



A STUDY ON NUTRITIONAL COMPONENTS OF THE LEAF AND STEM OF *ALOCASIA INDICA* L.

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ABSTRACT:

Plants are one of the most essential elements on the environment and an important resource for human being. Plants provide food materials for human and animals. *Alocasia indica* a medicinal plant locally known as “Maan kochu” is found everywhere in Bangladesh and many other countries of the world. The present study includes nutritional analysis of *Alocasia indica* leaves and stem. From nutritional investigation the proximate composition of moisture, ash, lipid, total sugar, reducing sugar, non-reducing sugar, crude fibre, starch, total phenols, vitamin C, vitamin B₁ and vitamin B₂ content of leaves were 82.8%, 23.2%, 2.39%, 63.4%, 17.62%, 43.49%, 9.5%, 16.8%, 6.0%, 23.53%, 0.12% and 0.05% respectively. On the other hand, moisture, ash, lipid, total sugar, reducing sugar, non reducing sugar, crude fibre, starch, total phenols, vitamin C, vitamin B₁ and vitamin B₂ content of stem were 75.2%, 14.5%, 1.44%, 72.3%, 12.76%, 56.56%, 7.2%, 17.59%, 10.84%, 3.14%, 0.09% and 0.03% respectively. Also leaves and stem were found rich in Iron content. The leaves and stem also contains Ca, K, P, and Na in significant amount.

KEYWORDS: *Alocasia indica*, Leaves and Stem, Nutrient.

INTRODUCTION

Nutrient analysis refers to the process of determining the nutrient content of food and food products. Nutrition is not just a food science; its depth has spread beyond the scope of modern scientist's knowledge. Nutrition is the key aspect for health, growth, well-being and

development. Plant nutritional analysis is going on for decades and providing major contributions in Science and health. Still, there are many plant species without any nutrient composition record. *Alocasia indica* is one of the oldest and popular herbal plants rich in much notable in health benefiting. Also it is the most familiar and

widely distributed plants in Bangladesh. *Alocasia indica* may contribute a lot by providing essential nutrient compositions of different herbal medicines for different ailments. Literature survey revealed that the plant contains flavonoids, alkaloids, cyanogenic glycosides, steroids, gallic acid, succinic acid, ascorbic acid, amino acids, oxalic acid^[1] and alocasin.^[2] Study has yielded alocasin, an antifungal and protein. According to some studies, different parts of this plant are traditionally used as hepatoprotective, antioxidant, analgesic, antiarthritic, anti-inflammatory, antitumor and antipyretic.^[1] It has been also reported to use in the treatment of diabetes mellitus and piles.^[3] Alcoholic extracts of *Alocasia* leaves were evaluated for antimicrobial,^[4] antidiarrheal,^[5] antioxidant,^[6] anti-inflammatory,^[6] and anthelmintic^[7] properties. Seeds extract is reported for its antifungal activity.^[8] At present research is focused on the medicinal properties of this plant focusing on its use as an antioxidant, anti-hypoglycemic agent, immune system modulator etc.

In Bangladesh, *Alocasia* extracts have been used in the treatment of diabetes. Stem juice is applied to prevent edema, pain, and bleeding from cuts and wounds. Whole plant is used for pus in the ears, jaundice, and constipation. In Java, chopped roots and leaves applied to painful joints. In India, rhizomes are rubefacient,

employed as external stimulant and for fevers. In Vietnam *Alocasia* extracts are used to treat inflammation, eczema and abscesses.

It is strange in fact that no scientific data has so far been found on the physico-chemical properties and nutritive values of *Alocasia indica* leaves and stem. In this study, we have determined the nutrient composition of the leaves and stems of *Alocasia indica* in Bangladesh.

MATERIAL AND METHODS

Plant material collection

Fresh leaves and stems of *Alocasia indica* were collected from Meherchandi area, Rajshahi, for experimental purpose. The leaves and stem were separated manually from the plants and washed several times with tap water to remove the foreign materials. Afterwards, the leaves and stems were stored for experimental purpose.

Nutrient analysis

We measured the pH of the leaf and stem extracts by Standard Operating Procedure for calibration and maintenance of pH Meters.^[9] Moisture content was determined by the Oven drying method. Ash and crude fibre content were determined by the A.O.A.C method.^[10] Water-soluble proteins content of *Alocasia indica* leaves and stem were determined by the Lowry method.^[11] Lipid content of

the *Alocasia indica* leaves and stem were determined by the method of Bligh and Dyer.^[12] Total sugar content of *Alocasia indica* leaves and stem were determined spectrophotometrically by the Anthrone method.^[13] Reducing sugar content of the *Alocasia indica* leaves and stem were determined by Dinitrosalicylic acid method.^[14] Non-reducing sugar content was determined by the Rangama method.^[15] The starch content of the *Alocasia indica* leaves and stem were determined by the Anthrone method.^[16] Total phenol content of *Alocasia indica* leaves and stem were determined by Folin-Ciocalteu's method.^[17] Vitamin C content of sample was determined by the titrimetric method.^[18] Vitamin B₁ and Vitamin B₂ content of *Alocasia indica* leaves and stem were determined by the method of Anon.^[19] All nutrient content were determined by standard operating condition and the results have been recorded as milligram per hundred grams (mg/100gm) on dry weight basis.

The mineral content of *Alocasia indica* leaves and stem were determined by flame photometer and atomic absorption spectrophotometer (Hitachi Z-2000, Japan) by standard operating condition and the results have been recorded as milligram per hundred grams (mg/100gm) on dry weight basis.

RESULTS AND DISCUSSION

pH content of *Alocasia indica* leaves and stem are shown in the Table 1. The pH of *Alocasia indica* leaves and stem were 6.32 and 6.26 respectively. The results indicate that the leave and stem of *Alocasia indica* are in the slightly acidic range of the pH scale. The moisture content of *Alocasia indica* leaves and stem were found about 82.8% and 75.2% as shown in Table1. The results reveal that the moisture content of *Alocasia indica* leaves greater than stem. Moisture is necessary for most of the physiological reaction in plant tissues. Moisture plays an important role in the growth activities of plants. Water is indispensable for the absorption and transport of food, to carry out photosynthesis, to metabolize materials and to regulate moisture in plants, as in all other living systems. It contributes as much as to the essential properties of life as do the other constituents like carbohydrate, protein. Therefore in the present study moisture contents in both leaves and stem were determined.

Most of the inorganic constituents or minerals are present in ash. The ash content of *Alocasia indica* leaves and stem are given in the Table 1. The ash content was observed 23.24% and 14.52% in leaves and stem respectively. The result suggesting that the ash content is almost greater in leaves than the stem. The amounts of water-soluble protein present in the *Alocasia indica* leaves and stem are

shown in the Table 1. The *Alocasia indica* leaves and stem contained 50% and 24.6% protein respectively. It shows the highest amount of water soluble protein was present in leaves than stem of *Alocasia indica*. Protein plays an important role in all the biological processes. The protein constituents of fruits and vegetables, although occurring in low concentration, are of primary importance not only as component of nuclear and cytoplasmic structures, but also including, as must be full complement of enzymes involved in metabolism during growth, development, maturation of fruit and vegetables. In defense mechanisms involving the protein gamma-globulins of blood and in blood clotting by prothombin, and fibrinogen.

Fats are concentrated form of energy and are important as carrier of certain fat-soluble vitamins such as, A, D, E and K. Lipid is more useful in animal body. Fats serve as efficient source of energy and insoluble material. Dietary fat helps in the adsorption of fat soluble vitamins, lipoproteins are important cellular constituents. Lipids are essential components of cell membrane, source of metabolic energy for cell maintenance, reproduction and embryogenesis in insects. Lipid contents of *Alocasia indica* leaves and stem are presented in Table 1. The present data clearly indicate that *Alocasia indica* leaves and stem contained very little amount of lipid. The lipid content was

highest at the leaves i.e. 2.39% while the stem contains 1.44%.

The main components of crude fibres are cellulose and lignin and it has pronounced effect on digestion and absorption of nutrients. The crude fiber content is commonly used as a measure of the nutritive value of poultry and livestock feeds and also in the analysis of various foods and food products to detect adulteration and quantity. As shown in the Table 1, the highest amount of crude fibers was present at the leaves i.e. 9.50%, and stem 7.20% respectively.

Phenolic-compound is distributed in the plant kingdom, and they are particularly prominent in fruits and vegetables where they are important in determining color and flavor. [20] Phenol content of *Alocasia indica* leaves and stem presented in Table 1. The result shows that the highest amount of phenol was present at the stem i.e. 10.84% compared with the leaves sample which about 6%. Some researchers for organic farming claim that organically grown potatoes, oranges, and leafy vegetables have more phenolic compounds and these may provide antioxidant protection against heart disease and cancer. [21] As they are present in food consumed in human diets and in plants used in traditional medicine of several cultures, their role in human health and disease is a subject of research. Total sugar, reducing and non-reducing sugar and Starch

contents of *Alocasia indica* leaves and stem are shown in Table 2. The amount of total sugar present in *Alocasia indica* leaves and stem were 63.4% and 72.3% respectively. The highest amount of total sugar was found in stem than the leaves. Leaves contained 17.62% reducing sugar, and stem contained 12.76% reducing sugar. The result shows that high amount of reducing sugar was present in leaves than the stem. Non reducing sugar content of leaves and stem were 43.49% and 56.56% respectively. Starch is stored carbohydrate of chlorophyll containing plants. In plant, the starch is land down in the cells in granules. It is formed by α -glycoside chain. In the leaves the amount of starch was present about 16.80% and in the stem about 17.59%. The result suggested that starch content of *Alocasia indica* leaves and stem were approximately same.

Glucose is the most commonly encountered carbohydrate. It is also a simple sugar and the most important facilitator of our bodily processes. Glucose is essential for a healthy, functioning body, but too much glucose can cause hyperglycemia, a condition in which our body has too much sugar in the blood without enough insulin to manage it. However, a glucose deficiency can cause our body to overreact when it finally gets glucose. It's best to maintain balanced levels of glucose whenever possible, neither high nor low. The increases in

reducing sugar were due to enzymatic conversion of starch to reducing sugar and also conversion of some non-reducing sugar. If we eat sugar with a starch, our body will use the sugar as energy and store the starch. If not used, that stored starch will turn into fat. This is because sugar is easier for the body to metabolize into energy. Because it is easier, and because it metabolizes quickly, it is one of the best sources of energy for your body when consumed in moderation. According to the results *Alocasia indica* will be the good source of sugar as plant source.

The amounts of vitamin C, vitamin B₁ and vitamin B₂ present in *Alocasia indica* leaves and stem are given in the Table 3. The result shows that the vitamin C content of leaves was higher 23.53% compared to the stem about 3.142%. Vitamin B₁ content of leaves was 0.12% and stem about 0.09% and vitamin B₂ content of leaves was 0.05% and stem 0.03%.

Vitamins are essential in maintaining our body's health. Our body requires that certain vitamins and minerals be present to maintain critical systems including our organs, skin, bone, and muscle. Vitamins also provide assistance in using chemical energy obtained from food to help process carbohydrates, proteins and fats. Vitamins are generally obtained from the food that we eat or supplements.

Vitamin C takes part in the formation of tissue collagen. Recent

research has established the role of ascorbic acid in the conversion of folic acid to a physiologically active form tetrahydrofolic acid. Vitamin C also involves in oxidation reduction reaction in cells. Ascorbic acid plays an important role in the metabolism of plants. Ascorbic acid reduces quinines to phenol and this reaction has got much attention in defense mechanism.

Thiamine is a vitamin, also called vitamin B₁. People take thiamine for conditions related to low levels of thiamine (thiamine deficiency syndromes) including beriberi and inflammation of the nerves outside the brain (peripheral neuritis) associated with pregnancy or with a vitamin-deficiency disease called pellagra. Thiamine is also used for digestive problems including poor appetite, ulcerative colitis, and ongoing diarrhea. Vitamin B₂ also called riboflavin. Riboflavin is used for preventing low levels of riboflavin (riboflavin deficiency), cervical cancer, and migraine headaches. It is also used for treating riboflavin deficiency, acne, muscle cramps, burning feet syndrome, carpal tunnel syndrome, and blood disorders such as congenital methemoglobinemia and red blood cell aplasia. Some people use riboflavin for eye conditions including eye fatigue, cataracts, and glaucoma.

The amount of Calcium, Phosphorus, Iron, Sodium and Magnesium

present in *Alocasia indica* leaves and stem are shown in Table 4. The results indicated that the amount of Calcium content of *Alocasia indica* leaves and stem were not change significantly. The Calcium content of *Alocasia indica* leaves and stem were 0.033% and 0.029% respectively. Phosphorus contents of *Alocasia indica* leaves and stem were present 0.150% and 0.120% respectively. The Iron content of *Alocasia indica* leaves and stem were 0.011% and 0.009% respectively. It was almost similar in leaves and stem. The Sodium content of *Alocasia indica* leaves and stem were 1.20% and 2.10% respectively. The Magnesium content of *Alocasia indica* leaves and stem were 0.86% and 0.69% respectively.

Minerals are inorganic elements exist in the body and in food as organic and inorganic combination. Minerals are maintained vital processes which are essential for life. Unlike vitamins, the minerals are not destroyed in food preparation. But as they are soluble in water, so that some loss will occur if cooking liquids are discarded. In foods mineral elements are present as salt. They combined with organic compound, e.g. iron in hemoglobin. Minerals are required for the teeth and bone formation. Minute amount of mineral elements are constituents of various regulatory compounds such as vitamins, enzymes and hormones. Some enzymes require calcium

for their activities as lipases and succinate dehydrogenase. Iron requiring enzymes are ferredoxin, catalase, indophenol oxidase, aldehyde oxidase etc. The mineral elements present in the intra and extra cellular fluid maintained water and acid-base balance. They regulate transmission of impulses and contraction of muscles. The deficiencies of minerals cause many disease in human being.

A balanced diet is essential to maintain a sound health. A balanced diet should contain sufficient fruits and vegetables in order to supply vitamins, minerals as well as nutrients, deficiency of those cause diseases. However the palatability and taste of any food depends mainly on its physical and chemical properties. The peoples of third world countries are always fighting to meet up there fundamental needs like foods, shelter, medicinal care and education. Malnutrition is one of the major problems in those countries. Peoples are suffering from numerous types of diseases for lacking of nutrients. A large number of populations have no knowledge about these plants. *Alocasia indica* is one of them. This leaves and stem are also rich in nutrients. For the ignorance of people, they do not know the nutritive value of leaves and stem of *Alocasia indica*. *Alocasia indica* may contribute a lot by providing essential nutrients and herbal medicines of different diseases for human being.

CONCLUTION

We can conclude that, both parts of this plant have almost same nutritional, vitamins and minerals values. This study has provided a first step towards the development of nutritional standards for *Alocasia indica* in our country conditions. Therefore both the leaves and stem can be used in traditional medicine system for different types of ailments.

Table 1 Nutrient content of the leaves and stem of *Alocasia indica*

Constitutes	Leaves	Stem
pH	6.32	6.26
Moisture (gm/100gm)	82.8	75.2
Ash (gm/100gm)	23.2	14.5
Water-soluble protein (mg/100gm)	50.0	24.6
Lipid (mg/100gm)	2.39	1.44
Crude fibers (mg/100gm)	9.50	7.20
Total phenol (mg/100gm)	6.0	10.84

Table 2 Carbohydrate content of the leaves and stem of *Alocasia indica*

Constitutes	Leaves	Stem
Total sugar (mg/100gm)	63.4	72.3
Reducing sugar (mg/100gm)	17.62	12.76
Non-reducing sugar (mg/100gm)	43.49	56.56
Starch (mg/100gm)	16.80	17.59

Table 3 Vitamins content of the leaves and stem of *Alocasia indica*

Vitamins	Leaves	Stem
Vitamin B1 (mg/100gm)	0.12	0.09
Vitamin B2 (mg/100gm)	0.05	0.03
Vitamin C(mg/100gm)	23.53	3.14

Table 4 M Minerals content of the leaves and stem of *Alocasia indica*

Minerals	Leaves	Stem
Ca (mg/100gm)	0.033	0.029
Fe (mg/100gm)	0.011	0.009
P (mg/100gm)	0.15	0.12
Na (mg/100gm)	1.20	2.10
Mg (mg/100gm)	0.86	0.69

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