BVG Trust

J. Sci. Trans. Environ. Technov. 2019, 13(1) : 15-18

Scientific Transactions in Environment and Technovation

Phytochemical Screening, Proximate and Mineral Composition of *Ipomea batatas* (L.) and *Zea mays* (L.)

https://doi.org/10.56343/STET.116.013.001.004
http://stetjournals.com

P. Menaga* and A. M. Thafshila Aafrin

PG and Research Department of Biochemistry,Sengamala Thayaar Educational Trust Women's College(Autonomous), Suundarakkottai, Mannargudi - 616 016, Tamil Nadu, India.

Abstract

Ipomea batatas (Family: Convolvulaceae) also known as sweet potato is an extremely versatile and delicious vegetable that possesses high nutritional value. Sweet potato is now considered a valuable source of unique natural products, including some that can be used in the development of medicines against various diseases and in making industrial products. *Zea mays* (Family: Poeceae), commonly known as sweet corn, is widely used as an ethanomedicine in India. It is prescribed for a wide variety of ailment like diuretic and mild stimulant. The phytochemical screening and quantitative determination of the proximate constituent levels of the plant that makes them usable for curing some diseases were made. The phytochemical screening revealed the presence of alkaloids, terpenoids, phenols, steroids, tannins, flavonoids, saponins, cardiac glycosides. The proximate composition revealed the presence of moisture content (19.25%), crude fibre (6.14%), protein (5.44%), total ash (5.56%) and crude lipid (2.4) and carbohydrates (54.4%) in *Ipomea batatas*. The quantitative composition of tuber and seeds of *Ipomea batatas* and *Zea mays* was studied using standard analytical methods. The minerals composition revealed high amount of calcium (30.1 mg/100g), magnesium (28.54 mg/100g) and manganese (2.3 mg/100g) iron (6.13 mg/100g) and copper (2.4 mg/100g) in *Ipomea batatas*.

Key words:.*Ipomea batatas* ,Mineral composition, Phytochemicl screening, *Zea mays*.

Received : March 2018 Revised and Accepted : January 2019

INTRODUCTION

Vegetables are the fresh and edible portions of herbaceous plants, which can be eaten raw, or cooked (Oyenuga and Fetuga, 1975). Vegetables are valuable in maintaining alkaline reserve of the body. They are valued mainly for their high carbohydrate, vitamin and mineral contents. Vegetables may be edible roots, stems, leaves, fruits or seed. Each group contributes to diet in its own way (Robinson, 1990). However, there are some used and inexpensive leafy vegetables whose nutritive and anti-nutritive potentials are yet to be adequately studied and utilized. Among these leafy vegetables, the leaves of sweet potatoes are also included. Sweet potato (*Ipomoea batatas*) is a herbaceous creeping plant with smooth, lightly moderate green leaves sometimes with a considerable amount of purple pigmentation especially along its veins (Longe, 1986). Its starchy tuberous root is the major economic part of the crop.

Maize (*Zea mays* L) is one of the most versatile crops which have adaptability for various agro-chemical conditions. Maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. It is cultivated on nearly 150 m ha in about 160 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 36 % (782 million tonnes) in the global grain production (Pearson, 1976).

MATERIALS AND METHODS

Plant collection and identification

The plant samples of *Ipomoea batatas* and *Zea mays* were collected around Sundarakottai, Mannargudi on the

Fig. 1. *Ipomoea batatas* (L.) Lam.

*Corresponding Author :
email: *ebasanar@gmail.com*

P - ISSN 0973 - 9157
E - ISSN 2393 - 9249

Fig. 2. *Zea mays* (L.)

month of September. These plants were collected from their natural habitat and from identified herbalists.

Preparation of the samples

The tuber and seeds of plant species were cleaned using water until soil and other materials on them were removed. Thereafter, they were then air dried under shade for a week. The plants materials were then ground into fine powder and then wrapped in air-tight containers and placed in the laboratory at room temperature (25°C) prior to further analysis.

Qualitative Analysis of Phytochemicals

The powdered samples were analysed for the presence of various phytochemicals such as phytochemical screening, proximate, quantitative and mineral analysis.

RESULTS AND DISCUSSION

Phytochemical Analysis

Qualitative Phytochemical Analysis

The phytochemical active compound of *I.batatas and Zea mays* qualitatively analysed and the results were given in the table I. It revealed the presence of various phytoconstituents like alkaloids, carbohydrates, glycosides, proteins, amino acids, flavonoids, quinones, tannins, phenolic compounds and terpenoids.

Phytochemical is a natural bioactive compound present in all plants and the amount may be different in different part of the plant which include fruits, leaves, flowers, roots and bark of the trees. These phytochemicals are mainly divided into two groups, which are primary and secondary constituents (Metabolites) based on their role in plant metabolism. Primary constituents (Primary metabolites) comprise of common sugars, amino acids, protein and chlorophyll which perform metabolic roles that are essential and usually evident whereas, the secondary metabolites constitutes alkaloids, terpenoids and phenolic compounds.

Secondary metabolites are not directly involved in the growth and development of the plants (Abraham, 2016). The major phytochemicals that are generally present in sweet potato and corn are flavonoids, terpenoids, tannins, saponins, glycosides, alkaloids, steroids and phenolic acids. These constituents may vary with varieties. Phlobotannins and cardiac glycosides are absent.

The proximate compositions determined in the tuber and seeds are summarized in Table 2.It shows that the both plant has a high moisture content (17.24 and 19.25%) and carbohydrate (54.4 and 43.21%), moderate concentration of protein (4.24 and 5.44%) and ash (5.56and 4.52%), and low concentration of fat (2.4 and 2.89 %) and fiber (4.84 and 6.14%). and 4.52%), and low concentration of fat (2.4 and 2.89 %) and fiber (4.84 and 6.14%).

High moisture content promotes susceptibility to microbial growth and enzyme activity (Friedman *et al*.,, 2007). On the other hand low moisture content indicates less chances of microbial degradation during storage.

Proximate analysis showed that *Zea mays* seeds had higher in percentage of moisture content, crude lipid, fibre and protein when compared to tuber of *I batatas*, while *I batatas* had higher percentage of ash and CHO compared to *Zea mays* seeds. The seeds of *Zea mays* contain higher fibre content compared to *I.batatas*.

Fibre is known to increase the bulk of diet content and also enhances the frequent release of bowel content (Imo, 2017). This has shown positive impact in human health since it can reduce certain conditions such as constipation. However, the frequent removal of bowel content can cause indigestibility in humans.

Adequate caution should be taken in the consumption of food materials that are very high in fibre since

Table 1. Preliminary phytochemical analysis of tuber and seeds of *I. batatas and Zea mays*

S.No	Constituents	*I.batatas*	*Zeamays*
1	Terpenoids	+	+
2	Alkaloids	+	+
3	Phenols	+	+
4	Steroids	+	+
5	Tannins	+	+
6	Flavonoids	+	+
7	Saponins	+	+
8	glycosides	_	+
9	Phlobatannins	_	_
10	Sugar	+	+
11	Aminoacids	+	+
(+) Indicates Presence		(-) Indicates Absence	

P - ISSN 0973 - 9157
E - ISSN 2393 - 9249

indigestibility will cause loss of nutrients and utilization of the undigested food materials. The high percentage of ash in the tubers shows that there will be a corresponding high mineral content in the tuber compared to the seeds. Carbohydrates and fat/lipid are known to be good sources of high energy generation compound (Edeoga *et al*., 2005). The human body depends on carbohydrates and lipid/fat largely to drive its required energy for regular activities. The significant high differences in the lipid and carbohydrates content of the seeds compared to the tuber show that the tuber could be a better source of carbohydrates than the seeds. Hence the tubers could be used in the preparation of special dishes such as the soup for nursing mothers which could contribute and satisfy the energy requirement..

The human body may also use the lipid and carbohydrates contained in the tubers as well as in the seeds for the generation of some necessary intermediates required for proper functioning of the human body system. The lipid and carbohydrates contents of tuber and seeds show that apart from their use as speices, they can contribute positively to general nutrition.

Zea mays seeds were significantly higher in protein content than tubers, however, the seed has appreciable protein content. This shows that apart from carbohydrates, the seeds are the good source of proteins. This indicate that the use of the tubers and seeds in general nutrition contributes to the provision of proteins which the human body requires for growth, replenishing worn-out tissues, provision of amino acids and hormones required for certain biochemical processes and provision of energy and enzyme catalysis.

Table 3 indicates the quantitative phytochemical composition of tuber and seeds of *I. batatas and Zea mays* and the results revealed the presence of six phytochemical compounds such as alkaloids, phenolic, flavonoids, steroids tannins and saponins at different concentrations (Table 3). Tannin was found to be present at a maximum concentration followed by steroids and saponins, respectively.

Table 2. Proximate composition of tuber and seeds of *I. batatas and Zea mays*

S.No.	Parameters	*I. batatas* (%)	*Zea mays* (%)
1	Moisture content	17.24	19.25
2	Total Ash	5.56	4.52
3	Crude Fibre	4.84	6.14
4	Crude lipid	2.4	2.89
5	Protein	4.24	5.44
6	Carbohydrates	54.4	43.21

The presence of phenolic compounds in this plant indicates that these plants may be used as an anti-microbial agent. This agreed with the findings of (Ofokansi *et al*., 2005) who reported that *B. pinnatum* is effective in the treatment of typhoid fever and other bacterial infections.

Flavonoids are potent water-soluble antioxidants and free radical scavengers, which prevent oxidative cell damage, have strong anticancer activity. Flavonoids in the intestinal tract lower the risk of heart disease. As antioxidants, flavonoids from these plants provide anti-inflammatory activity (Okwu, 2004).

Tannins are a heterogeneous group of high molecular weight polyphenolic compounds and are used as astringents, against diarrhea, as diuretics, against stomach and duodenal tumors and as anti-inflammatory, antiseptics, antioxidants and haemostatic pharmaceuticals.

Saponins are also considered as one of the natural antimicrobial products that make up the defense system of the plants and some can be beneficial rather than harmful to animals (Rupasighe *et al*., 2003). Saponins have a broad spectrum of biological activity such as cytotoxic activity, antifungal, antibacterial and *in vivo* antitumor activities.

Steroids are one of the members of large class of organic compounds that occur widely in plants and animals. It is characterized by the presence of 1, 2 cyclo pentano phenanthrene ring system (Dahanukar *et al*., 2000). The activity of steroids might be due to the association with membrane lipids and its action leading to leakage from liposomes.

The mineral composition of both the plants are given in table 4. Calcium and Magnesium are considered to be macronutrients. Copper, Iron and Manganese are micro nutrients. In plants these nutrients play a major role; Calcium is an important part of plants cell wall, Chlorophyll formation utilizes iron and the chlorophyll of all photosynthetic green plants contains magnesium. Manganese plays an important role by associating with enzymes of carbohydrate and nitrogen metabolism.

Table 3. Quantitative phytochemical composition of tuber and seeds of *I.batatas and Zea mays*

S. No.	Parameters	*I.batatas* (mg/100g)	*Zea mays* (mg/100g)
1	Alkaloids	32.7±0.03	29.4±0.12
2	Total Phenolics	16.4±0.1	18.6±0.22
3	Total flavonoids	24.13 ±0.12	26.4±0.4
4	Steroids	1.64 ±0.1	0.84 ±0.12
5	Total tannins	1.94 ±0.6	2.84 ±0.12
6	Total saponins	4.3±0.3	8.3 ±0.4

P - ISSN 0973 - 9157
E - ISSN 2393 - 9249

CONCLUSION

The present study conclude that the chemical constituents of the tubers and seeds of *I.batatas* and *Zea mays* could be used as nutritional, pharmacological and therapeutic agents and are also promising herbal drugs.

ACKNOWLEDGEMENT

We would like to express our sincere and heartfelt thanks to the correspondent Dr. V. Dhivaharan M.Sc., D.E.M., Ph.d., Dean, Life Sciences, S.T.E.T. Women's College (Autonomous), Sundarakkottai, Mannargudi for his encouragement, support and for providing adequate facilities to complete the research work successfully.

Table 4. Mineral composition of tuber and seeds of *I.batatas and Zea mays*

S. No.	Parameters	*I.batatas* (mg/100g	*Zea mays* (mg/100g)
1	Calcium	25.1	30.1
2	Magnesium	21.2	28.54
3	Iron	6.13	4.14
4	Manganese	1.9	2.3
5	Copper	2.4	1.5

REFERENCES

Abraham, K. G. (2016). Biochemical studies on the freshwater bivalve mussel Parreysia cylindrical. *World Journal of Pharmaceutical and Life Sciences*, 2, 343"349.

Dahanukar S A, Kulkarni R A, Rege N N (2000). Pharmacology of Medicinal Plants and Natural Products. *Indian Journal of Pharmacology*. 32: S81-S118.

Edeoga, H.O., D.E. Okwu and B.O. Mbaebie, 2005. Phytochemical constituents of some Nigerian medicinal plants. *Afr. J. Biotech.*, 4: 685-688. https://doi.org/10.5897/AJB2005.000-3127

Friedman M, Henika, P R, Levin C E, Mandrell R E (2007). Recipes for Antimicrobial WineMarinades against *Bacillus cereus, Escherichia coli O157:H7, Listeria monocytogenes*, and*Salmonella enterica*. *Journal of Food Science*. 72: M207-M213. PMid:17995688 https://doi.org/10.1111/j.1750-3841.2007.00418.x

Imo, C., 2017. Phytochemical and proximate composition of parts of Euphorbia hyssopifolia. AASCIT *J. Biol.*, 3: 30-33.

Longe, O.G. (1986). Energy Content of some tropical starch crop in Nigeria. Journal of Agriculture 21: 134-136.

Ofokansi, K.C., Esimone, C.O. and Anele C. K. (2005). Evaluation of the *in vitro* combined anti bacterial effects of theleaf extracts of *Bryophyllum pinnatum*. (Fam: crassulaceae) and *Ocimum gratissium* (Fam:Labiate). *Plant Production Research*. Journal, 9: 23-27. https://doi.org/10.4314/pprj.v9i1.35242

Okwu, D. E. and Okwu, M. E. (2004). Chemical Composition of Spondiasmombin linn plant parts. *Journal for Sustaining Agricultural Environment*, 6(2): 140-147.

Oyenuga, V.A. and Fetuga, B.L. (1975). First National Seminar on Fruits and Vegetables. In: proc. And Recom. & papers by NIHORT, Ibadan.

Pearson, D. (1976). The chemical analysis of foods. 7th Edn., Churchill Livingstone, London, pp:7-

Robinson, D.S. (1990). Food biochemistry and nutritional value. Longman scientific and technical publisher, New York. USA.