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Short Communication

Phytochemical screening on four edible legumes (*Vigna subterranean, Glycine max, Arachis hypogea,* and *Vigna uniguiculata*) found in eastern Nigeria

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The results of the phytochemical screening carried out on the seeds of *Vigna subterranea* (Bambara groundnut), *Glycine max* (Soya beans), *Arachis hypogea* (Groundnut) and *Vigna uniguiculata* (Black eyed peas) showed the presence of useful phytonutrients. The results showed that *V. subterranea* contained the highest percentage of alkaloids (0.41%) while *A. hypogea* showed the lowest yield of alkaloid (0.25%). *V. uniguiculata* had the highest saponin content with (0.44%) while *A. hypogea* with the lowest (0.25%). The highest yield of flavonoids was found in *V. uniguiculata* with 0.33% while the lowest yield was obtained in *A. hypogea* with 0.18%. The highest phenols yield were obtained from *V. subterranea* with 0.36% while *G. max* showed the lowest with 0.26%. The percentage of tannins was highest in *V. uniguiculata* but lowest in *A. hypogea*. The results of the phytochemical screening on the four species of legumes were discussed in relations to their usefulness to mankind.

Key words: Bambara groundnut, soya beans, groundnut, black eyed peas, edible legumes, phytochemical screening, phytonutrients.

INTRODUCTION

Legumes also known as dried beans and pulses are the edible seeds that grow in pods of annuals, biennials and perennials which are modified in many ways to facilitate their dispersal by animals, wind, and water. They belong to the family *Fabaceae*, which is one of the largest and economically important families of the flowering plants. Legumes are simple, dry dehiscent fruit bearing pods containing one or more seeds, which split open by the two longitudinal lines into two halves at maturity. Legumes are cosmopolitan in nature (Kunkel, 1984). The family Fabaceae is the third largest family of the flowering plants after the *Asteraceae* and *Orchidaceae* with 1800 species and about 650 genera (Polhill and Raven, 1981). Legumes can be trees, woody, vines, or herbaceous plants (Allen and Allen, 1981).

Legume is a term derived from French word which has a wider meaning and refers to any kind of vegetables. Though some are cultivated while others are wild (Charina, 2002). According to Barrett (1987), legumes are classified as forage legumes which are grown in pastures and grazed by livestock. Such legumes include the alfalfa, clovers and the grain legumes. They are cultivated from their seeds, they are also called pulses and are widely eaten (Roberts and Summerfield, 1986). Legumes are characterized by a particular morphology. They have their inflorescences arranged in many spikelets. Their flowers are usually bisexual. The flowers have five petals in which the superior ovary ripens to form a pod, which is the fruit. The roots of legumes are more developed. The stems of legumes do not have nodes, internodes and collar regions (Kunkel, 1984).

The flowers are slightly too strongly perigynous and zygomorphic. The perianth commonly consists of a calyx and corolla of five segments each. The androecium most commonly consists of ten (10) stamens in two groups; that is, they are diadelphous with nine (9) stamens in one brindle and the 10^{th} stamen is more or less distinct.

Legumes have the floral formula as: K $_{(5)}$ C (5) A $_{(5+5)}$ or $_{(9)}$ $_{+1}$ G1 (Barrett, 1987).

The leaves and pods can be introduced into the soil as green manure or nitrogen source. They can be rotated with other crops for soil improvement. That is they are used to replenish soil that has been depleted of nitrogen (Becker, 1983). Some legumes are for forestry such as

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Table 1. Quantitative analysis of the phytochemicals in the four legumes investigated.

Legumes	Alkaloids (%)	Saponin (%)	Flavonoids (%)
Vigna subterranea	0.40	0.43	0.29
Arachis hypogea	0.25	0.25	0.18
Glycine max	0.33	0.39	0.25
Vigna uniguiculata	0.37	0.44	0.33

Leucaena leucocephala and it can also be used as a nurse tree providing nutrients and shade for some crops.

Legumes serve as dehydrated feed for livestock such as cattle, horse pet and laboratory animals (Leventon and McMahon, 2003). The pigeon pea (*Cajanus cajan*) functions as a living fence. Legumes are the primary protein sources of diet. They are rich in vitamin B namely thiamine, riboflavin and niacin which help to release energy from nutrients. They contain fiber and glycemic index. They also contain non-nutritive components that are anti-nutrients such as trypsin inhibitor, phytate, and saponin which are glycoside composed of a lipid soluble glycone that consists of either a sterol or a treperoids which are phytochemicals (Gepts et al., 2005). *Vigna uniguiculata*, *Arachis hypogea*, *Glycine max* and *Vigna subterranean* serve as food to man and animals.

Their leaves, stems and pods serve as food to man. *V. uniguiculata* can be used for erosion control and has high quality of protein, which are the primary source of our diets especially for vegetarians. They have low glycemic indices which helps to reduce the risk of fatal and non-fatal heart attack which are caused by consuming starchy food with high glycemic index. Soluble fibers from black eyed peas help to lower the cholesterol level which blocks the blood pressure. The protein gotten from legumes like soya beans helps to regulate blood sugar, body fluid, kidney, adrenaline, liver function and other aspects of our metabolism (Gepts et al., 2005).

Black eyed peas and Bambara groundnut serve as food, though they can be cooked, boiled or ground to prepare bean cake and moi-moi. They are also useful in pharmacology, in the production of medicine and are also important biotechnological tools because they grow easily in cultures.

This work therefore is designed to phytochemically screen these four edible legumes obtained in Eastern Nigeria with the objective of observing and analyzing their respective chemical constituents.

MATERIALS AND METHODS

The legumes used in this study were collected from Idemili in Anambara State, Ubakala in Abia State, Orlu in Imo State and Nkanu in Enugu State. Only healthy and fresh legumes were collected. The samples were ground into uniform powder using Thomas Willey milling machine. The samples were kept in the chemistry laboratory of Micheal Okpara University of Agriculture, Umudike, Nigeria for analysis.

Phytochemical screening

Chemical tests were carried out with the standard specimens using standard procedures to identify the constituents as described by the Harbone (1988) and Sofowara (1993).

Quantitative determination of alkaloids

The alkaloid was extracted using a modified method of Maxwell et al. (1995). Dried sample using 100 ml of 10% action acid which was left to stand for 4 h. The extracts was filtered to remove cellular debris and then concentrated to about one quarter of the original volume. NH_4OH was added drop wise until no precipitate occurred. The alkaloid was dried to constant weight in an oven and the percentage of alkaloid calculated as:

$$\frac{\text{Weight of residue}}{\text{Weight of sample}} \times 100$$

Quantitative determination of saponin

The method used for the determination of saponin was that of Peny et al. (1995). The dried samples were ground and 10 g of each put into a conical flask and 100 ml of 20% aqueous ethanol added. The samples were stirred at a constant temperature of 55°C for 12 h. After the sample was filtered with whatman number 1 filtered paper and the residue re-extracted with another 200 ml of 2% ethanol. The extracts were combined and reduced to 40 ml by heating in a water bath at 55°C. The purification process was repeated two more times. 4 g of NaCl were added to adjust the pH of the solution to 4.5 (confirmed with a pH meter). The solution was shaken with 60 and 30 ml portions of n-butanol extracts and washed twice with 10 ml of aqueous NaCl. The bath was dried to constant weight, and the saponin extracted was taken and expressed as a percentage;

%Saponin = Weight of residue.

RESULTS

Table 1 showed the percentage of the chemical constituents of each legume investigated. *V. subterranea* contained the highest percentage of alkaloids (0.41%) while *A. hypogea* showed the lowest yield of Alkaloid (0.25%). The highest yield of Saponin was found in *V. uniguiculata* with 0.44% while the lowest yield of Saponin was contained in *A. hypogea*. The highest yield of flavonoids was obtained in *V. uniguiculata* while the lowest was obtained in *A. hypogea* with 0.18%. The highest phenols yield was obtained from *V. subterranea*

with 0.36% while the lowest yield was obtained in *G. max* with 0.26%. The percentage of tannins was highest in *V. uniguiculata* but lowest in *A. hypogea*.

DISCUSSION

The seeds of the four legumes (*V. subterranea, G. max, V. uniguiculata,* and *A. hypogea*) analyzed are rich in phytochemicals. The results of the phytochemical screening and quantitative estimation of the four edible legumes studied clearly showed that the legumes are nutritious and contained some phytochemicals such as alkaloids, flavonoids, saponin, tannins, and phenols. All these phytochemicals present in these legumes compared favorably with those reported from some medicinal plants found in Nigeria (Sofowara, 1993). The quantitative estimation of the percentage of the phytochemicals in these legumes showed the percentage content of alkaloids in *V. subterranea, V. uniguiculata, A. hypogea, and G. max* as 0.41, 0.37, 0.25 and 0.33% yields, respectively. Though the yields of the Alkaloids are low, but are useful in the prolonging of the action of several hormones and acting as stimulants especially *V. subterranea* which has the highest value of alkaloid.

Flavonoids enable food to be tasty which is in line with the work of Dakora (1995) that flavonoids promote peculiar taste in prepared foods. Flavonoids are capable of treating certain physiological disorder and diseases. They are potent water soluble, super anti-oxidant and free radical scavenger which prevents oxidative cell damage and have strong anti-cancer activity which adds protection against all stages of carcinogenesis (Okwu, 2004). Saponins are present in all the legumes studied and are contained in appreciable quantities, with *V. uniguiculata* having the highest value of 0.44% which means it has cholesterol binding properties, and help in hemolytic activities (Okwu, 2004).

The highest value of tannins was in *V. uniguiculata*, which serves as astringent properties for healing of wounds and inflaming mucous membrane (Okwu and Okwu, 2004). Phenols are found in different percentages and *V. subterranea* have the highest value of phenols with 0.36%. The presence of phenol indicated that these legumes have the ability to block specific enzymes that causes inflammation. They also modify the prostagladin pathways thereby protecting platelets from clumping.

Conclusion

In conclusion, the outcome of this phytochemical screening thus suggest that these legumes are highly recommended in everyday diet of man so that each of them can be used for normal metabolic activities of living organisms.

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