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# Studies on Physicochemical Properties of the Oil, Minerals and Nutritional Composition of Nut of Nut Grass (*Cyperus rotundus*)

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## ABSTRACT

The present study was undertaken to investigate the physicochemical properties of the oil, mineral and nutritional compositions of *Cyperus rotundus* (nut of nut grass) or "Aya" in Hausa language. The nuts were obtained from Oba's Market in Akure, Ondo State, Nigeria. The oil of the nut was extracted to study the physicochemical contents while the whole samples were oven-dried overnight at 40°C and ground into powder with milling machine to evaluate the mineral and nutritional compositions of the nut. The results of the physicochemical properties in (%) obtained from the study showed fatty acid to be 0.62±0.01, acid value of 10.1±0.17; iodine value of 24.15±0.25; peroxide value of 0.65±0.06 and saponification value of 37.71±0.97. Though, manganese, cobalt, zinc and iron were not detected in the sample, the results obtained for copper, magnesium, sodium, calcium and potassium were substantially high. The nutritional contents (%) showed in oil to be 29.48±0.01, crude fibre of 12.63±0.01, ash content of 2.67±0.21 and protein of 9.04±0.00 with carbohydrate content of 21.47±0.83. The results of the analyses showed that the nut of nut grass possessed good physicochemical properties and high values of nutritionally valuable minerals.

**Key words:** Physicochemical properties, valuable minerals, nutritional compositions, *Cyperus rotundus*

## INTRODUCTION

*Cyperus rotundus* is distributed throughout the tropics and subtropics and generally rewarded as the world's most troublesome weed. It is found in many parts of West Africa, especially near the coast and the northern part of the savanna zone, northern part of Nigeria and in most part of East Africa except for southern and western Tanzania (Ivens *et al*., 1978). *Cyperus species* belong to the family Cyperaceae and are used as staple food just like groundnut because it is rich in oil, carbohydrate, fibre and minerals (Messiaen, 1992). *Cyperus rotundus* occurs in all types of crop up to sugar and maize. *Cyperus* species are very persistent weeds, because although the tops may be killed by cultivation or spraying, the bulbs or tubers are a little bit affected and soon produce new shoots. Very dense infestations can build up in a few years. With *Cyperus rotundus* up to 1000 m shoots/m have been noted and is capable of producing 40 or more new bulbs (Ivens, 1967). The present study was however, undertaken to investigate the physicochemical properties of the oil, mineral and nutritional compositions of *Cyperus rotundus* (nut of nut grass).

## MATERIALS AND METHODS

**Sample preparation:** *Cyperus rotundus* nuts used in this investigation was obtained from Oba market in Akure, Ondo state, Nigeria, oven dried at 40°C overnight and ground to the finest particles using a dry milling machine. The ground sample was then analyzed for its nutritional values, mineral profile and physicochemical properties of the oil.

**Methods:** The proximate compositions (crude protein, crude fat, crude fibre, ash, moisture and carbohydrate) were determined according to the methods of AOAC (1990).

The mineral composition was determined using, analytical methods of atomic absorption spectrophotometer after ashing and dissolving the samples in 10% hydrochloric acid Perkin-Elmer Inc., 1982). The physicochemical properties of the extracted oil of the nut were estimated using the methods described by Pearson (1976). All the determinations were carried out in triplicates.

## RESULTS AND DISCUSSION

The results of *Cyperus rotundus* nuts for proximate composition from Table 1 revealed that the sample is rich in Moisture (24.73±0.28), Fat (29.48±0.33), fibre (12.63±0.01) and Carbohydrate contents (21.47±0.83). As evidenced in the Table 2, the mineral concentration (mg $g^{-1}$) of *Cyperus rotundus* nut showed that sodium was found to be most abundant (119.29) followed by potassium (110.11) and also rich in magnesium, copper and calcium while manganese, cobalt, zinc and iron were not detected.

The physicochemical properties of the oil of the nut of *Cyperus rotundus* showed that saponification, (37.71±0.97) iodine (24.15±0.25) and acid (10.10±0.17) values are high as evident from Table 3. The ash contents of nut of *Cyperus rotundus* is 2.67±0.21% and is close to that of

Table 1: Proximate composition of nut of *Cyperus rotundus* (nut grass) on dry matter basis %

| Parameters | Percentage composition |
|---|---|
| Moisture | 24.73±0.28 |
| Fat | 29.48±0.33 |
| Crude protein | 9.04±0.00 |
| Ash | 2.67±0.21 |
| Crude fibre | 12.63±0.01 |
| Carbohydrate | 21.47±0.83 |

Means of triplicate determinations

Table 2: Mineral composition of nut of *Cyperus rotundus* (nut grass) mg/100 g

| Mineral | Sample contents (mg/100 g) |
|---|---|
| Cu | 28.11±0.02 |
| Mn | ND |
| Mg | 50.76±0.50 |
| Co | ND |
| Na | 119.29±0.52 |
| Zn | ND |
| Ca | 16.40±0.32 |
| Fe | ND |
| K | 110.11±0.71 |

Means of triplicate determinations

Table 3: Physicochemical properties of nut of *Cyperus rotundus* (nut grass) (%)

| Physicochemical properties | Values (Mean±SD) (%) |
|---|---|
| Acid value | 10.10±0.17 |
| Free fatty acid (Oleic acid) | 0.62±0.01 |
| Iodine value | 24.15±0.25 |
| Saponification value | 37.71±0.97 |
| Peroxide value | 0.65±0.06 |
| Refractive index | 1.46±0.01 |
| Specific gravity | 0.93±0.01 |

Means of triplicate determinations

peanut (Egan *et al*., 1981), cashew nut 2.5% (Egan *et al*., 1981) but lower than that of almond 3.0% (Egan *et al*., 1981). The crude fibre is 12.63±0.01% which is relatively high and the high level of crude fibre has been reported to hinder bioavailability of nutrients in food samples (Joslyn, 1970). Crude fibre is the insoluble and combustible organic residue after sample has been treated under prescribed conditions. However, it has been found to aid elimination of waste (Joslyn, 1970). The nut is a good source of fibre which is an important component of food which slows down the release of glucose into the bloodstream as quoted by Onwuliri and Obu (2002). The carbohydrate content is 21.47±0.83 which is higher compared with almond nut 14.7%, lower than that of cashew nut 30.2% and is similar to that of peanut 20.0%. From Table 2, the nut shows a good mineral distribution that is useful for healthy growth and good bone formation.

It is observed from the result of analysis that copper, magnesium, calcium, sodium and potassium are 28.11, 50.76, 16.4, 119.29 and 110.11 mg/100 g, respectively. While iron, zinc, manganese and cobalt were not detected in the sample. From the results of physiochemical properties of the nut of *Cyperus rotundus* shown in the Table 3, the oil has specific gravity of 0.93±0.01 and refractive index of 1.46±0.01 which are comparable to the oil of *Bauhinia racemosa* as reported by Amoo and Moza (1999). The oil is brownish in colour with saponification value of 37.71±0.97. This value is lower than those reported for olive oil series which fall between the range of 188-196, coconut oil of 255, palm kernel oil of 247 as reported by Egan *et al*. (1981). The acid value of the oil is 10.10±0.17 which is relatively higher than 0.4% and this makes it unsuitable for edibility and sometimes industrial purposes as reported by Amoo and Moza (1999). Also the free fatty acid is 0.62±0.1, a function of an acid value which falls within the range of 0.5-7.5% as reported by Egan *et al*. (1981) as noticeable acidity to the palate. The iodine value content is 24.15±0.25 which is lower than those of linseed oil, sunflower oil which range between 125-200, cotton seed oil, sea same oil and soya oil range from 80-140, olive oil, arachis oil, almond oil 80-110 as reported by Egan *et al*. (1981). The peroxide value 0.65±0.06 (1.30 mEq $kg^{-1}$) of the oil does not fall within the reported noticeable rancidity range of 20 and 40 mEq $kg^{-1}$ as reported by Egan *et al*. (1981).

## CONCLUSION

The results presented showed that nut of *Cyperus rotundus* is nutritious most especially in protein and carbohydrate and also in oil and fibre. The level of the physiochemical properties shows the level of unadulteration. The low saponification value 37.71±0.97 makes the oil unsuitable for soap making.

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