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Phytochemical Screening of *Colocasia esculanta*

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ABSTRACT: Background: The *Colocasia esculenta* belonging to the family *Araceae* and is popularly known as "Taro". This plant has been cultivated widely from ancient times in the tropical and subtropical latitudinal band around the world. The herb has been known since ancient times for its curative properties and has been utilized for treatment of various ailments such as asthma, arthritis, diarrhea, internal hemorrhage, neurological disorders, and skin disorders. The schott tubers is used as a vegetable and considered as a good source of carbohydrate, protein and starch. The tubers can be consumed by baking, roasting, steaming or boiling. It can be fried, preserved, dried, made in to flour or consumed in many other ways. **Aim:** The present study aims at the phytochemical screening of *Colocasia esculenta.* **Results:** Phytochemical analysis revealed the presence of alkaloids, glycosides, flavonoids, terpenoids, saponins and phenols. The tubers are applied locally to painful rheumatic joints, to treat tuberculosis and pulmonary congestion. Alkaloids are also used in medicine for reducing headache and fever. **Conclusion:** Thus it can be concluded that *Colocasia esculenta* is a staple food and also have significant amount of phytochemicals, thus recommended for pharmaceutical industry.

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INTRODUCTIONS:

Herbal plants have played a significant role in maintaining human health and improving quality of human life since long and have served humans well as valuable components of medicines, seasoning, beverages, cosmetics, and dyes. The popularity of herbal medicine in recent times is based on the premise that plants contain natural substances that can promote health and alleviate illness. Therefore, the focus on plant research has increased all over the world and a large body of evidence show immense potential of medicinal plants used in various traditional system [1]. Herbal drugs

or medicinal plants, and their extracts and isolated compounds have demonstrated a wide spectrum of biological activities [2]. Taro (*Colocasia esculenta* L.), a root crop belonging to the *Araceae* family, has been cultivated for many centuries. Originating in Asia, taro is now primarily found in tropical and subtropical regions [3,4]. The historic use and importance of taro can explain the reason of such significant implications in human health.

Taro tubers are rich in starch and the corms contain the anthocyanins, cyanidin 3-glucoside, pelargonidin 3-glucoside, and cyaniding 3-rhamnoside [5]. In common with flavonoids, the related anthocyanins are reputed to improve blood circulation by decreasing capillary fragility [6], to improve eyesight, to act as potent antioxidants, to act as anti-inflammatory agents, and to inhibit human cancer cell growth [7,8]. The corms of taro also contain calcium oxalate, an irritant, which prevents them being eaten raw or incompletely cooked [9]. Tubers are known to supply easily digestible starch, substantial amount of protein, thiamine, riboflavin, niacin, as well as significant amounts of dietary fiber. Leaves of taro are eaten as vegetable by human, possess β carotene, iron, protein, vitamins and folic acid which protects against anemia.

The major nutrient in taro corms is dietary energy. The most abundant minerals in *Colocasia esculenta* are is potassium, phosphorus, magnesium, and calcium. The young leaves are rich in Vitamin C, and the roots are rich in starch. This plant is reported to have antimicrobial and antioxidant activity and anticancer activity [10].

Table 1. Moisture content and total ash value of dried tubers of *Colocasia esculenta*.

Parameters	Value
Moisture content (%)	57
Total ash (%)	1.22
Carbohydrate (mg/g)	3000
Protein (mg/g)	824
Starch (mg/g)	2700

In Present scenario, cancer is one of the dreadful diseases and its occurrence is increasing. In medical science the methods available to treat a cancer patient mainly includes surgery, chemotherapy and radiotherapy etc. As these known methods are very costly and have side effects with limitations of their use, there is need for effective and acceptable cancer therapeutics agents that would be non-toxic, highly efficacious against multiple cancers, palatable, cost effective. Medical plants have created great interest among researchers as they have been proved to possess anticancer activity [11] and have no side effects.

Poi, widely consumed among the people of Hawaii, is actually prepared by mashing boiled taro tubers. It has a paste like texture and delicate flavour. Taro tubers are emerging now as functional foods as they offer high nutritive values and health benefits. The Institute of Medicine's Food and Nutrition Board defined functional foods as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains." Clearly, all foods are functional, as they provide taste, aroma, or nutritive value and now days; there has been an explosion of consumer interest in functional foods [12].

It is a well-known fact that traditional systems of medicines have always played important role in meeting the global healthcare needs. They are continuing to do so at present and shall play major role in future as well. To explore the medicinal importance of taro tuber and leaf this study was undertaken. In this study antimicrobial and antioxidant effect of taro tuber and leaf was checked as well as cytotoxicity against human osteocarcoma cell line was also investigated. Phytochemical constituents of both tuber and leaf extract of this plant was studied and analyzed by TLC and GC-MS.

MATERIALS:

All chemicals, solvents and reagents (Methanol, Ethanol, Mayer's Reagent, Glacial Acetic Acid, Ferric Chloride, Concentrated Sulphuric Acid, Concentrated Hydrochloric Acid, Molish Reagent, Ammonia, Chloroform, Distilled Water and iodine)used in this research study were of analytical grade and procured from authorized dealer.

METHODS:

Collection of plant material:

The fully mature tubers of *Colocasia esculenta* were collected during month of September. The tubers were washed with distilled water and dried at room temperature. The dried tubers were manually ground to a fine powder. Fine powder of tubers was used for the physiochemical analysis.

Nutritive analysis:

Moisture content

Fresh weight of the sample was determined and placed the sample in a hot air oven initially for 1 h at 100ºC and then the dry weight of the sample become constant. The moisture content (MC) was calculated using formula [13], MC = [IW/(IW-FW)] × 100 ..... (1)

Where, IW and FW are initial and final weight in g.

Total ash:

About 5 g of powdered tubers was accurately weighed and taken separately in silica crucible, which was previously ignited and weighed. The powder was spread as a fine layer on the bottom of crucible. The powder was incinerated gradually by increasing temperature to make it dull red hot until free from carbon. The crucible was cooled and weighed. The procedure was repeated to get constant weight. The percentage of total ash was calculated with reference to air dried powder [13].

Extraction and estimation of total soluble carbohydrates Extraction:

About 200 mg sample dried tubers powder was suspended in 1:5(w/v) hot 70 % ethanol and extracted for 10 minutes. The pellet was re-extracted twice with equal volumes of 70 % of ethanol. The ethanol extracts were clarified by centrifugation, pooled and concentrated to 1 to 2 ml evaporations in vacuum. The concentrated ethanol extracts was diluted to 50 ml with distilled water [14].

Estimation:

The total soluble carbohydrate from dried tubers powder were extracted and estimated by the anthrone reagent method using glucose as a standard at 660 nm using a spectrophotometer. The average values were expressed on percentage on dry weight basis.

Table 2: Phytochemical constituents of dried tubers of *Colocasia esculenta*.

Phytochemical components	Methanolic extract	Aqueous extract
Alkaloids	++	++
Glycoside	+	+
Flavonoids	+	+
Terpenes	+	+
Saponins	++	+
Phenol	+	+
Tannins	-	-
Quinones	-	-
Steroid	-	-

Absence (-), Presence (+), fairly good amount (++)

Extraction and estimation of total proteins extraction:

About 200 mg sample of dried tubers powder were taken and was suspended in 1:5% (W/V) phosphate buffer. The extract was removed by centrifugation at 3000 rpm for 10 min. The pellet was washed with phosphate buffer twice and the defatted meal was washed with 100 ml of cold 10 % Trichloro acetic acid (TCA) and centrifuged at 3000 rpm for 15 min. The procedure was repeated, the resulting TCA-washed pellet was suspended in NaOH solution [14].

Estimation:

The proteins separated were estimated after TCA precipitation, as described earlier. The values were expressed as percentage on dry weight basis.

Extraction of tubers of *Colocasia esculenta*:

Each 15 g of air dried powder were taken in 50 ml of methanol and water separately. Plugged with cotton wool and then kept on a rotary shaker at 199 rpm for 48 h. The solvent were evaporated to the final volume one-fourth of the original volume and stored at 4°C in air tight containers. The plant extract used for phytochemical analysis.

Phytochemical screening [13-16]:

The condensed extracts were used for preliminary screening of phytochemical such as alkaloid, glycosides, carbohydrates, flavonoids, terpenes, saponins, phenols, tannins, quinones, and steroids.

Test for Alkaloids:

To reveal the presence of alkaloids, few drops of Mayer's reagent (potassium mercuric iodide) reagent were added to the extract, cream colour precipitate visualises the presence alkaloids.

Test for Glycosides:

To 2 ml of extract, add 1 ml of glacial acetic acid, few drops of 5 % $Fecl_3$ and conc. H_2SO_4 were added reddish brown colour at the junction of two layers and upper layers appears bluish green visualises the presence of glycosides.

To 2.3 ml of extract, few drops of Molisch reagent (α-napthol) was added, shaken well and conc. H_2SO_4 was added from the sides of the test tube, violet ring formation at the junction of two layers visualises the presence of carbohydrates.

Test for Flavonoids:

To the 1 ml of extract few drops of 10 % conc. H_2SO_4 was added and followed by adding 1ml of ammonia,

formation of greenish yellow precipitate visualises the presence of flavonoids.

Test for Terpenes/Terpenoids:

To 2 ml of extract, 5 ml of chloroform and 2 ml of conc. H_2SO_4 was added. Reddish brown colourations of interface visualize the presence of terpenes.

Test for Saponins:

To 2ml of extract add water and shaken vigorously for frothing presence visualize saponins.

Test for Phenols:

To 1 ml of extract add alcohol and few drops of ferric chloride solution is added for the formation of greenish yellow visualize the presence of phenols.

Test for Tannins:

To 1ml of extract, 1 ml of 5 % $Fecl_3$ was added which visualize by the presence of greenish black precipitate.

Test for Quinones:

To 2 ml of extract add conc. HCl by formation of green colour visualises the presence of quinones.

Test for Steroids:

To 2 ml of extract, 1ml of chloroform and drop of glacial acetic acid was added, followed by heating and add conc. H_2SO_4 which visualises by the presence of orange colour (Liebermann Burchard test, Salkowski test and Liebermann's reaction).

RESULTS AND DISCUSSION:

Plants are important sources of potentially bioactive constituents for the developments of new chemotherapeutic agents. The first step towards this goal is the nutritional profile and phytochemical screening. Phytochemicals are nonnutritive plant chemicals that have protective or disease preventive properties; they are found generally in plants. Phytochemicals can have complementary and overlapping action including antioxidants, modulation of detoxification enzymes and reduction of inflammation, modulation of steroid metabolism, antibacterial and antiviral effects in humans. *Colocasia esculenta* tubers contain moisture content (56.8 %), ash content (1.22 %), carbohydrate (3000 mg/gm), protein (824 mg/gm) and starch (2700 mg/gm). It contains high nutritive value.

Qualitaive phytochemical screening of *Colocasia esculenta* tubers in methanolic and aqueous extract showed that alkaloids, glycosides, flavonoids, terpenes, saponins and phenol are present. The results also revealed the absence of tannins, quinines and steroid in both the extracts. Alkaloids and saponins are significantly present in the methanolic extract of *Colocasia esculenta* tubers. Glycoside, flavonoids, terpenes and phenols are also noted. This study also revealed the absence of tannins, quinines and steroids in methanolic extract. It was indicated that aqueous extract of tubers shoes significant presence of alkaloids. Glycosides, flavonoids, terpenes, saponins and phenols are moderately present. Tannins, quinines and steroids are absent in the same extract.

CONCLUSION:

The present study concluded that the tubers of *Colocasia esculenta* contain high nutritive value. This plant contains alkaloids, glycosides, flavonoids, terpenes, saponins and phenols as phytoconstituents which could be helpful for treatment of several diseases like cardiovascular diseases (Alkaloids). Thus *Colocasia esculenta* could be recommended for Pharmaceutical Industry. Further study has to be done on analytical aspects of this plant constituents and their correlation with pharmacological effects.

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