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# Compositional Analysis of Horse Eye *(Dioclea Reflexa)* Seed Flour and Its Cake

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**Abstract:** A relatively unknown *Dioclea reflexa* seeds (a legume) was processed to flour and cake, respectively. Proximate, metallic and amino acids compositions of seed flour and cake were investigated. Antinutritional values of the cake and characteristic of seed oil was also analysed. Cake parameters were generally higher than that of seed flour in all the determinations; however both cake and seed flour data were within the acceptable levels for conventional legumes. The high saponification (201. 84 $mg^{-1}g$) and iodine (145.7mg/100g) values, low peroxide (8.85 meq/kg), acid (6.26 $mgg^{-1}$) values and low unsaponifiable matter (0.90%),were recorded for the extracted oil and cake respectively. *Dioclea reflexa* oil could be a good domestic and industrial substitute to the over increasing demands of conventional oils. Also, the oil seed cake could serve as important plant protein sources in livestock production.

**Key words:** Horse eye, seed flour, dioclea reflexa

## INTRODUCTION

*Dioclea reflexa*, a legume also known as horse eye, commonly distributed in the tropical region. The legume seeds have being used for curing piles, as thickener in soup preparation and as a cover crops by the farmers, especially in the eastern part of Nigeria. There is however, little or no information regarding the nutritional composition of this lesser known legume. The utilization and exploitation of a seed or legume or plant generally depends on the available information and data on such plant. It is the aim and objective of this study to investigate proximate composition, metallic composition, antinutritional factors and amino acid composition of both seed flour and cake, as well as characteristics of its oil.

## MATERIALS AND METHODS

*Dioclea reflexa* seeds were bought from a local market in Abeokuta, Ogun State, Nigeria. The seeds were washed, cracked to remove the pericarps and seed coat and then sundried before milling into granular flour form and stored in a refrigerator until needed for analysis. Oil was extracted from the flour sample using soxhlet extractor. The residue left after extraction of oil is the cake. The proximate composition was carried out using the methods of the Association of Official Analytical Chemists[1]. Tannin, phytin and phytin-phosphorus were determined with[2] method. Trypsin inhibitor activity, nitrogen solubility index (NSI), protein dispersibility index (PDI) were estimated using[3] methods (1985)[4] and available methionine[5] were also estimated. Metallic composition of the seed flour and cake were determined using Flame photometer for Na and K; Atomic Absorption Spectrometry (AAS) for other metals. Free fatty acid, peroxide, anisidine acid, iodine and saponification values were determined by[6]. Amino acids profile in seed flour and cake were determined with Technicon Sequential Multisample Amino Acid Analyzer (TSM).

## RESULTS AND DISCUSSION

**Proximate composition:** The result of the proximate composition of the seed flour and cake are presented in Table 1 and 2, respectively. The relative high moisture content of *Dioclea reflexa* seeds flour (14.50%) compared to cowpea of 9.2%[7] and Soybeans of 5.38%[8] may be due to the hard nature of the seed which prevents excessive moisture loss. This implies that *Dioclea reflex* seeds will have lower shelf life than cowpea and soyabeans flours.

The values of 35.90 and 23.88% for oil and protein contents respectively obtained for *Dioclea reflexa* seed flour, Pigeon pea oil content of 3.4%, Lima bean 1.6 Jack bean 8.8%, , cowpea of 1.7%[7] and 19.45% of Soyabeans[8] are lower than that of the sample studied. *Dioclea reflexa* cakes have higher protein content (48.31%) than in seed but lower than that of groundnut cake of 56.49%[9]. The high oil value obtained for the seed may make it a good

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Table 1: Proximate composition of horse eye (*Dioclea reflexa*)

| Seeds flour | |
|---|---|
| Parameters | %Composition |
| Moisture content | 14.50±0.71 |
| Ash content | 4.02±0.23 |
| Nitrogen content | 1.26±0.41 |
| Protein content | 23.88±3.71 |
| Oil content | 35.90±0.01 |
| Crude fibre | 7.62±0.03 |
| Sugar content | 12.63±0.18 |
| Glucose | 0.73±0.13 |
| Sucrose | 4.31±0.31 |
| Tanin | 0.95±0.03 |
| Phenol | 1.43±0.07 |

Mean of three determinations±SD

Table 2: The proximate composition of horse eye (*Dioclea reflexa*) seed flour and cakes (Dm basis)

| Parameters | Composition |
|---|---|
| Dry matter (%) | 93.42±4.21 |
| Crude protein (%) | 48.31±3.38 |
| Oil content (%) | 4.1±1.03 |
| Ash content (%) | 6.9±1.98 |
| Available lysine (g/16N) | 3.51±1.07 |
| Available methionine (g/16N) | 0.62±0.01 |
| Crude fibre | 10.20±1.12 |
| Nitrogen solubility index (%) | 27.12±2.61 |
| Protein dispersibility index (%) | 49.21±3.72 |
| Nitrogen solubility (% in 5N – HCl) | 4.25±3.92 |

Mean of three determinations ± SD

alternative or supplement to some conventional oil seeds such as groundnut and soyabean.*Dioclea reflexa* cake can be used as supplement in animal feed and could be fried in oil to form a delicious snack for humans' consumption and as supplementary in other dishes. Hence, *Dioclea reflexa* can be a cheap source of protein and fat for domestic and industrial consumption. Crude fibre of studied seeds (7.62%) and its cake (10.20%) are higher than common legumes such as cowpea- 3.6%[10], groundout seed- 2.7%, its cake- 4.6% [9]and soyabean- 4.28%[6]. Since food high in fibre content is considered good for diabetic patients[11-12]and also reduces blood cholesterol[13]. Thus, *Dioclea reflexa* seed and its cake could be recommended for incorporation into the diet of diabetic and antheroclerotic patients. The ash contents level of cake is higher than that of the seed flour. (Table 1 and 2).

Available methionine value (Table 2) of studied sample cake (0.62) was found to be the same with that of cotton seed – cake of 0.67; lower than that of full –fat soyabean meal of 0.91; rape seed – meal of 0.89; sesame – meal of 1.23; and but higher than that of groundnut cake of 0.51 and raw soyabean meal of 0.41[4].

The results of anti-nutritional factors of *Dioclea reflexa* cake are presented in Table 3. Phytin value (1.31%) and phytin- phosphorus value (0.21%) were lower than that reported by Bamgbose (1994) for cotton seed cake

Table 3: Antinutritional factors of horse eye (Dioclea reflexa) seed flour and Cake

| Antinutritional factors | Composition |
|---|---|
| Phytin (%) | 1.31±0.11 |
| Phytin phosporus (%) | 0.21±0.01 |
| Tanin (mg/100g) | 2.05±0.08 |
| Urease activity (DPH) | 0.10±0.00 |
| Dye- binding capacity ($mgg^{-1}$) | 2.14±0.21 |
| Trypsin inhibitor activity ($mgg^{-1}$) | 4.15±0.72 |

Mean of three determinations±SD

Table 4: The metallic composition of horse eye (*Dioclea reflexa*) seeds flour and cake

| | % composition | |
|---|---|---|
| Metal | Flour | Cake |
| Na | 0.03±0.01 | 0.11±0.00 |
| Ca | 1.44±0.06 | 1.62±0.02 |
| K | 0.67±0.13 | 0.82±0.01 |
| P | 0.09±0.01 | 0.7±0.01 |
| Zn | 0.02±0.00 | 0.42±0.04 |
| Pb | 0.00±0.00 | 0.00±0.00 |
| Mg | 0.02±0.01 | 0.20±0.06 |
| Fe | 0.03±0.01 | 0.12±0.09 |
| Mn | 0.02±0.01 | 0.05±0.01 |
| Ni | 0.01±0.00 | 0.01±0.00 |
| Cu | 0.02±0.01 | 0.04±0.05 |
| Cd | 0.01±0.00 | 0.03±0.01 |

Mean of three determinations±SD

(1.95 and 0.55%), groundnut cake (1.46 and 0.41%) and sunflower – meal (1.61 and 0.42%). *Dioclea reflexa* cakes have tannin level of 2.05mg/100g. This value is lower than that of Soya bean meal, groundnut cakes, rapeseed meal, sesame- meal and sunflower meal[14]. Tanin as an antinutritional factor is not as important as its effect on cakes though it is not unlikely that such minor effect as complimenting phytin in affecting mineral metabolism could occur. Urease activity of 0.1 was obtained for *Dioclea reflexa* cake, which is less than 0.16 in a soybean cake[14].

The abundance of macro and microelement in *Dioclea reflexa* seeds and its cake (Table 4) would speed up metabolic processes and improve growth and development of the consumers. Generally, levels of metals in cake are more than that of seeds (Table 4). The high concentration of potassium will regulate acid- base balance and normal metabolism. Sodium and Nickel would also play a vital role in this regard. The relatively high concentration of calcium and magnesium would make its oils useful for domestics' purposes. This is because calcium and magnesium ions play vital roles in the formation of bones while Mg and Mn act as enzymes activators and for the transmission of various signals such as those that trigger contraction of cardiac muscles causing the heart to beat[15-16].

Amino acids composition of *Dioclea reflexa* cake was generally higher than its flour (Table 5). Amino acids of *Dioclea reflexa* flour are within the range of other

Table 5: Amino acid content of horse eye (*Dioclea reflexa)* seed flours and cake

| | Composition | |
|---|---|---|
| Amino acid | Seed flour | Cake |
| Arginine | 10.29±0.91 | 15.45±1.02 |
| Histidine | 3.22±0.81 | 8.64±1.12 |
| Isoleucine | 4.38±1.01 | 9.15±1.23 |
| Leucine | 7.26±1.32 | 12.63±1.61 |
| Methionine | 1.13±0.04 | 6.38±1.14 |
| Cystine | 1.96±0.31 | 7.08±1.91 |
| Phenylalanine | 2.71±0.74 | 7.39±1.82 |
| Tyrosine | 2.85±0.61 | 7.90±1.74 |
| Threonine | 9.16±0.98 | 15.24±2.05 |
| Tryptophan | 0.81±0.15 | 4.93±1.09 |
| Valine | 6.23±1.04 | 11.45±1.72 |
| Alanine | 5.78±1.4 | 10.81±1.99 |
| Aspartic acid | 12.92±1.13 | 18.03±2.42 |
| Glutamic acid | 2.1±2 | 27.59±2.88 |
| Proline | 2.31±0.01 | 7.42±1.07 |
| Serine | 7.01±1.45 | 14.11±1.92 |
| Lysine | 8.24±1.06 | 15.78±1.84 |

Mean of three determinations±SD

Table 6: Characteristics of horse eye (Dioclea reflexa) seeds oil

| Properties | Values |
|---|---|
| Unsaponifiable matter % | 0.9% |
| Oxidation number | 35.83±3.39 |
| Anisidin value | 18.13±2.03 |
| Acid value mg/g | 6.26±1.99 |
| Peroxide value (meq/kg) | 8.85±1.89 |
| Free fatty acid value (mg/g) | 4.65±1.12 |
| Iodine value (mg/100g) | 145.7±4.56 |
| Saponification value (mg/g) | 201.84±5.92 |
| Refractive index (400C) | 1.4641±0.03 |

Mean of three determinations±SD

legumes such as soyabean, pigeon pea, cowpea and groundnut[17]. It however have higher lysine (8.24%) than pigeon pea (6.57%) and cowpea (6.58%), threonine (9.16%) than soyabean (3.3%), pigeon pea (3.49%) and cowpea (3.68%), cystine (1.96%) than soyabean (0.8%) and 1.69% for African yam bean[17-8]. In practical terms, supplementation of legume protein may be achieved by combining *Dioclea reflaxa* with cereals in foods.

The characteristics of the *Dioclea reflexa* seed oil is given in table 6. The refractive indices of the oils of studied seed (1.4641) is in close range with the values obtained for some convectional oils such as palm kernel oil (1.449- 1.451), Soya bean oil (1.466-1.470) etc[18].

Since the refractive indices of the oils are greater than that of water (1.330) at room temperature, this property suggests the use of the oils in studies relating to optics.
The saponification values of the oil is quite high and is in good agreement with that of some conventional oils, e.g. groundnut oil (188-195mgg$^{-1}$) and palm oil (195-205mgg$^{-1}$)[18]. The high saponification and iodine values conferred on the oil the properties required in soap making and in cosmetics industry. These properties also make the oil useful raw material and as sources of essential fatty acids required in the body. The acid value of the oil (6.26mgg$^{-1}$) is within the range 3-7mgg$^{-1}$ reported for kernel oil, convectional oil[19].

The low acid and peroxide values are indicators of the ability of the oils to resist lipolytic hydrolysis and oxidative deterioration. The unsaponification matter showed an inverse relationship to the saponification values of the oils. The values obtained in this work (0.9%) compared well with those of convectional oils such as palm oil (<1%) and maize oil (<1%)[18]. The unsaponification matter represents the non saponification materials such as sterols, fatty alcohols, squalene, and vitamins etc. which have basic biological functions such as hormone synthesis. The low unsaponifiable matter of the oils is an indicator of low levels of minor constituents such as cholesterol. Hence, the oil can be used as component of drugs and as antioxidant agents.

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