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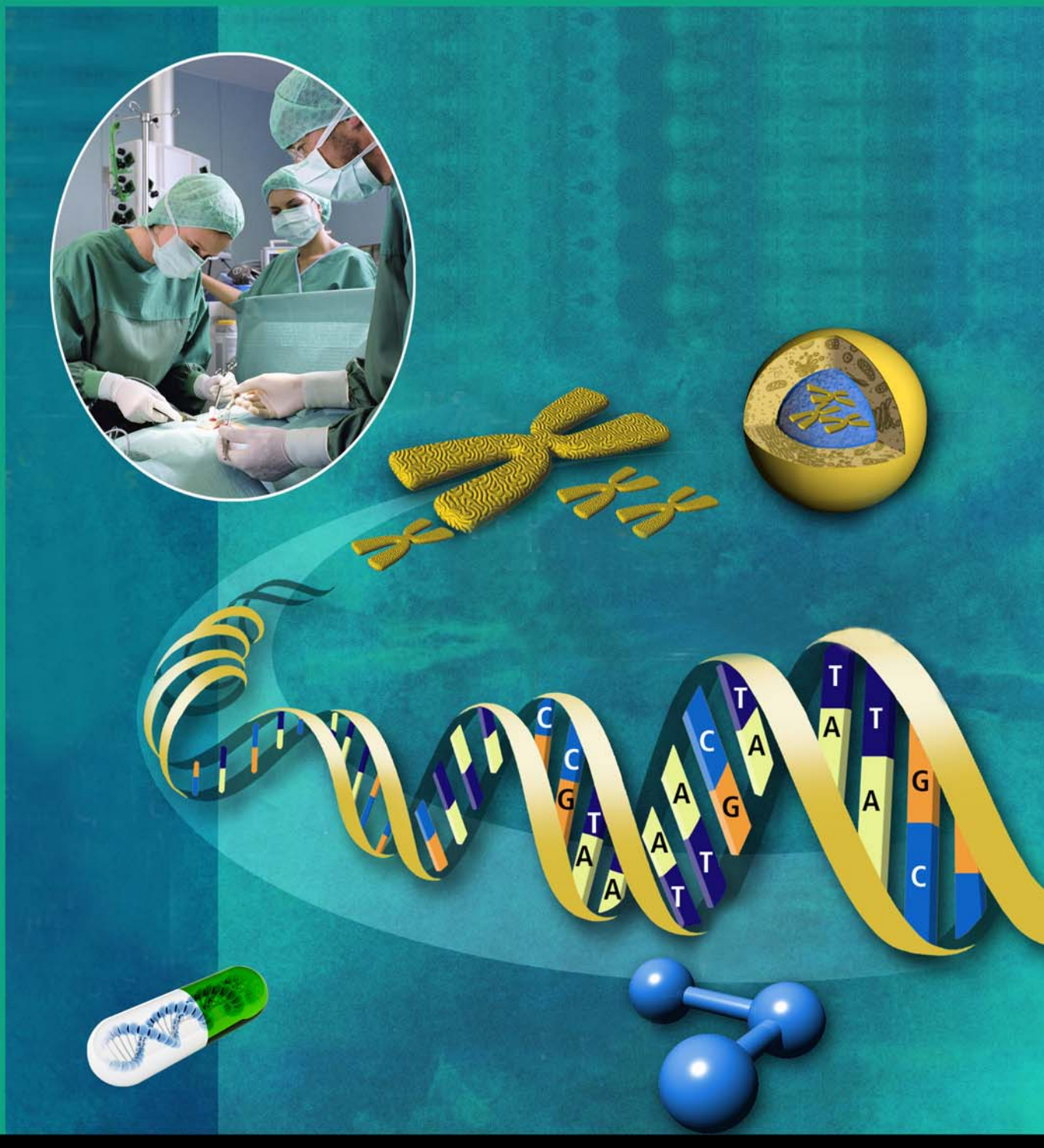

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Research Paper

ANTI-NUTRIENTS SURVEY OF THREE MAIZE VARIETIES CONSUMED IN ABAKALIKI, METROPOLIS NIGERIA

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Three major maize varieties found in Abakiliki metropolis in Nigeria namely the pop corn, white corn and yellow corn were screened for their antinutrient contents at the Project Development Institute Enugu, Nigeria. The maize varieties were collected from Abakpa and Kpirikpiri Markets, all in Abakaliki metropolis. The results showed that saponin concentration ranged from 0.0003±0.0004mg/g in the white corn to 0.0024 ± 0.0004mg/g in the yellow corn,while the lethal level of saponin is 0.2mg/g. Phenols ranged from 0.0009 ± 0.0005mg/g in the yellow corn to 0.00092±0.0002 mg/g in popcorn , but the lethal level of phenol is 0.3 mg/g. The concentration of flavonoid ranged from 0.0030 ± 0.0006 mg/g in the yellow corn to 0.0049 ± 0.0004 mg/g in the pop corn and its lethal level is 0.35 mg/g. Alkaloids concentration ranged from 0.0017 ± 0.0004 mg/g in yellow corn to 0.00250 ± 0.00007 mg/g in the pop corn, but its lethal level is 0.025 mg/g. The results generally indicated that the concentration of these antinutrients in the maize varieties consumed in Abakaliki are significantly ($p < 0.05$) lower than their various lethal levels in animal.

Keywords: Anti-nutrients, Pop corn, White corn, Yello corn

INTRODUCTION

Anti-nutrients are substances to which we are all exposed to through food and water, that antagonize food nutrients needed for good health (Reddy and Pierson ,1998). Some anti-nutrient bind to nutrients and change their nutritional values, others tie up or inhibit enzymes that are needed for food digestion and other body functions. Some problems caused by creating a greater need for certain nutrients, others caused by nutrients to be excreted more rapidly from the body (Reddy and Pierson, 1998). Many of the antinutrients have either a direct or indirect effect on the immune function and nutritional status of the body.

Cereals and other plants used as food may contain a significant amount of toxic or anti-

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nutritional substances (Chaven and Kadam, 1999). Legumes are generally rich on protease inhibitors, amylase inhibitors, metal chelators, hemagglutinins, saponins, cyanogens, lathyrogens, tannins, allergens, acetylenic furan, isoflavonoids and phytoalexins (Pariza, 1996). Most cereals also contain an appreciable amounts of phytates and enzyme inhibitors.Some cereals like sorghum and millet contains large amount of polyphenols and tannins (Salunkhe *et al*., 1990). Some of these substances reduce the antinutritional value of foods by interfering with mineral bioavailability and digestibility of proteins and carbohydrates. Since legumes are often consumed together with cereals, proper processing of cereal-legumenious mixtures could be capable of eliminating these antinutrients before consumption (Chaven and Kadam, 1999). Relatively little is known about the fate of antinutrients and toxicants in traditional fermented foods. Toxicants in foods can arise from intrinsic and extrinsic sources. The intrinsic toxicants are those that are components of foods by synthesis or degradation and as such are referred to as naturally occurring food toxicants. An example of some of these toxicants are phytate, cyanogenic glycosides and tannins. Probably all intrinsic toxic substances function as antinutrients in foods or their complexes (Chaven and Kadam,1999). Hence, man has over the ages, through trial and error techniques segregated plant and animal foods into toxic and non-toxic groups. For example, in some of the foods which contain intrinsic principles, processing techniques have been developed which make them safe for human consumption. There has been over the past few years a systematic attempt by scientists to elucidate the chemical nature of various naturally occurring toxicants in common and lesser known foods with a view to developing simpler detoxification procedure for them (Pariza, 1996). Most plant materials contain some form of toxic compounds but whether it is toxic or not to an animal will depend on the potency of the toxic factor, dosage, the frequency of intake and the natural species in unity to that particular toxic substances (Pariza, 1996).

There are recognizably more toxic plants than animals .These toxic plants and animals contain compounds that have medicinal and pharmacological properties which have been successfully explored by traditional herbalists. Some of the intrinsic toxic principles found in foods include trypsin inhibitors, gossypol, cyanogenic glycosides, oligosaccharides, goitrogens, antivitamins and other specific factors found in the roots, tubers and other foods.

This study was designed to determine the levels of the various antinutrients in different maize varieties consumed in Abakaliki, Ebonyi State with a view to determining the detoxification efficiency of maize processing methods.

MATERIALS AND METHODS

Sample Collection

Three species of corn, namely the white corn, yellow corn and the pop corn were collected from different locations in Abakpa and Kpirikpiri markets all in Abakaliki metropolis.

Chemicals/Reagents

All chemicals used in this study were of analytical grade and products of May and Baker, England; BDH, England and Merck, Darmstand, Germany.

Extraction Procedure

Fresh corns of pop corn, yellow corn and white corn were carefully dried. The corn samples were ground into powder with a mortar and pestle. 150

g of each ground sample of the corn were macerated in distilled water for 24 h. After which the extractives were filtered out with filter paper and cheese cloth. The resulting extract for each of the corn samples were concentrated. The weights of the semi-solid extracts were also measured.

Determination of Percentage Yield of Extract

The percentage yield of the extract was determined by weighing the coarse corn sample before extraction and the corn extract after concentration and then calculated using the formula.

$$\text{Percentage (\%) yield} = \frac{\text{Weight (g) of concentrated extract}}{\text{Weight (g) of ground corn sample}} \times 100$$

Determination of Percentage Saponin, Phenols, Alkaloids and Flavonoids

The concentrations of saponin, phenols, alkaloids and flavonoids were determined using the AOAC method, 1990.

RESULTS

The Percentage Yield of Pop Corn

From the result in Table 1 the percentage (%) yield of the pop corn extract was found to be 14.87%.

Table 1: The Percentage Yield for Pop Corn Extract

Initial Weight of Ground Extract (g)	Final Weight of Extract (g)	Percentage (%) Yield of Extract
150	22.30	14.87

The Percentage Yield of White Corn

From the result in Table 2 the percentage (%) yield of the white corn extract was found to be 15.60%.

Table 2: The Percentage Yield for White Corn Extract

Initial Weight of Ground Extract (g)	Final Weight of Extract (g)	Percentage (%) Yield of Extract
150	23.40	15.60

The Percentage Yield of Yellow Corn

From the result in Table 3 the percentage (%) yield of the yellow corn extract was found to be 15.15%.

Table 3: The Percentage Yield for Yellow Corn Extract

Initial Weight of Ground Extract (g)	Final Weight of Extract (g)	Percentage (%) Yield of Extract
150	22.73	15.15

The Concentration of Saponin In Maize Varieties Consumed In Abakaliki

The results in Figure 1 and Table 4 shows that the concentration of saponin in yellow corn was greater than its concentration in the pop corn and white corn. The mean concentration of saponin was 0.0024 ± 0.0004 mg/g in yellow corn, whereas the mean concentration of saponin in pop corn and white corn were 0.0014 ± 0.0001 mg/g and 0.0003 ± 0.0004 mg/g respectively.

Figure 1: Concentration of Saponin in Maize Varieties Consumed in Abakaliki, Ebonyi State

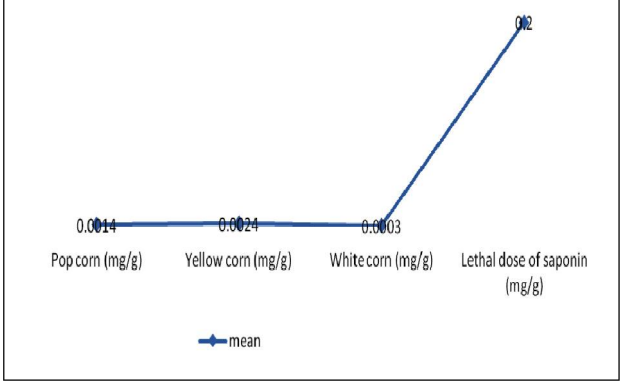

Table 4: The Concentration of Saponin in Maize Varieties Consumed in Abakaliki

Replicates	Pop Corn (mg/g)	Yellow Corn (mg/g)	White Corn (mg/g)
1	0.0013	0.0027	0.0002
2	0.0014	0.0020	0.0007
3	0.0015	0.0025	0.0001
Mean±SD	0.0014±0.0001	0.0024±0.0004	0.0003±0.0004

The Concentration of Phenol in Maize Varieties Consumed in Abakaliki

The results in Figure 2 and Table 5 shows that the concentration of phenol in pop corn was greater than its concentration in the white corn and yellow corn. The mean concentration of phenol in pop corn was 0.0092 ± 0.0002 mg/g, whereas the mean concentration of phenol in white corn and yellow corn were 0.0017 ± 0.000001 mg/g and 0.0009 ± 0.0005 mg/g respectively.

Figure 2: Concentration of Saponin in Maize Varieties Consumed in Abakaliki, Ebonyi State

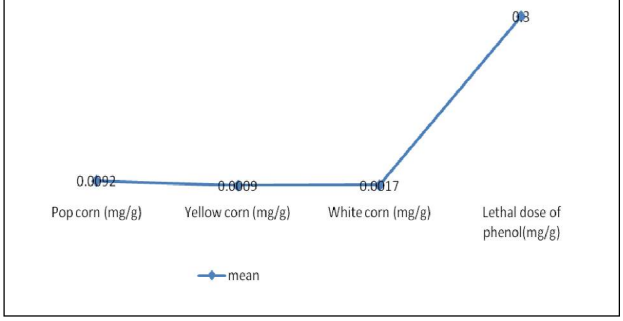

Table 5: The Concentration of Saponin in Maize Varieties Consumed in Abakaliki

Replicates	Pop Corn (mg/g)	Yellow Corn (mg/g)	White Corn (mg/g)
1	0.0090	0.0004	0.0015
2	0.0094	0.0012	0.0019
3	0.0092	0.0012	0.0017
Mean±SD	0.0092±0.0002	0.0009±0.0005	0.0017±0.000001

The Concentration of Flavonoids in Maize Varieties Consumed in Abakaliki

The results in Figure 3 and Table 6 shows that the concentration of flavonoids in pop corn was greater than its concentration in the other two varieties. The mean concentration of flavonoids in pop corn was 0.0049 ± 0.0004 mg/g , whereas the mean concentration of flavonoids in white corn and yellow corn were 0.0045 ± 0.0002 mg/g and 0.0030 ± 0.0006 mg/g respectively.

Figure 3: Concentration of Flavonoids in Maize Varieties Consumed in Abakaliki, Ebonyi State

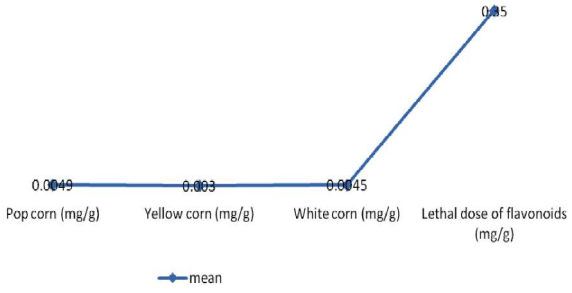

Table 6: The Concentration of Flavonoids in Maize Varieties Consumed in Abakaliki

Replicates	Pop Corn (mg/g)	Yellow Corn (mg/g)	White Corn (mg/g)
1	0.0044	0.0026	0.0047
2	0.0051	0.0033	0.0044
3	0.0052	0.0027	0.0045
Mean±SD	0.0049±0.0004	0.0030±0.0006	0.0045±0.0002

The Concentration of Alkaloids in Maize Varieties Consumed in Abakaliki

The results in Figure 4 and Table 7 shows that the concentration of alkaloids in pop corn was greater than its concentration in the other two

Figure 4: Concentration of Alkaloids in Maize Varieties Consumed in Abakaliki, Ebonyi State

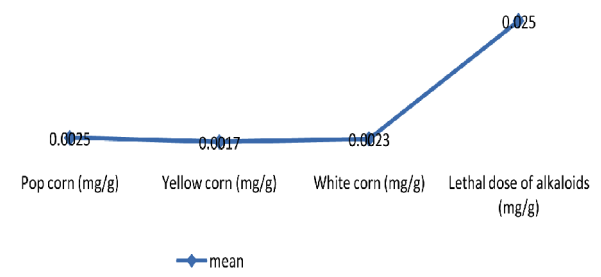

Table 7: The Concentration of Alkaloids in Maize Varieties Consumed in Abakaliki

Replicates	Pop Corn (mg/g)	Yellow Corn (mg/g)	White Corn (mg/g)
1	0.0025	0.0020	0.0023
2	0.0025	0.0010	0.0023
3	0.0025	0.0020	0.0023
Mean±SD	0.0025±0.0007	0.0017±0.0004	0.0023±0.0001

varieties .The mean concentration of alkaloids in pop corn was 0.0025±0.0007mg/g , whereas the mean concentration of alkaloids in white corn and yellow corn were 0.0023±0.0001 mg/g and 0.0017 ±0.0004 mg/g respectively.

DISCUSSION

Corn is one of the most staple food in the world especially in the tropics .About 90% of the population depends on it particularly children. Carbohydrates is its major food nutrient (Chauldry and Malik , 2000). Anti -nutrients are substances, to which we are all exposed to through food and water, that reduces food nutrients needed for good health (Reddy and Pierson, 1998). These, anti-nutrients inhibit digestive enzymes, some cause problems by creating a greater need for certain nutrients, while others make nutrients to be excreted more rapidly from the body (Reddy and Pierson, 1998). Many of the anti-nutrients have either a direct or indirect effect on the immune system and nutritional status of the body. However, some of the anti-nutrients protect the body from various types of cancers, free radicals and radiations.

The results of saponin concentration of the three maize varieties consumed in Abakaliki metropolis ranged from 0.0003 ± 0.0004 mg/g in white corn to 0.0024 ± 0.0004 mg/g in the yellow corn,while the lethal level of saponin is 0.2 mg/g (Diwan *et a l.,* 2000) which shows that the saponin concentration in the three maize varieties consumed in Abakaliki metropolis may be safe for consumption.

The results of Phenol concentration obtained in the three maize varieties consumed in Abakaliki metropolis ranged from 0.0009 ± 0.0005 mg/g in the yellow corn to 0.00092 ± 0.0002 mg/g in popcorn , but the lethal level of phenol according to (Sternitke *et al.,* 1992) is 0.3 mg/g indicating a non-toxic levels of phenol in the three maize varieties consumed in Abakaliki metropolis.

The concentration of flavonoid ranged from 0.0030 ± 0.0006 mg/g in the yellow corn to 0.0049 ± 0.0004 mg/g in the pop corn while its lethal level obtained by (Kal *et al.,* 1992) is 0.35 mg/g, which indicated that the flavonoid concentration of the three maize varieties consumed in Abakaliki Metropolis could be safe for human consumption.

Alkaloids concentration of the three maize varieties consumed in Abakaliki metropolis ranged from 0.0017 ± 0.0004 mg/g in yellow corn to 0.00250 ± 0.00007 mg/g in the pop corn, but its lethal level is 0.025 mg/g (Pfister *et al.,* 1994). The results above showed that alkaloid levels in the three maize varieties consumed in Abakaliki metropolis could also be safe for consumption.

CONCLUSION

The results obtained generally indicated that the concentration of these anti-nutrients in maize varieties consumed in Abakaliki metropolis were significantly lower ($p<0.05$) than their respective lethal levels in mice as reported by Chauldry and Malik, 2000; Diwan *et al*., 2000; Stemitke *et al*.,1992; Kal *et al*., 1992 and Pfister *et al*., 1994.

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