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Phytochemical, Elemental, Proximate And Anti- Nitrients Composition Of Irish Potato (*Solanum Tuberosum*) Obtained In Kwaja, Mubi Sourth Local Government Area Of Adamawa State

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Abstract

The study investigated the phytochemical, elemental, proximate and anti-nutritional composition of Irish potato (solanum tuberosum) cultivated in Kwaja, Mubi South Local Government Area Adamawa State. The mineral content of the samples was determined using atomic absorption spectrophotometer and flame photometer. While the proximate and phytochemicals analyses were done by chemical methods. The anti-nutrient contents were determined using high-performance liquid chromatography (HPLC). The result of phytochemical test showed the presence of terpenoids, flavonoids, steroids and alkaloids in the Irish potato samples. While the result of the elemental analysis revealed the presence of Na (25.652 ± 0.007 mg/ 100g), Ca (504.67 ± 0.014 mg/100 g), K (1245.3555± 0.021 mg/ 100g), Zn (11.47 ± 0.00 mg /100g), Mn (0.32 ± 0.014 mg /100g), (53.32 ± 0.014 mg /100g) Fe (2.53 ± 100mg / 100 g), P(185.36 ± 0.01 mg /100g). The result of the proximate analysis of the samples showed that ash content, carbohydrate, moisture content, fibre, fat and crude protein were 2.83 ± 0.014%, 16.565 ± 0.035%, 69.35 ± 0.00 %, 0.45 ± 0.00 %, 2.545± 0.007 % and 8.26 ± 0.014 % respectively. The anti –nutrition analysis showed that oxalates (0.155± 0.007), phytates (1.325 ± 0.007 %), tannins (0.535 ± 0.021 %) and cyanids (0.00 ± 0.00 %) were very low. Considering the results obtained solarium tuberosum could be good for human consumption. Also the tuber could be used as a source of minerals in diet and source of drugs in pharmaceuticals.

Key words: Irish potatoes, Investigate, Phytochemical, Elemental, Proximate, Anti-nutritional. Diet, Drugs

Introduction

Plants provide a variety of resources that contribute to the fundamental need of both human being and animal such as food, clothing and shelter. Among plants of economic importance are medicinal plants. Plants have been utilized as therapeutic agents since time immemorial in both organized and unorganized forms. The healing properties of many herbal medicines have been recognized in many ancient cultures. Medicinal plant has been the main sources of traditional herbal medicine among rural dwellers worldwide (Agustine *et al.,* 2015).

According to the world health organization, a medicinal plant is any plant which, in one or more of its organs contain substances that can be used for therapeutic purposes or which are pre cursors for chemo-pharmaceutical synthesis. Parts of such planst including leaves, roots rhizomes teams, barks , flowers, fruits , grains or seeds, employed in the control or treatment of a disease condition and therefore contains chemical component that are medically active (Doughari *et al.,* 2009).

Irish potato (*solanum tuberosum*) is originated from the high land of Boloivia in South America. The spread of the crop outside its Centre of origin was mainly by deliberate introduction. Irish potato (solanum tuber asum) is the fourth most important food crops in the world after rice, wheat and maize and is the only major food crop that is a tuber. Potato is a very efficient food crop and produces more dry matter, protein and minerals per unit area in comparison to cereals. Potato being the staple food in the developed countries account for one hundred and thirty Kcal of energy per person per day against forty one Kcal in the developing countries where it is still considered as vegetables. Apart from being rich sources of starch, potatoes contain good quality of small molecules and phytochemicals which play an important role in a number of process. Many of the compounds present in potato are important because of their beneficiary effect on health, therefore, are highly desirable in the human diet (Katan and De Roos, 2004).

One of the global health goals is to increase the availability of nutrient to a large population of the world (Agbo *et al.,* 2013). Kubmarawa *et al.,* (2009) reported that a sensible approach to achieve this goal would be to increase the nutritional content of highly consumed crops. Potatoes are grown throughout the world and are consumed in large quantity. Furthermore, potatoes has

higher mineral element content and are amenable to development through breeding , differences in geographical location and bio technology approaches .

Irish potatoes (*solanum asrum*) constitute an important part of a balance diet as they are natural sources of food nutrient needed by human and animals. Such food nutrients include protein, carbohydrate, mineral and dietary fibre. It is very important to consider our locally available Irish potato and determine their nutrients composition which varies with their growing environment for the purpose of increasing the production of such with global focus on increase food production and emphases on provision of nutritive food for the world population. This paper aimed at investigating the proximate, elemental, phytochemical and anti-nutrients composition of Irish potatoes (*solanum tuberosum*) farmed in Kwaja Mubi.

Materials and Methods

Sample collection and identification

Matured tuber of Irish potato was obtained from Kwaja Mubi South, Adamawa State. The tuber was identified and authenticate by Baba Yahaya Kirri in the department of crop production Adamawa State University Mubi.

Sample preparation

The tuber of Irish potato (*solanum tuberosum*) was slide, coped and dried in oven .After drying the sample was grinded into pulverized form using mortar and pestle and stored in a tight container for further analysis.

Chemicals and reagents

All Chemicals and reagents used were of analytical grade

Elemental Analysis

The mineral content of the sample were determined using atomic absorption spectrophotometer and flame photometer following the procedure adopted by AOAC (2000).

Phytochemical Analysis

Irish potato (solanum tuberasum) was tested for the presence of bioactive compounds. The phytochemicals of the tuber samples were estimated following the procedure adopted by Nwankwo and Ukaegbu-Obi, (2014).

Test Terpenoids

Organic extract of 2 ml was dissolved in 2 ml of chloroform and evaporated to dryness. Concentrated sulphuric acid of 2 ml was added and heated for two minutes. A grayish color was observed.

Test for Flavonoids (Alkaline Reagent Test)

Extract of 200 mg was mixed with 2 ml of 2% solution of NaOH. An intense yellow colour formed which turned colorless on addition of few drops of diluted acid was observed.

Test for Steroids

To 2 ml of acetic anhydride was added 0.5 g of the sample followed by an addition of 2ml H_2SO_4. The color changed from violet to blue green was observed (AOAC, 2000).

Test for Alkaloids

Extract of 200 mg was mixed with 10 ml of methanol. To 2 ml of the filtrate was added 1% HCl and then steamed. To 1ml of the filtrate was added 6 drops of Wagner reagent. Brownish-red precipitate was observed.

Proximate analysis

The proximate composition (moisture, crude fibre, crude fat, ash content, protein and carbohydrate) of powdery sample of *solanum tuberasum* was determined following the method described by AOAC (2000).

Anti-nutritional Content Analysis

The anti-nutrient contents (oxalates, phytates, tanins and cyanids) were determined using high-performance liquid chromatography (HPLC) following the procedures adopted by AOAC (2000).

Statistical Analysis

All determinations were replicated three times and results were reported in mean (±) standard deviation.

Results and Discussion

Proximate composition

The result of the analysis of the proximate composition of solasumtuberosum was shown in Figuer 1. From the figure it can be seen that moisture content has the highest value followed by carbohydrate, crude protein, ash, fat and crude fibre. The moisture content value recorded was 69.35 ± 0.00 % which falls within the 65 – 82 % range of Dioscorea dumetorum and Ipomoea batatasa respectively (Abubakar *et al.,* 2010; Mohammad *et al*.,2016). The high moisture content of the tuber suggests it can be stored for long periods of time after harvest. The result obtained in this study showed that carbohydrate content was 16.565 ± 0.035 % which fall within the range 16.34 – 19.74 % reported by Williams *et al.,* (2019), contribute the major part of dry matter and hence the energy value of *solanum tuberosum* is below the content obtained (21 -25%) in fresh sample of Ipomoea batayas as reported by Nwauzoma and Dawari (2013). Since tubers are eaten mainly as sources of energy, the lower calorific value for *solanum tuberosum* thus makes it a preferable source of energy for people who are on a weight loss diet. The crude protein recorded was 8.26± 0.014% more than the value of 2.5% reported for D. dumetorum. Variation in research findings may be due to factors such as age of plant, varity, season of growth, time of harvest, soil nutrient composition and other environmental factors. In any case, this specie is richer in crude protein than other varieties. Though yam is low in protein, the higher content recorded in *solanum tuberosum* can serve as reason for its use in malnourished communities. A relatively high value (2.83 ± 0.014%) was recorded for *solanum tuberosum* in this study, which was higher than the 1.1 % reported for D.dumetorum and the range of 0.1 – 1.2 % reported for more common yams .The ash content is a reflection of the mineral content of the tuber. Low crude fat recorded from this study suggests that the *solanum tuberosum* could be recommended as good source of food supplement for patient with cadiac problems or at risk with lipid induced disorders.

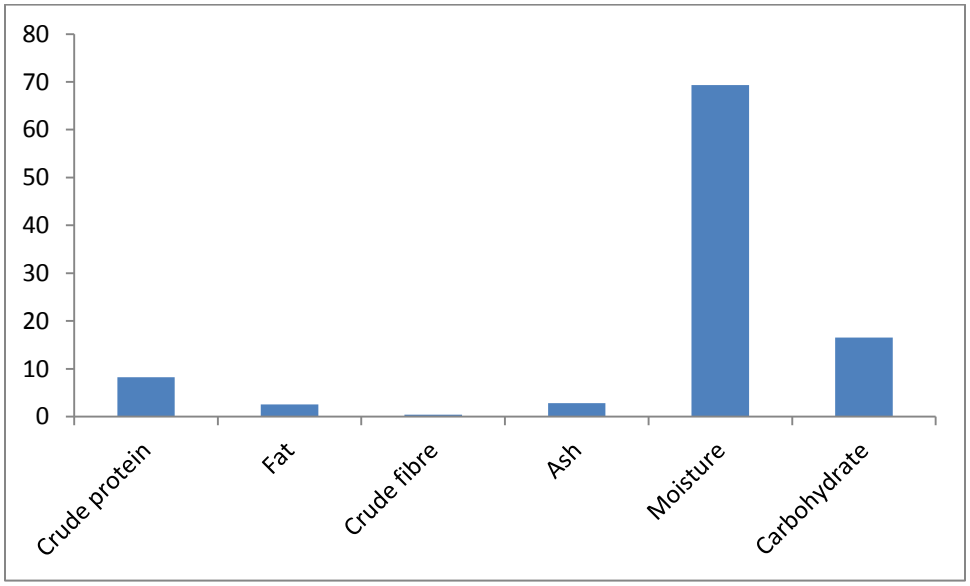

Figure 1 proximate analysis of Solanum tuberosum (%)

Phytochemical compositions

The result of the phytochemical analysis revealed the presence of alkaloids, steroids, flavonoids and terpenoids as shown in figure 2. From the figure it can be observed that Alkaloids has the highest value followed by flavonoids, terpenoids and lastly steroids with least value which was not indicated by the figure.

The high value (3.715 ± 0.007 %) of alkaloids have been reported to have stimulating effects and act as tropical anaesthetic ophthalmology, powerful pain relievers, antipyretic action. The presence of alkaloids could mean that the Irish potato may have antibacterial activity as explained by Quilly *et al.*, (2017). Several researchers have reported the analgesic and antibacterial properties of alkaloids, Flavoniods, terpenoids and steroids (Agbo *et al*., 2013; Augustine *et al*., 2015; Williams *et al*., 2019). The values of alkaloids, Flavoniods, terpenoids and steroids obtained in this study were 2.34 ± 0.014%, 1.475 ± 0.007% and 0.013 ± 0.001 % respectively. The high amount of flavonoids is appreciable because flavonoids behave as powerfull protective agents against inflemetary disorder. They reduced odema formation and inhebit the senthhysis of prostaglandin. Steroids have found therapeutic application as arrow poisonous or cardiac drogs. The cardiac glycocides and basically teroids have an inherent ability to afford a very specific and powerful action only on the cardiac muscle when administered

through injection into man or animal. Steroids (anabolic steroids) have been observed to promote nitrogen retention in osteoporosis and in animals with worsen illness (Maurya *et al.*, 2008; Madziga *et al.*, 2010).

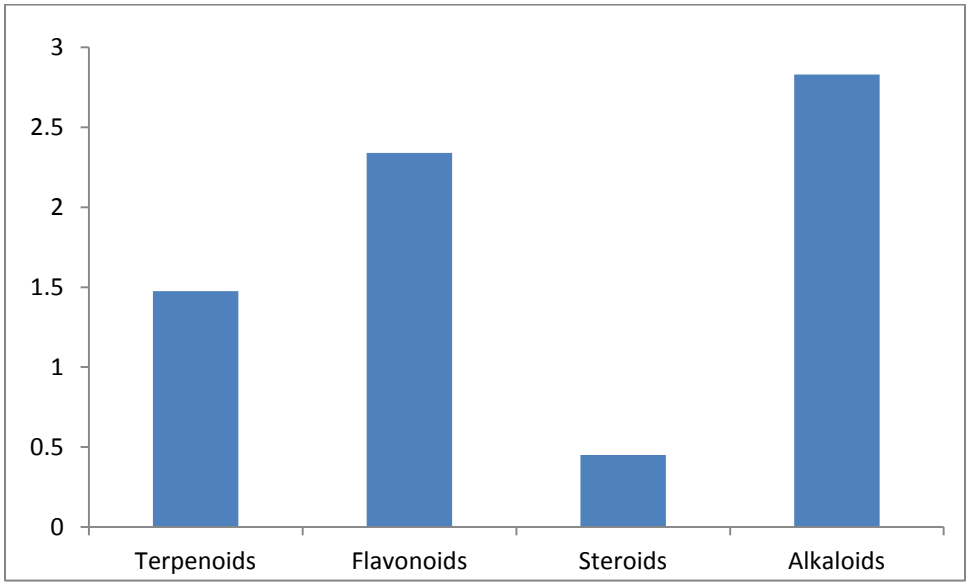

Figure 2 phytochemical composition of Solanum tuberosum (%)

Anti – nutrient composition

The results of the anti-nutrient composition were shown in figure 3. From the figure it can be seen that phytates has the highest value (1.325± 0.007%) followed, by tannins (0.535 ± 0.021%) and oxylate (0.155± 0.007%) while cyanide was not detected. Gemede *et al.*, (2015) reported that the problem associated with phytate in food is that it can bind some essential mineral nutrients in the digestive tract and can result in mineral deficiencies. Tamnins had been reported to affect protein digest ability, adversely influencing the bioavailability of non- haemiron leading to poor iron and calcium absorption, also carbohydrate is affected leading to reduced energy value of a diet containing tannins, however, its anti-nutritional effect depend upon their chemical structure and dosage (Maffey *et al* .,2001). Oxalate can have a harmful effect on human nutrition and health, especially by reducing calcium absorption and aiding the formation of kidney stone.

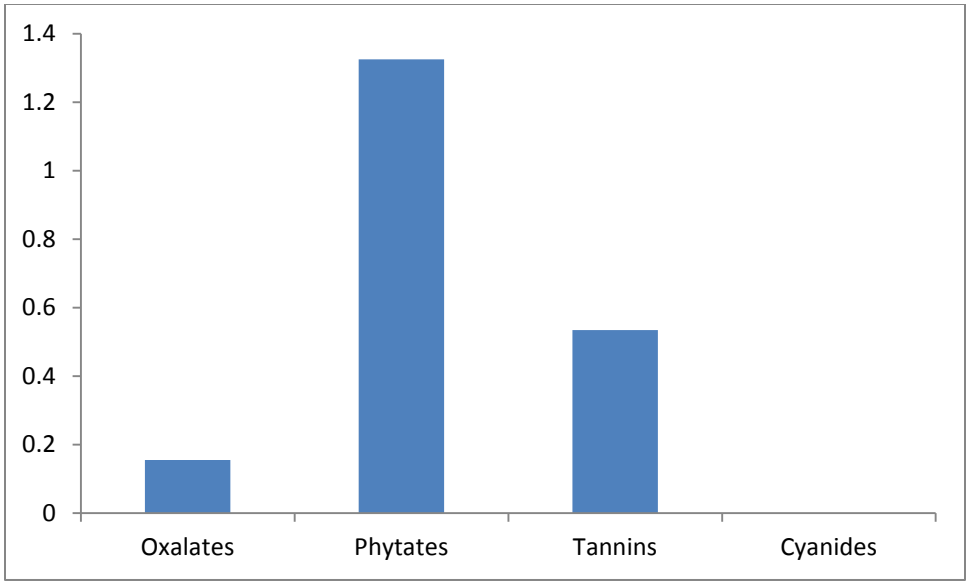

Figure 3 Anti-nutrients composition of Solanum tuberosum (%)

Mineral composition

The result of the analysis of mineral composition were presented in table 1.The study revealed that K has the highest value(1245.355 ± 0.021 mg/ 100g). The raw tuber of potato had higher amount of K ranging from 697 – 2082 mg/100g on dry mass weight bases (George *et al*., 2009), corroborating the report of Abubakar *et al.*, (2010). K assess in muscle contraction and in maintaining fluid and electrolyte balance in body cell.

The value of Ca was 504.68 ± 0.014mg/100g. Ca is important for bone and tooth structure, blood clotting and nerve transmission. Deficiencies are associated with skeletal mal – formation and blood pressure abnormality (Kawo *et al.*, 2009). The concentration of phosphorus (P) was found to be 185.36± 0.010 mg/100g. Phosphorus plays a vital role in human body and is a key player for healthy cells, teeth and bones (Maffey *et al* .,2001). Magnesium is an essential cofactor in much enzymatic reaction in intermediary metabolism. Magnesium is required for normal functioning of muscles, heart and immune system. It also helps in maintaining normal blood sugar levels and blood pressure (George et al., 2009). In this study the value of magnesium was found to be 53.32 ± 0.104 mg /100g.

The concentration of sodium, iron and manganese was found as follows 25.625± 0.007 mg/100g, 2.545 ± 0.021 mg/100g and 0.32 ± 0.014 mg/100g. Respectively .Potato is a modest source of Fe, a study of cultivated varieties showed 0.3 – 2.3 mg of Fe in a 100 g tuber. Manganese plays a role in blood sugar regulation, metabolism and thyroid hormone function.

Table 1 Mineral contents of solanumtuberosum(mg/100g)

Parameter	Value
Na	25.652 ± 0.007
Ca	204.68 ± 0.0114
K	1245.355 ± 0.021
Zn	11.47 ± 00
Mn	0.32 ± 0.014
Mg	53.23 ± 0.014
Fe	2.545 ± 0.021
P	185.36 ± 0.010

Conclusion

The study revealed that there was high mineral content in locally cultivated *solanum tuberosum* obtained in Kwaja Mubi South Local Government Area of Adamawa State. Mineral elements which are nutritionally required of both humans and livestock which suggest that the tuber could be used as feeds supplement to improve health and growth performance in humans and livestock. The most remarkable finding of the study was that the plant under consideration was found to be a good source of mineral elements like potassium, calcium, phosphorus and sodium which can be recommended as a remedy to alleviate malnutrition in the country. Interestingly, the anti-nutritional composition of the plants was very low.

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