Research Article

# Nutritional and Anti Nutritional Constituents of *Plectranthus rotundifolius*

**S. Anbuselvi*, M.Hema priya**
Department of Industrial Biotechnology, Bharath University, Chennai-73, Tamilnadu, India.
***Corresponding author's E-mail:** anbuselvichennai@yahoo.com

**Accepted on:** 01-07-2013; **Finalized on:** 31-08-2013.

**ABSTRACT**

There are so many crops are lost in cultivation due to urban civilization, improper rainfall and non use of fertile lands. One among the lost crop is *Plectranthus rotundifolius* which is commonly called as coleus potato. This plant is cultivated in south Tamilnadu especially in the month of January to May. This plant is cultivated in dry black soil with little amount of irrigation facility. The tuber can be used as an edible food in the form of baking and frying. Coleus potatoes are rich source of reducing sugar, protein, crude fat and crude fiber. There are so many secondary metabolites are present in these tuber which shows therapeutic and pharmaceutical application.

**Keywords:** *Plectranthus rotundifolius*, secondary metabolites, coleus potato, alkaloids.

## INTRODUCTION

*Plectranthus rotundifolius* is a perennial herbaceous plant, rare tuber and its native to tropical Africa, cultivated in various parts of west Africa, south Asia and southeast Asia for its edible tubers. Wild varieties are found in the grasslands of east Africa. In English, *P.rotundifolius* is often called "Coleus potato. In India, it is grown mostly in Kerala, Karnataka and southern Tamil Nadu[1]. Hausa potato is an erect, semi-succulent annual herb. It is bushy from the base, up to 30 cm tall, prostrate or ascending, and has a succulent stem and somewhat thick leaves. "It has small flowers, which are blue, pinkish white or pale violet in a distal inflorescence. The flowers are hermaphroditic, produced on an elongated terminal raceme. Small tubers are produced in clusters at the base of the stem[2].

*P. rotundifolius* is tolerant of high temperatures and rain-fall and prefers well-drained, loose or sandy soil and direct sunlight. It produces less well in the shade or in dense soil. In dry conditions, it may fail to produce tubers. This potato is harvested in south of Tamil Nadu during the month of January-March. Tubers of this potato have special aromatic flavours, taste and are used as vegetable. The tubers are mostly eaten as cooked vegetables. Like potatoes, they may be boiled, baked, or fried[3]. The food-energy content is good as well—almost 400 calories per 100g dry matter in *rotundifolius* tuber.

*Plectranthus rotundifolius* are used to treat stomach pain, nausea, vomiting, diarrhoea, mouth and throat infections and are used as purgative, carminatives and as antihelmintics. *Plectranthus rotundifolius* are the most frequently citied species for the treatment of abdominal pain, burns, wounds, sores, insect bites and allergies. *Plectranthus* is also used to treat nervous and sensory disorders associated with ear and eye problems[5]. The main objective of this study was to analyze the nutritive and anti-nutritive composition of *plectranthus rotundifolius* tuber and its waste.

## MATERIALS AND METHODS

*P.rotundifolius* tuber sample was collected from field during the month of January - March season. Citric acid content of tubers were measured by weighing 10 g of potato tuber and waste were mixed with 200 ml distilled water, boiled for 1 hour, cooled and filtered. 10 ml of filtrate was titrated with 0.1M Sodium hydroxide up to PH 8.1 measured by pH meter. The results were expressed as % Citric acid[6,7]. The reducing sugar content in Chinese potato samples were determined quantitatively by using 3,5, dinitrosalicylic acid[8]. Protein content in potato tuber and was measured by Lowry et.al[9]. Crude fat was determined from Chinese potato tubers. The samples were put into a thimble covered with fat free cotton and then put into Soxhlet apparatus. The flask was filled with 150 $cm^3$ petroleum ether and extraction was done for 16 hours in water bath. The samples were dried at $100^0$ C in oven for one hour, cooled and re-weighed. The difference in weights give the fat soluble materials present in the sample. Crude fiber was determined from the residue after the crude fat determination[10].

### Preparation of extracts

500g of dried form of *P.rotundifolius* tuber was pulverized using an electric blender. The aqueous extract of chinese potato tuber and peel samples were prepared by soaking 100g in 200ml of different solvents namely ethanol, methanol and ethylacetate. The extraction was performed for a period of 24 hours. The crude extract was subjected to centrifugation at 10,000 rpm and supernatant was used to analyze the anti-nutritive content of tuber.

### Test for alkaloids

The extract was dissolved in 2N Hydrochloric acid. The mixture was filtered and the filtrate was divided into three equal portions .First portion was mixed with a few drops of Mayer's reagent to form cream precipitate. Second portion was treated with equal amount of

Dragondroff reagent to get orange precipitate and final portion was mixed with equal amount of Wagner's reagent to form a brown precipitate. All the three tests confirmed the presence of alkaloids[11].

**Test for saponins**

About 0.5ml of extract was mixed with distilled water and shaken well vigorously. Frothing was indicated the evidence of saponins

**Test for tannins**

0.5 ml of extract was dissolved in 10ml of distilled water and filtered. To the filtrate, 0.1% ferric chloride was added drop by drop to get brownish green or black .

**Test for steroids**

To the 2ml of extract and 2ml of acetic anhydride, 2ml of sulphuric acid was added. The Appearance of green color indicates the presence of steroids.

**Test for flavonoids**

2ml of extract was treated with 1.5 ml of 50% methanol solution and heated. To this solution magnesium and few drops of concentrated hydrochloric acid were added. The red color was observed for flavonoids and orange for flavones[12].

**Test for anthocyanin**

1 ml of filtrate was mixed with 5ml of dilute hydrochloric acid. The appearance of pale pink color shows the presence of anthocyanin.

**Test for anthraquinones**

0.5 ml of extract was dissolved in 5ml of chloroform and shaken well for 5 minutes. The extract was filtered. To this filtrate, added equal volume of 10% ammonia solution. A pink violet or red color in ammonical layer indicates the presence of anthraquinones[13].

**Test for phenolic flavonoids**

1 ml of filtrate was mixed with 2ml of 10% lead acetate to form brown color which confirmed the presence of phenolic flavonoids.

**Test for ascorbic acid**

0.1 ml of brominated sample extract was added with 2.9 ml of distilled water. 1 ml of 2% DNPH reagent and 1-2 drops of thiourea were added and incubated at 37°C for 3 hours. The Red osazone crystals were dissolved in 7 ml of 80% sulphuric acid and kept for 5 minutes. The red color indicate the presence of ascorbic acid

**Test for cardiac glycosides**

0.2 g of extract was dissolved in 1 ml of glacial acetic acid containing 1 drop of 1% ferric chloride solution. This was then under layered with 1ml of concentrated sulphuric acid. A brown colored ring was interfaced which showed a characteristic nature of cardiac glycosides.

**Test for tri-terphenoids**

To the 5 ml of the extract, 2ml of chloroform was added. Concentrated sulphuric acid was added along the sides of the test tubes. Reddish brown ring was observed between the two layers.

**Table 1:** Biochemical constituents of *P.rotundifolius*

| Parameters | Tuber | Peel |
|---|---|---|
| Reducing sugar | 26 mg | 21 mg |
| Protein | 13.6 mg | 15.6mg |
| Crude fat | 1.2.% | 0.9 % |
| Crude fiber | 1.6% | 4.8% |
| Citric acid | 0.35% | 0.36% |

**Table 2**: Anti-Nutritional constituents of *P.rotundifolius*

| Phytochemicals | Ethanolic extract | Methanolic extract | Ethyl acetate extract |
|---|---|---|---|
| Alkaloids | +++ | +++ | ++ |
| Saponins | - | - | - |
| Tannins | - | - | ++ |
| Steroids | - | - | + |
| Anthocyanines | + | +++ | ++ |
| Flavonoids | + | ++ | - |
| Anthraquinones | - | - | - |
| Phenolic flavonoids | + | ++ | |
| Ascorbic acid | + | ++ | + |
| Cardiac glycosides | ++ | – | + |
| Tri-terpenoids | - | +++ | ++ |
| Phlobatannins | - | - | + |

## RESULTS AND DISCUSSION

The biochemical constituents of `*P.rotundifolius* was quantitatively assessed. The maximum amount of reducing sugar was observed in tubers. 15.6 mg of protein content and 1.2% of crude fat were found to be higher in tubers than peel. The crude fiber and citric acid present in higher quantity in peel were 4.8% and 0.36% respectively (Table 1). The anti-nutritive components of `*P.rotundifolius* tuber and peel were qualitatively analyzed in Table 2. Alkaloids are a diverse group of secondary metabolites which shows antimicrobial activity by inhibiting DNA topoisomerase[14]. Alkaloids were present in all three sample extracts. The maximum concentration was present in methanolic extract. Saponins are present in plants having anticarcinogenic property[15]. It was absent in ethanolic, methanolic and ethylacetate extracts. Tannin is one of the important secondary metabolite reduces the risk of coronary heart diseases [16]. Tannin was only observed in ethyl acetate extract of tubers.

Steroids play a significant role of anti inflammatory and analgesic agents[17]. It was slightly observed only in ethylacetate extract. Anthocyanins were found to be high in methanol extract and moderately present in ethylacetate extract. Anthocyanins are potential therapeutic role of cardiovascular diseases, cancer, AIDS, nerve disorders and behavioral disorders[18]. This can be useful in controlling oxidative stress during pregnancies. Anthraquinones were absent in all samples. There are many natural antioxidants present in different parts of plants in the form of phenolic compounds such as flavonoids, phenolic acid and tocopherols[19]. These compounds are potential antioxidants and free radical scavengers[20]. Phenolic flavonoids and ascorbic acid were moderately present in methanol extract. Cardiac glycosides were slightly occurring in ethanolic extract. Terpenoids were found to be high in methanolic extract and very little amount in ethylacetate extract. Phlobatannins are rarely present in ethyl acetate extract which shows diuretic property[21].

## CONCLUSION

All plants have nutritional and anti nutritional components which show medicinal property and are utilized for health care and pharmaceutical application. *P.rotundifolius* tuber contains nutritional and large amount of secondary metabolites which helps in improving body immune system and defense against diseases.

## REFERENCES


1. Schippers RR, African Indigenous Vegetables: An Overview of cultural species, third Ed, Natural Resources Institute (NRI), Chatham, UK,2000,43-78.
2. Elizebeth Acheam Pong, Thesis on Tropical crops, University of Ghana, 2010, 12-35.
3. Burkill HM, The useful plants of Tropical West Africa, Vol 3, 1995, Royal botanic Garden.
4. Ojewole GS and Ehiri CG, Evaluation of Living stone and Hausa potato as Energy source for broiler chicken,J.AnimnVet.Adv, 5, 2006, 472-477.
5. Catherine W, Lukhobaa, Monique SJ, Simmonds and Alan, J.Paton, Plectranthus A review of ethnobotanical uses, J.Ethnopharmacology, 103(1), 2006,1-24.
6. Ranganna S, Manual of analysis of fruit and vegetable products, Tata Mc;Graw- Hill publishing , New Delhi,1997.
7. AOAC (Association of Official Analytical Chemists) , 16th Edition, Virginia,1995.
8. Miller GL, Use of Dinitrosalicylic acid for determination of reducing sugar, Anal. Chem, 31, 1972, 426.
9. Lowry HO, Rosenbrough NJ, Farr AL and Randall RJ, Protein measurement with folin phenol reagent, J.Bio.Chem1931951, 265-275.
10. Sadasivam S and Manickam, Biochemical Methods, 2nd Ed, New Age Publishers, 2005.
11. Sofawara A, Medicinal plant and traditional medicine in Africa, John wiley and sons, New York,1993, 50.
12. Trease GE, Evans WC, Pharmacognosy, 11 th Ed, Mac Millan publishers,1989.
13. Harborne JB, Phytochemical Methods, 3rd Ed, Chapmanand Hall, London,1998,1-302.
14. Bonjean K, De pauw-Gillet MC, Plant metabolites, Ethnopharmocol, 69, 1998, 241-248.
15. Rao AV and Sung MK, Saponins as anticarcinogens, J. Nutrition, 1995, 34-38.
16. Janaki Ranjith kumar, Secondary metabolites investigation, J.Chem.Pharm.Res, 2(4), 2010, 371-377.
17. Singh AP, Distribution of steroid like compounds in plant flora, Pharmacognosy magazine, 2006, 56-62.
18. Froytlog, Health promoting properties of fruits and vegetables, 266.
19. Ali SS, Kasoju n, Luthra A, Singh H, Sharanabasava A, Sahuand U, Bora W, Indian medicinal herbs as source of antioxidants, 2006.
20. Cespedes C, Yaldez-Morales M, Avila EL, Hafidi M, Alarcon J and Paredes Lopez O, Phytochemical profile and antioxidant activity of chile and wild black berry fruits, Food chemistry, 1(19), 2010, 886-895.
21. Awoyinka OA, Balogun IO,Ogunnowo AA, Phytochemical screening and in vitro bioreactivity of cnidoscolus aconitifolius, J.Med. plant. Res, 1(3), 2007, 63-65.


**Source of Support:** Nil, **Conflict of Interest:** None.