CHEMICAL CHARACTERISATION OF COMMONLY USED DIETARY OILS IN BROILER PRODUCTION

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ABSTRACT

This study was conducted to characterize different dietary oils commonly used in broiler chicken production. Soybean oil (SYO), Palm-kernel oil (PKO), Sheabutter (SHO), Coconut oil (CO) and Groundnut oil (GNO) were each assayed for their physical and chemical characteristics using standard procedures. The SYO had higher (P<0.05) saponification value (14.55 mg/KOH) compared to GNO (12.00mg/KOH), which had the lowest value, SHO had the higher (P<0.05) acid value of (3.65 mgKOH/g), compared to SYO that had the lowest value (0.90) and PKO had the highest value for iodine and peroxide values (2.50) as compared to SYO which had the lowest value of (1.60). For the fatty acid profile, CO was higher(P<0.05) in Arachidonic acid of (2.25) while GNO had the a lower value of (0.07) and Linoleic acid was highest in CO (19.72) as compared to (8.21) of PKO that had the lowest value, linolenic acid was highest in SYO (2.81) compared to SHO (0.16) that had the lowest value. SYO (2.19) had the highest content of vitamin A compared to SHO (1.73) that had the lowest value while SYO had the highest value for vitamin E (53.29) content and SHO had the lowest value (38.25). The different oils have varying level of inherent nutrient which when used as ingredient, may have varying impact on performance of broiler chickens

Keywords: Saponification value, Iodine value, Peroxide value, Acid value, Dietary oils.

INTRODUCTION

The main goal of poultry production is to increase the carcass yield, reduce abdominal fat pad and produce at a minimal cost. Dietary oils are commonly added to broiler diet to supply energy and to improve the acceptability of dusty diets by chickens. Dietary oils are being used indiscriminately in broiler chicken production without recourse to the effects such oil will have on performance and broiler meat quality. According to Sanz *et al.* (2000), inclusion of sunflower oil in the diets of broiler chickens promoted fatty acid oxidation and depressed fatty acid synthesis thereby lowering abdominal fat percentage of broilers. Each oil has distinctive characteristics which are dependent on their chemical and physical components that will impact differently when used in the diets for broiler chickens, Therefore, this study was aimed at documenting the Chemical characteristics of commonly used dietary oils in broiler production.

MATERIALS AND METHODS

The profiling of the oils was carried out at the Central Laboratory, Department of Animal Science, University of Ibadan. Five vegetable oils analysed were: Palm-kernel oil, Sheabutter, Coconut oil, Groundnut oil, Soybean oil. The melting point was carried out according to (AOAC, 1990). Saponification, Peroxide, Iodine, Acid values and Vitamin determinationas well as the fatty acid profile were determined using standard procedures. (AOAC, 2005)

Data analysis

Data were subjected to analysis of variance using SAS (2000) and means were separated using Duncan's Multiple Range option of the same software (P≤0.05).

RESULTS AND DISCUSSION

The physical characteristics of the oils showed that the lowest melting point of 16°C was recorded for SYO and highest value of 38°c was recorded for SHO, while CO, GNO and PKO had melting point of 24°C, 26°C and 28°C respectively. Table 1: Shows the chemical characterization of the oils. SHO had the highest

saponification value (31.55) because it contains high level of impurities while PKO and CO had the lowest value (12.00), PKO had the highest Iodine value (2.50) this shows it is highly unsaturated, acid value was highest in SHO (3.65) this shows that it contains more soluble acid while GNO had the lowest (0.90)($P<0.05$) PKO had highest (42.00) peroxide value which suggests it has high rate of peroxidation while CO contained the lowest (14.50). The fatty acid profile of the different dietary oils is shown in Table 2: Arachidonic acid was higher in SHO (2.25) ($P<0.05$) compared with PKO (0.07), while PKO had the highest content of linoleic acid (19.72) compared to SHO that had the lowest (8.21). Linolenic acid was highest in SHO (3.14) as compared to SHO that had (1.60). Table.3: shows the inherent vitamin A and E in the oil. SYO (2.19, 53.29) and PKO (2.05, 48.80) had the highest values for vitamins A and E, this could be due to their high rate of unsaturation. Evaluation of the different vegetable oils showed that there were variations in the chemical composition of the different oils.

CONCLUSION

Common dietary oils have varying physical and chemical properties and are expected to exact varying effect when used in the diet of broilers.

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Table 1: The chemical characteristics of the different selected dietary oils

TREATMENT	SAPONIFICATION VALUE	IODINE VALUE	ACID VALUE	PEROXIDE VALUE
Sheabutter	14.55^{a}	1.60^{b}	3.65^{a}	31.55^{ab}
Palm-kernel oil	12.00^{b}	2.50^{a}	1.60^{b}	42.00^{a}
Coconut oil	12.00^{b}	1.85^{b}	1.10^{c}	14.50^{b}
Groundnut oil	13.05^{ab}	1.65^{b}	0.90^{d}	29.05^{ab}
Soybean oil	13.20^{ab}	2.30^{a}	1.60^{b}	23.00^{ab}
SEM	10.78	0.03	0.01	88.54

Means with separate superscripts are significantly different from each other

Table 3: Vitamin profile of the oil (mg/kg)

Sample	Vitamin A	Vitamin E
Palmkernel oil	2.05 ± 0.01	48.80 ± 0.01
Soybean oil	2.19 ± 0.02	53.29 ± 0.02
Groundnut oil	1.86 ± 0.02	38.39 ± 0.21
Sheabutter	1.73 ± 0.01	38.25 ± 0.01
Coconut oil	1.97 ± 0.01	47.57 ± 0.01

Table 2: Fatty acid profile of selected dietary oils

Fatty Acids (%)	A	B	C	D	E	SEM
Arachidonic	2.10^{c}	2.33^{b}	0.07^{d}	0.08^{d}	2.25^{a}	0.28
Behenic	0.03^{d}	0.06^{a}	0.04^{c}	0.05^{b}	0.04^{c}	0.04
Capric	0.03^{d}	0.16^{b}	0.16^{b}	0.15^{c}	0.28^{a}	0.02
Caprylic	1.38^{c}	1.20^{e}	2.53^{a}	2.50^{b}	1.36^{d}	0.16
Capric	1.24^{c}	1.07^{d}	3.74^{a}	3.7^{ab}	1.26^{b}	0.33
Erucic	0.06^{b}	0.08^{a}	0.26^{c}	0.24^{d}	0.04^{e}	0.03
Lauric	3.92^{b}	5.23^{a}	1.28^{d}	1.26^{d}	2.02^{c}	0.42
Linoleic	8.21^{e}	18.05^{d}	19.72^{b}	19.65^{c}	43.27^{a}	3.09
Linolenic	2.81^{c}	3.14^{a}	0.19^{d}	0.16^{e}	2.83^{b}	0.36
Lignoceric	0.06^{c}	0.04^{d}	0.11^{a}	0.10^{b}	0.06^{c}	0.01
Margaric	0.99^{c}	1.06^{a}	0.20^{d}	0.19^{d}	1.02^{b}	0.10
Myristic	0.67^{e}	0.76^{c}	3.79^{a}	3.77^{b}	0.70^{d}	0.40
Oleic	38.65^{a}	42.15^{c}	26.95^{d}	26.93^{e}	37.67^{b}	1.69
Palmitic	5.77^{c}	8.83^{a}	3.57^{d}	3.54^{e}	5.83^{b}	0.52
Palmitoleic	0.66^{a}	0.40^{c}	0.41^{d}	0.38^{e}	0.08^{b}	0.04
Stearic	3.13^{d}	4.07^{a}	3.54^{b}	3.51^{c}	2.89^{e}	0.11

Means with separate superscripts are significantly different from each other.
A-Palm-Kernel Oil, B-Soybean Oil, C-Groundnut Oil, D-Sheabutter Oil,
,E-Coconut Oil