.Agric.Food Chem.J., **53**, 6162-616 **(2005)**.

[5] L.S.Goodman, A.Gilman; Las Bases Farmacológicas da Terapéutica, 10ª Edition, McGraw Hill Interamericana, 1647 **(1996)**.

[6] Gopalan et al.; Nutritive value of Indian foods, NIN, ICMR Hyderabad, 92-94 **(2006)**.

[7] V.Gupta, M.Sharma; Phytochemical Analysis and Evaluation of Antioxidant Activities of Methanolic Extracts of Maytenus Emarginata, **16(5)**, 257-262 **(2012)**.

[8] C.A.Jaleel; Change in non enzymatic antioxidants and ajmalicine production in *Catharanthus roseus* with different soil salinity regimes, Botany Research International, **2(1)**, 1-6 **(2009)**.

[9] M.M.Jones, D.O.Johnson, J.T.Netlerville, J.I.Wood, M.D.Joesten; Chemistry and Society, 5th Edition, Saunders College Publishers U.S.A., 521-577 **(1985)**.

[10] A.Latif, H.Ahmad, S.Begum, M.Adnan, S.Hassian, M.Waseem; Medicinal and other economic plants as substitute to forest logging in Miandam and Sulatanr valleys, Swat, Proceedings of international workshop on conservation and sustainable use of medicinal and aromatic plants in Pakistan, WWF Pak., 101-105 **(2003)**.

[11] R.H.Liu; Potential synergy of phytochemicals in cancer prevention: Mechanism of action, J.Nutr.J., **134**, 3479S EOF-3485S EOF, **(2004)**.

[12] R.N.Morris; Plant for a Future, Charitable Publishers Ltd., England, 20-25 **(2004)**.

[13] R.M.Niranjan, S.Kanaki; Bioactive Molecules and Medicinal Plants, 349-369 **(2008)**.

[14] W.K.Novak, A.G.Haslberger; Food Chem.Toxicol., **38**, 473-483 **(2000)**.

[15] A.T.Oladiji, F.O.Mih; African J.Biotech., **4(12)**, 1440-1441 **(2005)**.

[16] G.I.Onwuka; Food Analysis and Instrumentation, Theory and Practice, Naphthalic Prints, Surulere, Lagos, Nigeria, 219-230 **(2005)**.

[17] C.C.Pamela, A.H.Richard, R.F.Denise; Lippincotts illustrated Reviews Biochemistry, 3rd Edition, Lippincott Williams and Wilkins, Philadelphia, 335-388 **(2005)**.

[18] M.Pandey, A.B.Abidi, S.Singh, R.P.Singh; Nutritional evaluation of leafy vegetable paratha, J.Hum.Ecol., **19(2)**, 155-156 **(2006)**.

[19] D.M.Pereira, J.Faria, P.Valentao, M.Sottomayor, P.B.Andrade; Exploiting *Catharanthus roseus* roots: Source of antioxidants, Journal of Food Chemistry, **6**, 235-242 **(2010)**.

[20] N.D.Prajapati, T.Prajapati; Sustainable cultivation of medicinal plants; okMulti tier agriculture system-A new concept URLwww.technopreneur.net/timeis/technology, **(2002)**.

[21] R.Rahimi, S.Nikfar, B.Larijani, M.Abdollahi; A review on the role of antioxidants in the management of diabetes and its complications, Biomed. Pharmacother.J., **59**, 365-373 **(2005)**.

[22] N.Rasool, K.Jiwan, M.Zubair, K.R.Naveed, Imran, Imran², V.U.Ahmed; Antioxidant potential of different extracts and fractions of *Catharanthus roseus* shoots, International Journal of Phytomedicine, **3**, 108-114 **(2011)**.

[23] C.Sánchez-Moreno; Compuestos polifenólicos: efectos fisiológicos: actividad antioxidante, Alimentaria, **329**, 29-40 **(2002)**.

[24] B.Singh, P.Sangwan; Taxonomy, ethnobotany and antimicrobial activity of Alstonia scholaris (L.) R.Br., Carissa carandas L. and Catharanthus roseus (L.) G.Don, International Journal of Biotechnology and Bioscience, **1(11)**, 102-112 **(2011)**.

[25] M.Valko, D.Leibfritz, J.Moncol, M.T.D.Cronin, M.Mazur, J.Telser; Free radicals and antioxidants in normal physiological functions and human disease, Int.J.Biochem.Cell Biol.J., **39**, 44-84 **(2007)**.

[26] WHO; Guidelines for the Assessment of Herbal Medicines, World Health Organization, Geneva, **(1991)**.

[27] World Health Organization; Vitamin and Mineral Requirements in Human Nutrition, 2nd Edition, http://www.who.int/nutrition/publications/micronutrients/en/index.html, (accessed 15 June 2012), **(2004)**.