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Phytochemical Analysis and Assessment of Nutrients present in edible parts of *Colocasia esculenta*

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Abstract : *Colocasia esculenta is a very common herbaceous plant belonging to family Araceae, used mainly as staple food plant in most of the countries worldwide. This plant is acclaimed as a rich source of nutrition and has medicinal importance also. The present study is conducted to phytochemically analyze and assess the primary nutritional elements present in different edible parts of Colocasia. Fresh parts of the plant, tuber, leaf and stem are dried and their crude extract is prepared separately. Primary metabolites like protein, fat, and carbohydrate is detected and their presence is estimated by using different tools and standard techniques. Photochemical screening of primary metabolites shows that leaves are the most nutritive part of the plant. Results from this study indicate that the leaves and tuber of Colocasia esculenta can serve as a good nutritional source in combating malnutrition.*

Keywords: *Colocasia esculenta, phytochemical screening, primary metabolites.*

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Introduction :

Colocasia esculenta is a herbaceous perennial plant. It belongs to family Araceae (Gills, 1998). It is known by several names such as Amadumbe (South Africa), Taro (Pacific Islands), Cocoyam (West Africa) Kachu or Arvi in India. *Colocasia esculenta* originated from Southeast Asia and is reported to be one of the first crops cultivated by man. (Coursy, 1968; Onwueme, 1978; Morren and Hyndman, 1987; Bown, 1988). The edible part of the plant is its tuber and which is considered to be rich source of starch, protein and vitamins. The edible tubers of *Colocasia* are the traditional starch staple of many tropical areas. The

leaf juice is applied over snake bite (Johnson, 1999).

Its growth is best at moderate temperature. The plant can be damaged at very low temperature. The root tuber is planted close to the surface. The first sign of growth appears in 1-3 weeks. The plant grows best in compost rich soil and in shade. Periodic fertilization with a common plant fertilizer increases the productivity of the crop.

An undocumented information shows that *Colocasia* plant causes skin and throat irritation in human being, which suggests the presence of secondary metabolite like calcium oxalate, amylase, protease etc. (Mc Ewen, 2008). Even then this plant is very widely accepted as an important source of nutrition.

Materials and Methods:

The material required for this study was selected from the local area. Tuber, stem and leaves were washed and kept in open air for drying. Dried plant parts were then ground to powder form. It was then dissolved in Methanol solvent in (10/1, w/v) (Chandra, *et al.*, 2012). The mixture was centrifuged at 1048 g (2500 rpm and radius 15 cm) for 5 minutes. The filtrate obtained was used as crude extract and was subjected to different photochemical tests for detection, analysis and assessment of primary metabolites like protein, fat carbohydrate and amino acid.

Test for detection of fat: Thin sections of tuber, stem and leaf were cut and placed in Sudan III for 10 minutes, washed with 10% alcohol and was mounted in glycerin.

Xathoproteic test for protein detection: Three drops of concentrated HNO_3 was added to 2ml extract of tuber, leaf and stem taken in 3 different test tubes. White precipitate was formed in all 3 test tubes on heating. When two drops of concentrated NH_4OH was added, change in colour was observed.

Carbohydrate detection test : Three drops of Benedict's reagent was added to 2 ml extract each of tuber, stem and leaf. On heating gently, change in colour was observed. Orange precipitate was observed in all the 3 test tubes.

Amino acid detection test: Four drops of Ninhydrin reagent was added to 2 ml extract of tuber, stem and leaf sample each and was boiled for 10 minutes. Colour change was observed.

Estimation of protein: Fresh samples (200 mg) of tuber, stem and leaves of *Colocasia* plant were crushed and dissolved in 20 ml acetate buffer solution. Mixture was centrifuged at 1048 g for 5 minutes. 5 ml alkaline reagents were added to all 3 samples separately. After 10 minutes 0.5 ml Folin ciocalteaue reagent was added and the absorbance of the samples were noted by using UV-VIS Spectrophotometer. The concentration of protein was calculated with the help of standard graph prepared with use of BSA.

Estimation of carbohydrate: Fresh samples (25 gm) of tuber, leaf and stem was taken and macerated in 50 ml of 80% ethanol. Mixture was centrifuged at 1048 g for 5 minutes and the supernatant was evaporated till dryness. Dry supernatant was dissolved in 25 ml distilled water and sample solution was obtained. One ml of each sample solution was taken in 3 different test tubes. One ml of 5% phenol and 5 ml concentrated H_2SO_4 was added to the sample solutions. The absorbances of solutions of all the three test tubes were noted at 490 nm, by using UV-VIS Spectrophotometer.

Estimation of free fatty acid: Freshly prepared extract (2.5 ml) in ethanol, of tuber, leaf and stem were taken in three different conical flasks. 25 ml neutral solvent was added to all the flasks. 4 drops of phenolphthalein indicator was added to each flask. It was titrated against 0.1N KOH solution.

Result and Discussion:

Phytochemical analysis of samples showed the presence of primary nutritional elements in all the edible parts of the *Colocasia esculenta* plant. Table 1 shows presence of fat only in tuber and stem as the red stained droplets appeared only in tuber and stem sections but were not clearly visible in leaf section. Protein and carbohydrate were detected in tuber, leaf and stem. Amino acid was not detected in stem. In extracts of tuber and leaf blue colour appeared which indicated the presence of amino acid. Samples of tuber stem and leaf showed yellow colour which later changed to orange colour. Orange colour indicated the presence of protein.

Table 1: Detection of primary metabolites in tuber, leaf and stem

S.N.	Nutrients	Tuber	Leaf	Stem
1	Protein	+	+	+
2	Fat	+	–	+
3	Carbohydrate	+	+	+
4	Amino acid	+	+	–

+ present; – absent

Phytochemical analysis by Spectrophotometer : The results of Table 2 indicated the highest concentration of protein present in leaf sample when plotted on standard graph prepared during the course of study. Concentration of protein in tuber sample was estimated less compared to leaf and more when compared to stem. Maximum concentration of carbohydrate was estimated in the leaf sample. Highest concentration was also observed in leaf.

Table 2: Protein and carbohydrate content in different parts of plant

Plant parts	Protein (µg/ml)	Carbohydrate(µg/ml)
sLeaf	750	1
Stem	201	0.7
Tuber	370	0.9

Phytochemical analysis for lipid content: The result showed that the leaf and tuber samples contained minimum amount of free fatty acids. It was expressed as oleic acid equivalence. The result shown in the Table 3 suggested that there was less free fatty acid content in tuber and leaf which made it suitable for consumption.

Table 3: Free fatty acid in different parts of plant

Plant parts	Acid value	Free fatty acid content
Leaf	0.448	0.0056
Tuber	0.448	0.0056
Stem	0.122	0.14

The results of phytochemical tests show that the tuber, stem and leaf are edible and nutritious parts of *Colocasia esculenta* plant. The primary metabolites like protein and carbohydrate are detected in tuber, leaf and stem. Fat content has not been detected in the leaf sample whereas amino acid has not been detected in stem sample. This finding is similar to the findings of Chandra *et al*., (2012). It has been suggested that the tubers are great source of starch and all the primary metabolites are present in the edible tuber (Chandra, *et al.,* 2012). The present study also reveals maximum concentration of protein and carbohydrate in the leaf sample. Presence of less free fatty acid content in the leaf and tuber sample makes it suitable for consumption. The results of the present work is similar to the findings of work done by Awasthi and Singh, 2000, which suggests that leaves have great nutritional quality. It has been reported that edible tubers are good source of crude protein, fat and crude fibers and therefore, they are consumed worldwide.

Conclusion :

Colocasia esculenta is a plant which is used as a rich source of nutrition worldwide. The results of the research and study conducted on the edible parts of the plant shows that it is the leaf, which is

rich in protein and amino acid whereas the tuber of the plant is a rich source of carbohydrate. Generally tuber is considered to be best suited for dietary use, our study emphasizes on use of leaf of *Colocasia esculenta* more as staple food since it has the highest concentration of protein. Since the plant is very easily cultivated and propagated it should be used in places where condition of malnutrition prevails. It is a known fact that consumption of *Colocasia* irritates our skin and throat due to presence of oxalates, even then it should be consumed due to its high nutritional value.

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