

Phytochemical screening and mineral elements composition of *Xanthosoma sagittifolium* inflorescence

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ABSTRACT

The phytochemical screening of the ethanolic extract and the mineral elements composition of cocoyam inflorescence was determined using standard analytical methods. The results revealed that cocoyam inflorescence is a good source of both micro and macro elements. Iron was found to be present in high concentration (39.332mg/100g), followed by zinc (31.332mg/100g), magnesium (7.660mg/100g) and copper (3.833mg/100g). Potassium had the highest concentration (52.997mg/100g) among the macro elements followed by phosphorus (44.439mg/100g), sodium (19.333mg/100g) and calcium (17.666mg/100g). The phytochemical screening revealed that terpenoids, cardiac glycosides and tannins were highly present (+++), flavonoids and alkaloids were moderately present (++) while saponins and steroids were present in trace (+) amounts. The presence of these elements and phytochemicals in appreciable quantities highlights the nutritional and therapeutic value of cocoyam inflorescence.

Keywords: phytochemical screening, mineral elements, cocoyam inflorescence.

INTRODUCTION

Cocoyam is an herbaceous perennial with large green leaves belonging to the family, Araceae. It is an ancient food crop grown in wetlands with Nigeria being the largest producer in the world. There are many species but the two most edible genera are *Colocasia esculanta* (taro) and *Xanthosoma sagittifolium* (tannia) [1]. Both types are known to grow to a height of between four to six feet, producing large corms rich in carbohydrates and minerals [2].

The leaves like other vegetables are reported to be rich in nutrients including minerals and vitamins and this is responsible for its use as leafy vegetables and pasture for livestock [3].

Cocoyam seldom flowers but *Xanthosoma sagittifolium* species does. This flower is the inflorescence, the reproductive part of the plant. It produces a sweet smell once the flowers mature and this attracts the pollinators. The inflorescence, commonly called etrong in Ibibio is also edible and it is used locally as spice or seasoning to prepare foods like oto mboro, ekpang nkukwo etc. In Central America, the young inflorescence is cooked and eaten as vegetable [4]. The spadix is also reported to be rubbed on fresh wounds to aid blood clotting and rapid healing [5]. Much work has been done on the tubers and leaves of cocoyam but information is scanty on the inflorescence. This study was therefore designed to screen the phytochemical content as well as determine the mineral elements composition of the inflorescence in order to ascertain its nutritional and medicinal value.

MATERIALS AND METHODS

Mature *Xanthosoma sagittifolium* inflorescences were harvested from farmlands located in Etinan LGA of Akwa Ibom State and conveyed to the laboratory in a polythene bag for processing. The sample was rinsed with distilled water and air dried. Thereafter, it was cut into pieces, oven dried at 55°C, cooled, milled into powder and stored in an airtight container for the analysis.

Phytochemical screening was carried out on the ethanolic extract using standard procedures to identify the constituents [6], [7], [8]. The mineral element analysis to determine the concentration of copper, manganese, zinc, iron and magnesium was done using atomic absorption spectrophotometer [9], [10], while the concentration of sodium and potassium were determined using flame photometer [10]. Colorimetric method was however used for the estimation of the concentration of phosphorous in the sample. All the chemicals used were of analytical grade.

RESULTS AND DISCUSSION

The results obtained in this work were as summarized in tables 1 and 2

Table 1: Phytochemical screening of cocoyam inflorescence

Phytochemicals	Observation	Inference
Tannins	Blue green precipitate occurred	+++
Phlobatannins	No precipitate was observed	-
Saponins	Persistent frothing for more than 30 min	+
Flavonoids	A yellow coloration observed	++
Steroids	Green colour observed	+
Terpenoids	A reddish brown coloration at the interface	+++
Cardiac glycoside	Reddish brown ring observed at interface	+++
Alkaloids	Orange coloration observed	++

Key +++: strongly present, ++: moderately present, +: Trace, -: Absent

Table 2: Mineral element composition

Elements	Concentration (mg/100g)
Iron (Fe)	39.332
Manganese (mg)	7.660
Copper (Cu)	3.833
Zinc (Zn)	31.332
Calcium (Ca)	17.666
Phosphorous (P)	44.439
Potassium (K)	52.992
Sodium (Na)	19.333

DISCUSSION

The phytochemical screening of the cocoyam inflorescence studied revealed that the sample is rich in phytochemicals such as tannins, terpenoids, cardiac glycosides, flavonoids and alkaloids. Saponins and steroids were present in trace amounts while phlobatannins were absent.

Tannins in the sample were found to be highly present. The presence of tannin could be partly responsible for the bitter taste associated with the raw inflorescence and its use in treating wounds. They are known to have astringent properties, hasten the healing of wounds and inflamed mucous membrane [11]. Tannins also possess fungidal properties thus serving as a defense mechanism in plants against herbivours, pathogens and hostile environment.

Terpene was also found to be highly present in the sample. Generally, plant terpenoids are known to play a role in traditional herbal medicine as pharmaceutical applications [2].

The cardiac glycosides were also found to be highly present in the sample. These are naturally occurring drugs in plants known for their beneficial and toxic effects on the heart. Being an active ingredient in many effective heart medicines, it is used therapeutically in the treatment of disease associated with the heart like cardiac failure [8].

Flavonoids were found to be moderately present in the sample. Basically, flavonoids are a class of secondary metabolites widely distributed in plants, fruits and flowers. They are reported to have antiviral, anti-allergic, anti-inflammatory, anti-tumour, anti-cancer and anti-oxidant activities [12], [13].

Alkaloids were also found to be moderately present. They are naturally occurring chemical compounds having pharmacological effects and as such are used as medication, as recreational drugs etc. Examples are the local anaesthetic and stimulant cocaine, nicotine, the analgesic morphine or the anti-malarial drug quinine [14], [15].

Saponins were present in trace amounts in the sample. They are useful in medicine and pharmaceutical industry due to its foaming ability for the manufacture of vaccines, insecticides and synthesis of steroidal hormones. Other studies have proven that saponins have ability to reduce cholesterol levels in man and animals [16] [17] [18].

The results of mineral analysis revealed high concentrations of potassium (52.99mg/100g), phosphorous (44.439mg/100g), iron (39.332mg/100g) and zinc (31.332mg/100g). Levels of sodium, calcium, manganese and copper were 19.333mg/100g, 17.666mg/100g, 7.660mg/100g and 3.833mg/100g respectively.

The high concentration of these minerals could be an advantage as certain inorganic mineral elements are known to play important roles in the maintenance of the body. Iron for instance is a micro element required for haemoglobin formulation and the high value of iron observed is a good indicator that cocoyam inflorescence can serve as a good source of this mineral.

The concentration of zinc (31.332mg/100g) was high when compared with RDI value which is 15mg/day. Zinc is essential for the production or release of insulin [19], thus the high zinc content could mean that the plant can play a valuable role in the management of diabetes.

The concentration of manganese was found to be 7.660mg/100g, this indicates that it contains appreciable quantity of this element and can serve as a supplement in diets when consumed. The copper content (3.833mg/100g) compares favourably with the body requirement of 1-4mg/day. Copper is essential for the functioning of a large number of enzymes. Thus the plant is a good source of the element.

Potassium concentration (52.997mg/100g) was found to be high. It is an element needed to maintain the pH and electrolyte balance of human cells. Though the value obtained is lower than the RDI value (187- 5625mg/100g) for adults, the plant can still serve as a supplement. The concentration of phosphorous was found to be 44.439mg/100g. Phosphorous is one of the components of bones and teeth, a vital constituent of cell wall, and soluble cellular proteins. Though the value is low when compared with RDI value (800mg/day), an appreciable quantity is still present in the plant.

The concentration of sodium (19.333mg/100g) is low when compared with the RDI value (200mg/day). Sodium serves as the principal cation in extracellular fluid and this helps to control the amount of fluid around cells as well as regulate blood pressure and volume. The low sodium content is an advantage due to the direct relationship of high sodium intake with hypertension in human.

The calcium concentration (17.666mg/100g) is also low when compared with RDI value (400-1000mg/100g). Calcium is the major component in bones and teeth formation. It helps in blood clotting and muscles contraction. Though the value is low, the plant can still serve as a source of calcium in the diet.

CONCLUSION

The study has revealed the presence of bioactive compounds used for therapeutic purposes as well as appreciable quantities of mineral elements needed by the body. Therefore cocoyam inflorescence can be consumed.

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