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COMPARATIVE ASSESSMENT OF THE PHYTOCHEMICALS AND NUTRITIVE QUALITIES OF ZEAMAYS (MAIZE) AND SORGHUM BICOLOR (GUINEA CORN) SEEDS

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ABSTRACT

The health benefits of corn are attributed in part to their unique phytochemical composition. A meal rich in maize and guinea corn can go a long way in protecting against many diseases and ailments. A comparative assessment of the phytochemical and proximate analysis of the dried seeds of zea mays (maize) and sorghum bicolor (guinea corn) was made using the methods described by Adewunmi (1980), Harbone (1973), James (1995), and Pearson (1976). Phytochemical analyses of the seeds showed the presence of alkaloids, saponins, tannins, phenols, glycosides and flavonoids. Percentage composition of the phytochemical analyses showed that maize contained 14% alkaloid, 15% flavonoid, 0.65% phenol, 10.1% saponin and 0.6% tannin. Guinea corn contained 6% alkaloid, 23% flavonoid, 0.9% phenol, 13.1% saponin and 0.3% tannin. The proximate analyses showed that maize contained 2% ash, 2.2% fat, 2.8% crude fibre, 11% glutin, 15% moisture and 67% carbohydrate while guinea corn contained 1.4% ash, 1.8% fat, 3.2% crude fibre, 10.5% glutin, 13% moisture and 70.1% carbohydrate. The study showed that maize and guinea corn are good sources of carbohydrate. While maize is richer in alkaloids and tannins, guinea corn had higher content of flavonoid, phenol, saponin and fibre. Maize and guinea corn are therefore good for consumption both for their medicinal value and as a source of energy.

***Keywords*:** *guinea corn*, phytochemical, *flavonoids, tannin, alkaloids*

INTRODUCTION

Maize also known as Indian corn or corn in America, originated from South Africa (Awake, 2008). It is a tall plant of the grass family grown for its yellow grains that are used for making flour or eaten as a vegetable (Anyanwu, 2001). It is an annual grass whose female inflorescence or ear is an axial receme (the cob), each with long silky fibers that protrude from the tip of the ear. The ear is enclosed in modified leaves called husk. Six types of maize have been identified as follows: dent corn, flint corn, floury corn, pod corn and sweet corn. It comes in a variety of colours: yellow, red, blue, pink or black (Anyanwu, 2001). Guinea corn is a type of sorghum cultivated for its grain. However, it is a small grained cereal grass grown extensively in tropical Africa. It is a tall erect plant with an appearance strikingly similar to maize. The plant has coarse stems growing in dense clumps with leaves like grass (Anyanwu, 2001). The plant varies in appearance and size, depending on the variety. It include diverse types of cereal grains such as Sudan grass, broom corn and tall sorghum that may be grown for forage, silage or syrup (Kordylas,1990). Maize and guinea corn seeds and their products are very important sources of energy, carbohydrate, protein and fiber. They also contain a range of micronutrients such as vitamins B and E, Sodium, zinc and magnesium (Microsoft Encarta reference library, 2002). There is evidence to suggest that regular consumption of these products, specifically whole grains may have a role in the prevention of chronic diseases e.g. coronary heart disease and type II diabetes (Microsoft Encarta reference library, 2002). Adequate intake of maize grains serves as a stimulant and vasodilator, increases the flow of urine and reduces the rate of development of cancer, hyperglycemia and Hypertension (Anyanwu, 2001). Maize provides oil in the form of corn oil which is used as raw material in some industries. It can also be used as an alternative to sucrose (Awake, 2008). Guinea corn is a hypoglycemic, hypotensive and good diuretic substance (Anyanwu, 2001). It serves as a vasodilator by widening the arteries and veins for easy flow of blood (association of official analytical chemistry, 1992). The health benefits of corn are attributed in part to their unique phytochemical composition (Adom and liu, 2002). This study is therefore designed to compare the phytochemical and nutrient composition of floury maize and guinea corn.

MATERIALS AND METHODS

SOURCES OF MATERIALS:

The samples of maize (floury type) and guinea corn were obtained from Eke ukwu, Owerri main market.

PREPARATION OF SAMPLES:

The samples were thoroughly cleaned, washed and sun dried. The maize and guinea corn samples were grounded to powdered forms and each of them stored separately in an airtight container before analysis.

PREPARATION OF AQUEOUS EXTRACT:

Five gram of the sample (maize or guinea corn) was dissolved in 100ml of ethanol and left to stand for twelve hours in a closed container. It was filtered and used for analysis.

QUALITATIVE ANALYSIS

TEST FOR ALKALOID

The presence of alkaloid in each of the test samples was investigated using the tests described by Harbone (1973).

TEST FOR PHENOL

The presence of phenols in the test samples was determined by ferric chloride test described by Adewunmi et al, (1980).

TEST FOR SAPONINS

The presence of saponin in the test sample was determined by the froth test described by Harbone (1973).

TEST FOR TANNIN

Tannin was determined using a method described by Harbone (1973).

QUANTITATIVE ANALYSIS

TEST FOR ALKALOID

Five gram of the sample was weighed into 250ml beaker, 200ml of 20% acetic acid in ethanol was added and allowed to stand for 4hours. The mixture was filtered and the extract was collected and concentrated to one quarter of its original volume using a water bath. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was completed. The solution was allowed to settle and was filtered with Whatman filter paper 42. Thereafter the weight of the alkaloid was determined.

% alkaloid = $100(W_2-W_1)/ 100$(weight of sample)

Where:

W_1 = Weight of filter paper

W_2 = Weight of filter paper and alkaloid.

TEST FOR FLAVONOID

Ten gram of the powdered sample (maize or guinea corn) was extracted for twelve hours with 100ml of 80% aqueous methanol at room temperature. The solution was filtered using Whatman filter paper No 42. The filtrate was later transferred into a crucible and was evaporated to dryness over a water bath and the weight was determined.

% flavonoid = $100(W_2-W_1) / 1$(Weight of sample)

Where:

W_1 = Weight of crucible

W_2 = Weight of crucible and extract.

TEST FOR PHENOL

Test for the quantitative amount of phenol was determined using Pearson's (1976) method.

TEST FOR SAPONINS

Twenty gram of the powdered sample was added to 200ml of 20% ethanol. The mixture was heated in a water bath for 4 hours with continuous stirring at about 55^0C. The mixture was filtered and the residue re-extracted with another 200ml of 20% ethanol. The whole extract was reduced to 40ml over water bath at about 90^oC. The concentrated extract was transferred into a 250ml separating funnel and 20ml of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded.60ml of normal butanol was added to the extract. The solution was washed twice with 10ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath and evaporated. Thereafter, the extract was dried in the oven at 110^oc and the weight determined. The saponin value was then calculated as follows:

% saponin = $100(W_2-W_1)/ 1$(Weight of sample)

Where:

W_1 =weight of beaker

W_2 = Weight of beaker and saponin value

TEST FOR TANNINS

Tannin was determined by Fallins-Dennis Spectrophotometric method using pearson's method (1976).

PROXIMATE ANALYSIS

TEST FOR ASH

The ash content of the samples was determined using the method described by James (1995).

TEST FOR FAT AND OIL

The fat and oil content of the samples was determined by solvent method using soxhlet apparatus (extractor) as described by James (1995).

TEST FOR CRUDE FIBRE

The crude fibre was determined by the Weened method described by both James (1995) and Pearson (1976).

TEST FOR GLUTIN

This was determined by the method described by pearson (1976).

TEST FOR MOISTURE

Two gram of the sample was weighed and dried in an oven at a temperature of 130^oC for one hour. After drying, it was cooled in a dessicator and weighed.

% of moisture = $100(W_2-W_1) / 1$(Weight of sample)

Where:

W_1= Weight of sample + beaker after drying

W_2=Weight of sample + beaker before drying

TEST FOR P^H

Ten gram of the sample was weighed in a beaker and 100ml of distilled water was added. It was allowed to stand for 30 minutes and then filtered. The p^H meter was standardized with distilled water after which the p^H of the sample was determined and recorded.

RESULTS

The results of the phytochemical analysis of both maize and guinea corn are as represented in tables 1.1, 1.2 and 1.3.

TABLE 1.1: A table showing the qualitative phytochemical composition of maize and guinea corn.

S/N	PHYTOCHEMICAL TEST	TEST NAME/REAGENT USED	ETHANOL EXTRACT OF MAIZE	ETHANOL EXTRACT OF GUINEA CORN
1.	Alkaloids	Mayer and Wayner's reagent	+	+
2.	Flavonoids	Distilled water and conc.NH_3	+	+
3.	Glycosides	Distilled water, H_2SO_4 and chloroform.	+	+
4.	Phenols	Distilled water,$FeCl_3$ and heat	+	+
5.	Saponins	Distilled water	+	+
6.	Tannins	Distilled water and $FeCl_3$	+	+

TABLE 1.2: A table showing the quantitative composition of phytochemical components of maize and guinea corn seeds.

S/N	PHYTOCHEMICALS	MAIZE (%)	GUINEA CORN (%)
1.	Alkaloid	14.0	6.0
2.	Flavonoid	15.0	23.0
3.	Phenols	0.6	0.9
4.	Saponins	10.1	13.1
5.	Tannins	0.6	0.3

TABLE 1.3: A table showing the percentage proximate composition of maize and guinea corn seeds.

S/N	COMPONENTS	MAIZE(5)	GUINEA CORN(%)
1.	Ash	2.0	1.4
2.	Fat	2.2	1.8
3.	Crude fibre	2.8	3.2
4.	Glutins	11.0	10.5
5.	Moisture	15.0	13.0
6.	P^H	6.2	6.7
7.	Carbohydrate	67.0	70.1

DISCUSSION

A wide range of food plants are consumed by humans all over the world (Oguntona, 1988). In most parts of the world, food plants are made up of mainly the complement foods (Oguntona, 1988). Roots and tubers such as yam, potatoes, cocoyam, cereals such as rice, maize and guinea corn with legumes such as cowpeas constitute an indispensable constituent of human diets in different parts of the world (Oguntona, 1988). These diets apart from their food qualities have been found to contain phytochemicals with demonstrated activities which makes them very useful in chemoprevention management, treatment and control of diverse diseases (Sofowora, 1982). The essence of assessing the chemical contents of food is to provide health benefits beyond those provided by basic nutrients such as vitamins and minerals (Vivekananthan, 1995). Very high levels of carbohydrate were observed in maize and sorghum in this study. This reveals that maize and sorghum are good sources of carbohydrate. They should therefore be consumed as a source of energy. Results from this

study also showed that corn and sorghum have very low content of tannin. This agrees with the work done by Jingwen et al, (2021) who also reported a reduced content of tannin in sorghum in their study. It also agreed with studies by Adom and liu, (2002) and De majia et al, (2005). Liu and co-workers from Cornell University investigated the complete phytochemical profiles in free, soluble conjugated and insoluble bound forms as well as the antioxidant activities in a few uncooked whole grains. They found that corn had the highest total phenolic content (15.55 micromol of garlic acid equiv/g of grain) of the grains tested, followed by wheat (7.99 micromol), Oats (6.53 micromol) and rice 5.56 micromol (Adom and Liu, 2002).

This present study has shown that maize and guinea corn are good sources of alkaloids, flavonoids, glycosides, phenols, saponins and tannins. These are phytochemicals and phytochemicals are chemicals that are found in plant and plant derived foods (Stampter and Rimm, 1993). They are chemicals that appear to work alone and also in combination with vitamins and other nutrients in foods to prevent diseases (Stampter and Rimm, 1993). De Mejia and Prisecaru from university of Illonois have pointed out that corn contains important chemicals like lectins which attribute various health benefits to corns (De majia et al, 2005). Jingwen et al, (2021) reported that sorghum is rich in bioactive phytochemicals which are known to provide many health benefits including antioxidant, anti-inflammatory, anti-proliferative, anti-diabetic and anti-atherogenic activities. Being rich in phytochemicals, maize and guinea corn provides protection against numerous chronic diseases (Ramjiganesh et al, 2000). High percentage of saponin in both maize and guinea corn seeds make them to be good antioxidants which fight cancer causing free radicals. Corn is a rich source of a phenolic compound ferulic acid, an anti cancer agent which has been shown to be effective in fighting tumours in breast cancer and liver cancer (Adom and Liu, 2002).

High percentage of flavonoid in guinea corn shows that it can be used to reduce thyroid and hormonal disorder. Consumption of corn kernels assists the management of non insulin dependent diabetes mellitus and is effective against hypertention due to the presence of phenolic phytochemicals in corn (Ramjiganesh et al, 2000).

Corn oil has been shown to have anti-atherogenic effect on cholesterol levels, thus preventing the risk of cardiovascular diseases. Corn starch may be applied topically to soothe skin rashes and irritations (Ramjiganesh et al, 2000).

A meal rich in maize and guinea corn can go a long way in protecting against many diseases and ailments. They should therefore be consumed both as a source of energy and for their medicinal value.

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