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Review Paper

A Review on Colocasia esculenta: Botanical Features to Pharmacological Significance

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ABSTRACT

The herb Colocasia esculenta is used in traditional medicine. These are found all over the world and are cultivated for their tasty corms and leaves in an environment that is damp and rainy. This plant has been utilized for its therapeutic qualities and to treat baldness and bodily aches. These are excellent providers of vitamins, minerals, fiber, potassium, and carbs. Antimicrobial, antihepatotoxic, anti-diabetic, anti- lipid peroxidative, antimetastatic, antifungal, and anti- inflammatory properties are all present in the complete plant. Leaf juice serves as a good stimulant, expectorant, astringent, appetizer, and otalgia in addition to being utilized to maintain healthy mucous membranes, skin, and vision. It is also used to prevent malignancies of the mouth and lungs. Along with its nutritional benefits, it plays a part in sustainable agriculture and food security, particularly in developing tropical countries. The plant is a new crop of scientific and commercial interest because of its capacity to adapt to a variety of climatic conditions and its prospective applications in pharmaceutical formulations, nutraceuticals, and functional foods..

INTRODUCTION

Colocasia esculenta Linn.:

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Figure 1: *Colocasia esculenta* plant leaves.

Colocasia esculenta (commonly known as taro), a member of the Araceae family, is an ancient crop cultivated throughout humid tropical regions for its edible corms and leaves, as well as its traditional and ceremonial uses. It is believed to have originated in India, from where it spread eastward to Burma (Myanmar) and China, and southward to Indonesia, eventually reaching Melanesia and Polynesia.

Colocasia esculenta is a nutrient- rich food source, providing carbohydrates, dietary fiber, minerals (including potassium), and vitamins, making it both a therapeutic and nutritional plant of importance.[1]

Table No. 1: Different vernacular names of *Colocasia esculenta* in India [2]

Names	LANGUAGES
Taro	English
Aravi	Hindi
Alupam	Sanskrit
Alavi	Gujatati
Alu	Marathi
Sempu	Tamil

Table No. 2: Different vernacular names of *Colocasia esculenta* in the various countries other than India [3]

Name	Country
Dmmbhe	Republic of South Africa
Cocoyam	Ghana
Ndalo	Fiji
Taro	Tahiti
Talo	Samoa

TAXONOMICAL CLASSIFICATION [4,5]:

- **Kingdom:** Plantae
- **Subkingdom:** Tracheobionta
- **Superdivision:** Spermatophyta
- **Division:** Magnoliophyta
- **Class:** Liliopsida
- **Subclass:** Arecidae
- **Order:** Alismatales
- **Family:** Araceae (Arums)
- **Genus:** *Colocasia* Schott
- **Species:** *Colocasia esculenta Linn.*

PHYTOCHEMICAL CONSTITUENTS:

Phenolic and Tannin Content

The total phenolic content of *Colocasia esculenta* leaves was determined using the Folin– Ciocalteu assay, while tannin content was estimated through a modified vanillin method.[6]

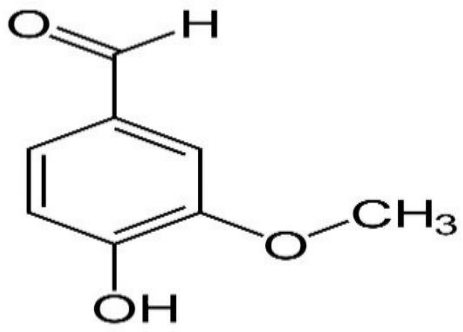

Figure 2: Structure of Vanillin

Carbohydrates and Starch:

Colocasia esculenta is notably rich in carbohydrates, consistent with reports from the food and Agriculture Organization (FAO). The corms contain 70-80% starch, with small granules that contribute to high digestibility. Owing to these properties, taro starch is recommended for patients suffering from peptic ulcers, pancreatic disorders, inflammatory bowel disease, and gallbladder ailments. Among organic acids, malic acid predominates (≈60%), followed by citric acid (≈25%) and oxalic acid (≈15%). [7,8]

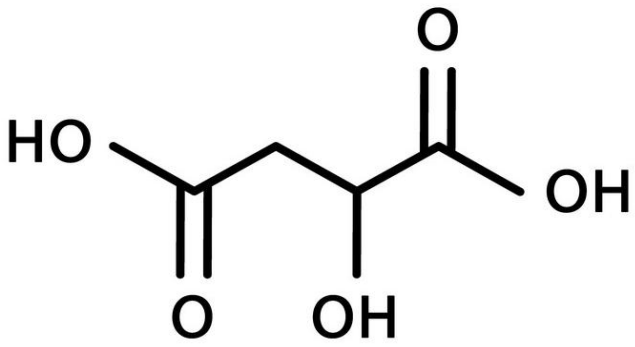

Figure 3: Structure of Malic acid

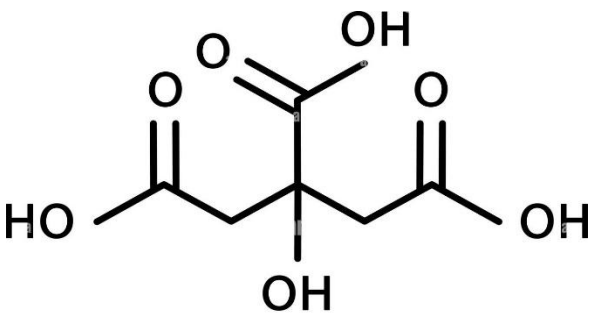

Figure 4: Structure of Malic acid

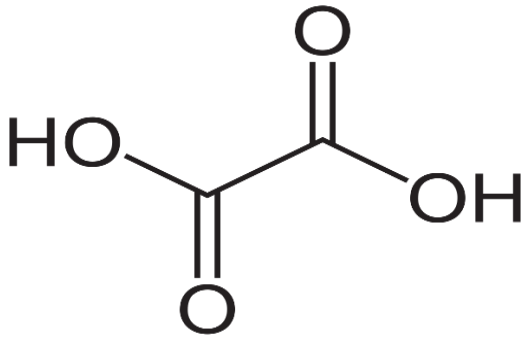

Figure 5: Structure of Oxalic acid

Moisture Content:

The moisture content of taro varies depending on the variety, growth conditions, and harvest time, typically ranging between 60-80%. [9]

Protein:

Taro exhibits higher protein content than many other root crops. This is attributed to symbiotic soil bacteria associated with its roots and rhizomes, which fix atmospheric nitrogen and enhance its nitrogen content. These bacteria also act as natural growth promoters by releasing hormones that stimulate root and plant development. Such symbiosis supports taro's adaptability to a wide range of ecological and environmental conditions, providing both agricultural and ecological benefits.[10]

Total ash:

Taro possesses a moderate ash content, ranging from 3.54% to 7.74%, indicating its substantial mineral composition. [11]

Flavonoids:

The flavonoid concentration was measured colorimetrically as per the Zhishen et al. method. UV spectral analysis confirmed the presence of eight major flavonoids: orientin, isoorientin, isovitexin, vicenin-2, orientin-7-O-glucoside. [12]

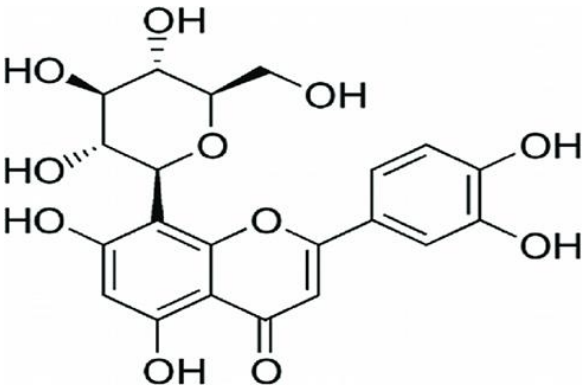

Figure 6: Structure of Orientin.

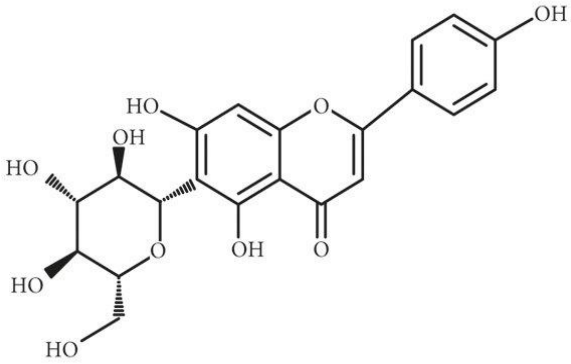

Figure 7: Structure of Isoorientin.

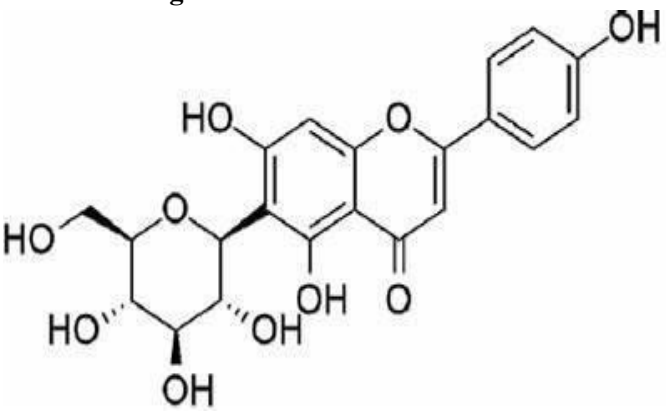

Figure 8: Structure of Isovitexine.

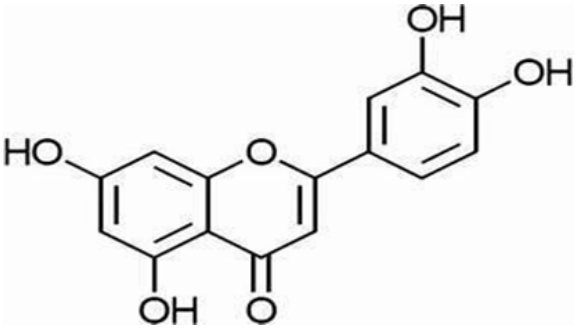

Figure 9: Structure of Luteolin.

Anthocyanins:

Chromatographic and spectrophotometric studies identified three key anthocyanins in the leaf extract cyanidin-3-glucoside, pelargonidin-3-glucoside and cyanidin-3-rhamnoside. [13]

Figure 10: Structure of Cyanidin-3-glucoside

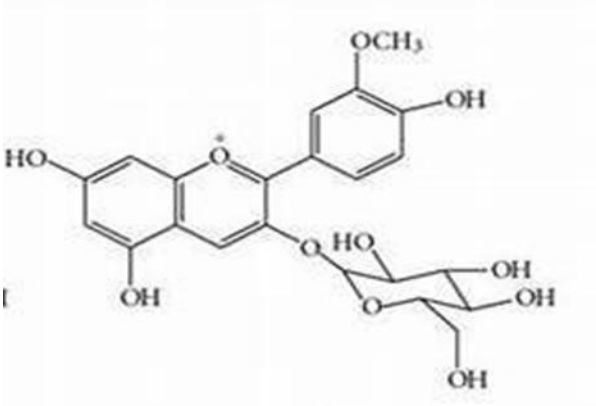

Figure 11: Structure of Pelargonidin-3-glucoside.

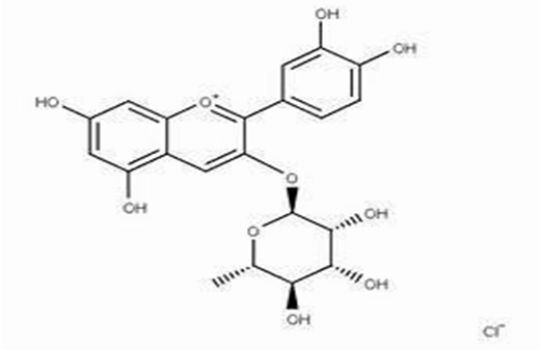

Figure 12: Structure of Cyanidin-3- rhamnoside.

Oxalate content:

The total oxalate content in the corms of *Colocasia esculenta* ranges from 33 to 156mg per 100g of fresh weight. [1]

PHARMACOLOGICAL ACTIVITIES:

- Antidiabetic/Hypoglycemic
- Antimicrobial

- Anti- lipid per oxidative
- Antifungal
- Anti- inflammatory
- Nervine tonic
- Hepatoprotective/ Antihepatotoxic
- Anticancer

Antidiabetic / Hypoglycemic Activity:

The antidiabetic potential of the ethanolic extract of *Colocasia esculenta* leaves was evaluated using an alloxan-induced diabetic rat model. The study assessed both blood glucose levels and body weight in treated animals. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, saponins and tannins, with flavonoids being the major constituents of the ethanolic extracts. [14]

These bioactive compounds are known to exert hypoglycemic effects by enhancing insulin secretion, improving glucose utilization, and inhibiting intestinal glucose absorption. The study concluded that the hypoglycemic activity of Colocasia esculenta may be attributed primarily to its flavonoids, alkaloids, saponins, and tannins. [15]

Antimicrobial Activity:

The aqueous extract of *Colocasia esculenta* (AECE) leaves demonstrated significant antimicrobial activity when tested using the agar well diffusion method. The extract was evaluated against Gram-positive bacteria (Bacillus subtills, Streptococcus mutans), Gram- negative bacteria (Klebsiella pneumoniae, Pseudomonas fragi, Escherichia coli), and fungal strains (Aspergillus niger, Candida albicans).

The results revealed that AECE possesses broad-spectrum antimicrobial properties, supporting its traditional use in treating infections and supporting its potential for developing plant-based antimicrobial agents. [16,17]

Anti- Lipid Peroxidative Activity:

The anti-lipid peroxidative potential of *Colocasia esculenta* leaves was studied using rat liver slices in vitro. The liver slices were incubated with cytotoxic concentrations of carbon tetrachloride (CCl4) and acetaminophen (paracetamol), both known to induce oxidative stress in hepatocytes.

Co-incubation of the hepatotoxin-treated liver slices with taro leaf juice significantly reduced lipid peroxidation, indicating potent free radical scavenging activity. This suggests that *Colocasia esculenta* leaf juice effectively neutralizes reactive oxygen species (ROS) generated during the metabolism of CCl4 and paracetamol, thus protecting liver cells from oxidation damage. [18,19].

Antifungal Activity:

The ethanolic leaf extract of *Colocasia esculenta* was evaluated for antifungal, coupled with molecular cloning and recombinant gene expression studies. A cDNA clone (CeCPI) encoding a phytocystatin protein was isolated from the plant's corms using degenerate primers, reverse transcription-polymers chian reaction (RT-PCR), and 5'/3' rapid amplification of cDNA ends (RACE).

The recombinant CeCPI protein exhibited cysteine protease inhibitory activity, which plays a role in defense mechanisms against fungal pathogens. These findings highlight the biotechnological and pharmacological significance of Colocasia esculenta in antifungal therapy. [20]

Nervine Tonic Activity:

The hydroalcoholic leaf extract of *Colocasia esculenta* was tested for neuropharmacological activities in adult Wistar albino rats. Behavioral assessments were performed using the Elevated Plus Maze (EPM) test, a standard model for studying anxiolytics and antidepressant effects.

The results indicated that the extract exhibited antidepressant, anxiolytic, sedative, and smooth

muscle relaxant properties. These finding validate the traditional use of *Colocasia esculenta* as a nervine tonic and suggest its potential role in managing neurological and mood disorders. [21]

Hepatoprotective / Antihepatotoxic Activity:

The aqueous extract of *Colocasia esculenta* leaves was evaluated for hepatoprotective effects against thioacetamide (TAA) induced liver toxicity in rats. TAA is a well- known hepatotoxin that disrupts liver function and elevates hepatic enzyme levels. [22]

In untreated rats, TAA administration significantly increased aspartate transaminase (AST), alanine transaminase (ALT), and alkaline phosphatase (ALP) levels key markers of liver injury [34]. Treatment with *Colocasia esculenta* leaf extract effectively reduced ALT, AST, and ALP levels, demonstrating its ability to restore normal liver function and protect hepatocytes from oxidative and chemical damage. [23]

Anticancer Activity:

The anticancer potential of *Colocasia esculenta* was investigated against YYT colon cancer cell lines. The incorporation of 3H-thymidine was used as an indicator of DNA synthesis and cell proliferation. The extract significantly inhibited cell multiplication, suggesting a potential cytostatic or cytotoxic effect on cancer cells. [24]

THERAPEUTIC USES:

Different parts of *Colocasia esculenta* including its leaves, stems, and tubers exhibit a broad spectrum of medicinal and therapeutic properties. Traditionally, the entire plant has been employed for its antimicrobial, anti-hepatotoxic, antidiabetic, anti-lipid peroxidative, anti-metastatic, antifungal, and anti-inflammatory effects. [25,26]

In folk medicine, *Colocasia esculenta* has been used to prevent malignancies of the mouth and lungs. The leaf juice or hydroalcoholic extract is reported to possess sedative, anxiolytic, antidepressant, and smooth muscle relaxant activities, validating its use as a nervine tonic.

The corm juice is traditionally applied to relieve body aches and external baldness (alopecia), while internally it acts as a galactagogue, laxative, demulcent, and anodyne. It is also used to manage piles and portal system congestion

The pressed juice of the petiole, known for its styptic properties, is applied topically to arrest arterial bleeding. Similarly, the infusion of the peel is used to treat diarrhea, promote weight gain, and reduce excess phlegm secretion in individuals with asthma. The plant is also regarded as a stimulant and rubefacient, and has been applied to relieve internal hemorrhages and earaches.

From an industrial perspective, the starch and gum derived from the tubers have promising applications in pharmaceutical formulations serving as binders, matrix-forming agents, and thickening agents in dosage forms.

The leaf juice is known for its astringent, expectorant, appetizer, stimulant, and otalgic (pain- relieving for earache) properties. Moreover, the cooked mucilage from the plant acts as a nervine tonic, supporting the nervous system. The juice from the petioles, when combined with salt, is traditionally used as an absorbent for swollen lymph nodes and inflamed glands.

Overall, *Colocasia esculenta* has long been valued in traditional medicine for its therapeutic versatility, contributing to both internal and external treatments of a wide variety of ailments. [27,28]

CONCLUSION:

Colocasia esculenta is widely utilized across the world as both a nutritious dietary component and a traditional medicinal plant. Various parts of the plant from leaves to tubers are employed for multiple therapeutic purposes such as, antidiabetic, antimicrobial, anti-lipid per

oxidative, antifungal, anti-inflammatory, nervine tonic, hepatoprotective or antihepatotoxic, anticancer.

The review emphasizes the Taxonomical classification, phytochemical constituents, pharmacological activities, and therapeutic uses of *Colocasia esculenta.* The plant is known to contain diverse bioactive constituents such as phenols, steroids, alkaloids, flavonoids, terpenes, and glycosides.

Despite promising results, further in-depth studies including toxicological assessments, clinical evaluations, and mechanistic investigations are necessary to fully validated these traditional claims and to harness the plant's therapeutic potential for modern medical applications.

REFERENCES

1. Quero-García J, Courtois B, Ivancic A, Letourmy P, Risterucci AM, Noyer JL, Feldmann P, Lebot V. First genetic maps and QTL studies of yield traits of taro (Colocasia esculenta (L.) Schott). Euphytica. 2006 Sep;151(2):187-99.
2. Khatun S, Hossain SM, Saha P. An Overview of Taro (Colcasia Esculenta). Research Journal of Medicinal Plants in Ayurveda.;1(1).
3. Lad SS, Kolhe SU, Devade OA, Patil CN, Nalawade RD, Rode MR. A Review on Medicinal properties of Colocasia esculenta Linn. Research Journal of Pharmacology and Pharmacodynamics. 2023 Aug 7;15(3):2321-5836.
4. Temesgen M, Retta N. Nutritional potential, health and food security benefits of taro Colocasia esculenta (L.): A review. Food Science and Quality Management. 2015 Jun;36(0):23-30.
5. Lebot V. Biomolecular evidence for plant domestication in Sahul. Genetic resources and crop evolution. 1999 Dec;46(6):619-28.
6. Savage GP, Dubois M. The effect of soaking and cooking on the oxalate content of taro leaves. International journal of food sciences and nutrition. 2006 Jan 1;57(5-6):376-81.
7. Roots T. Plantains and Bananas in Human Nutrition. Rome: Food and. 1990.
8. AC A. Association of official analytical chemists. Official methods of analysis of AOAC International. 1990.
9. Arnavid-Vinas, M. D. R., and K. Lorenz. "Pasta products containing taro." (1999).
10. Lucy M, Reed E, Glick BR. Applications of free living plant growth-promoting rhizobacteria. Antonie van leeuwenhoek. 2004 Aug;86(1):1-25.
11. Huang AS, Tanudjaja LS. Application of anion-exchange high-performance liquid chromatography in determining oxalates in taro (Colocasia esculenta) corms. Journal of agricultural and food chemistry. 1992 Nov;40(11):2123-6.
12. Mitharwal S, Kumar A, Chauhan K, Taneja NK. Nutritional, phytochemical composition and potential health benefits of taro (Colocasia esculenta L.) leaves: A review. Food Chemistry. 2022 Jul 30;383:132406.
13. Noda Y, Kaneyuki T, Mori A, Packer L. Antioxidant activities of pomegranate fruit extract and its anthocyanidins: delphinidin, cyanidin, and pelargonidin. Journal of agricultural and food chemistry. 2002 Jan 2;50(1):166-71.
14. Catapano AL. Antioxidant effect of flavonoids. Angiology. 1997 Jan;48(1):39-44.
15. Nogodula JN, Draug JM, Jamero MS, Suyom CL. Phytochemical and antibacterial action of taro (Colocasia esculenta, Araceaea) aqueous-ethanolic leaf extract against selected bacterial strains. UIC Res J. 2012;1:221-36.

16. Al-Kaf AG, Al-Deen AM, ALhaidari SA, Al-Hadi FA. Phytochemical analysis and antimicrobial activity of colocasia esculenta (taro) medicinal plant leaves used in folk medicine for treatment of wounds and burns in Hufash district al Mahweet Governorate–Yemen. Universal Journal of Pharmaceutical Research. 2019 May 5.
17. Patil BR, Ageely HM. Anti-lipid peroxidative activity of Colocasiaesculenta leaf juice against CCL 4 and acetaminophen mediated cell damage. International Journal of Pharmaceutical Applications. 2011;2(3):141-9.
18. Neyrinck AM, Gomez C, Delzenne NM. Precision-cut liver slices in culture as a tool to assess the physiological involvement of Kupffer cells in hepatic metabolism. Comparative Hepatology. 2004 Jan 14;3(Suppl 1):S45.
19. Yang AH, Yeh KW. Molecular cloning, recombinant gene expression, and antifungal activity of cystatin from taro (Colocasia esculenta cv. Kaosiung no. 1). Planta. 2005 Jun;221(4):493-501.
20. Kalariya M, Parmar S, Sheth N. Neuropharmacological activity of hydroalcoholic extract of leaves of Colocasia esculenta. Pharmaceutical biology. 2010 Nov 1;48(11):1207-12.
21. Alkiyumi SS, Abdullah MA, Alrashdi AS, Salama SM, Abdelwahab SI, Hadi AH. Ipomoea aquatica extract shows protective action against thioacetamide-induced hepatotoxicity. Molecules. 2012 May 22;17(5):6146-55.
22. Bhadauria M, Shukla S, Mathur R, Agrawal OP, Shrivastava S, Johri S, Joshi D, Singh V, Mittal D, Nirala SK. Hepatic endogenous defense potential of propolis after mercury intoxication. Integrative Zoology. 2008 Dec;3(4):311-21.
23. Chinonyelum AN, Uwadiegwu AP, Nwachukwu OC, Emmanuel O. Evaluation of hepatoprotective activity of Colocasia esculenta (L. Schott) leaves on thioacetamide-induced hepatotoxicity in rats. Pak J Pharm Sci. 2015 Nov 1;28(6 Suppl):2237-41.
24. Brown AC, Reitzenstein JE, Liu J, Jadus MR. The anti-cancer effects of poi (Colocasia esculenta) on colonic adenocarcinoma cells in vitro. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives. 2005 Sep;19(9):767-71.
25. Prajapati R, Kalariya M, Umbarkar R, Parmar S, Sheth N. Colocasia esculenta: A potent indigenous plant. International Journal of Nutrition, Pharmacology, Neurological Diseases. 2011 Jul 1;1(2):90-6.
26. Reyad-ul-Ferdous M, Arman MS, Tanvir MM, Sumi S, Siddique KM, Billah MM, Islam MS. Biologically potential for pharmacologicals and phytochemicals of medicinal plants of Colocasia esculenta: A comprehensive review. American Journal of Clinical and Experimental Medicine. 2015;3(5-1):7-11.
27. Keshav A, Sharma A, Mazumdar B. Phytochemical analysis and antioxidant activity of Colocasia esculenta (L.) leaves. International Journal of Chemical and Molecular Engineering. 2019;13(1):20-3.
28. Lim TK. Edible medicinal and non-medicinal plants. Dordrecht, The Netherlands:: Springer; 2012.

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