

Effect of Partial Replacement of Soya Meal with Sphenocentrum Jollyanum Seed Meal on the Growth Performance and Haematological Constituents of Broiler Chicken

Zubairu H^{1*}, Mubarak A. Adediran², Alagbe J.O³

^{1,2}University of Abuja, Nigeria

³Gandhi College of Agriculture, Rajasthan India

Corresponding Author: Zubairu H; zubairu@uniabuja.edu.ng

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ABSTRACT

This experiment was carried out to determine the effect of partial replacement of Soya meal with Sphenocentrum jollyanum seed meal on the growth performance and some haematological constituents of broiler chicken. 200 - one day old unsex broiler chicks (Cobb 500) were equally divided into four dietary treatments with five replications each replicate consists of 10 birds each. The experiment lasted for 42 days and the group consists of treatment 1 (control): basal diet only, Sphenocentrum jollyanum seed meal was partially used to replace soya meal at 5 %, 10 % and 15 % in treatment 2, 3 and 4 respectively. Feed and fresh water were made available at all times and a completely randomized experimental design was used. Proximate composition of Sphenocentrum jollyanum seed meal showed that it contained: crude protein of 35.17 %, dry matter of 89.02 %, crude fibre (5.91 %), ether extract (2.07 %) ash (9.08 %) and energy of 2555.4 Kcal/kg. Phytochemical composition of Sphenocentrum jollyanum seed meal revealed that flavonoids had the highest concentration of 57.95 (mg/100g), followed by saponins (35.18 mg/100g), phenols (28.01 mg/100g), tannins (12.93 mg/100g), alkaloids (8.66 mg/100g) and steroids (5.76 mg/100g). Experimental outcome revealed that feeding different levels of Sphenocentrum jollyanum seed meal increased ($p < 0.05$) body weight gain, feed consumption as well as feed conversion ratio especially at 10 % and 15 % compared to the other treatment. Partial replacement of soya meal with Sphenocentrum jollyanum seed meal did not influence ($p > 0.05$) the concentration of hematocrit, haemoglobin, red blood cell and platelet except the white blood cell count ($p < 0.05$). However, values were within the normal reference range for healthy birds. It was concluded that Sphenocentrum jollyanum seed meal can be used to replace soyabean meal up to 15 % without affecting the performance of broiler chickens

INTRODUCTION

Despite the detrimental effects of rising global feed prices on profitability, the market for chicken meat is expected to grow steadily because of its comparative advantages over beef and sheep meat in terms of affordability, health benefits, and environmental sustainability. Broiler chickens are a dependable source of high-quality meat that is popular among the majority of Nigerian households (Van Huis et al., 2017). Due to competition between humans and poultry for the same food ingredients brought on by the growing human population, the cost of conventional feed ingredients, particularly maize and soy beans, has increased significantly, pushing the overall cost of feeding poultry to between 60 and 80 percent (Anyanwu et al., 2015).

The primary source of plant protein used in traditional chicken diets is soybean meal, which is also the most widely used dietary protein in the swine and poultry feed sectors. More research is being done on alternate feedstuffs for chicken diet formulations as a result of the growing demand for soybean meal and its effects on the environment (Georganas et al., 2023). In order to replace soybeans in chicken nutrition, focus has been placed on using locally accessible agro-industrial by-products that are not in fierce competition for human use.

Sphenocentrum jollyanum is a tiny, upright shrub with few branches that can reach a height of 1.5 meters. The elliptical leaves, which can grow up to 20 cm in length and 5–12 cm in width, have a wedge-shaped base, a smooth margin on both sides, and a short, blunt apex. (2005) Egunyomi et al. It is used to treat a variety of human ailments and is primarily found as an undergrowth plant in West African tropical forests. The edible fruits of *Sphenocentrum jollyanum* are used as a snack to combat weariness. All morphological parts are important elements in numerous recipes for the treatment of sickle cell illness, fibroids in traditional Nigerian medicine, fevers, and body aches. In Nigeria, the roots are used as chewing sticks, as a cough remedy, and as a constipation reliever. Hamburger and Oke (2002)

Sphenocentrum jollyanum is rich in bioactive compounds, according to prior study, and may help broiler health and immunological response. Its inclusion may result in improved growth performance, which is important for chicken productivity (Olorunnisola et al., 2017). The performance traits and haematological parameters of broiler hens fed *Sphenocentrum jollyanum* seed meal in place of soyabean are, however, poorly understood and documented. This study aims to examine how broiler chicken growth performance and haematological components are affected when *Sphenocentrum jollyanum* seed meal is partially substituted for soy meal.

LITERATURE REVIEW

Study Location

The experiment was carried out at the Gandhi College of Agriculture's Poultry Unit in Rajasthan, India, which is situated at latitude 80 44' N and longitude 38o 38' E in North West India. The experiment was created at Gandhi College of Agriculture's Department of Animal Nutrition and Biochemistry in India, and the birds were raised in accordance with the Indian Institute of Animal Production's guidelines for animal management.

Collection, processing of *Sphenocentrum jollyanum* seeds and analysis

Fresh *Sphenocentrum jollyanum* seeds were purchased from a Rajasthani open market and delivered to the Biological Science Department so that a qualified taxonomist could properly authenticate them. After the gathered seeds were screened to remove unwanted impurities, they were air dried for 13 days on a flat plastic tray, crushed into meal using a hammer mill, and stored in airtight polythene bags until analysis was required. The Association of Analytical Chemist's (2012) standard techniques were used in the proximate analysis of ground *Sphenocentrum jollyanum* seed meal. The sample was subjected to phytochemical examination using techniques recently reported by Singh et al. (2022). Each phyto-compound was quantified at different optical densities after samples were subjected to Vule Auto-Gas chromatography - mass spectrometer (Model ADF/08C/2550, Punjab, India).

Management of Experimental Birds, Ration and Design

Unsex broiler chicks (Cobb 500) that were 200-1 day old were split evenly into four nutritional treatments, each of which had five replications, each of which had ten birds. The experiment was conducted in a deep litter house with a wire mesh wall and a wood shaving-covered floor. Pens, food stations, and plastic watering troughs were all meticulously cleaned and disinfected two weeks prior to the study's start. After being weighed to determine their starting body weight upon arrival, the birds were divided into several treatments and given an experimental diet that included anti-stress water. In accordance with the NRC's (2000) guidelines for broiler nutrition, experimental meals (Tables 1 and 2) were designed to be almost isocaloric and isonitrogenous.

Chicks were heated using a gas brooder, and the initial brooding temperature was set at 35°C. This was lowered every week until a temperature of 27°C was reached. *Sphenocentrum jollyanum* seed meal was utilized to partially replace soy bean meal at 5%, 10%, and 15% in diets 2, 3, and 4, respectively, in treatment 1 (control), which consists of a basal diet alone. In accordance with the vaccination schedule created at Gandhi College of Agriculture based on the prevalent disease state in the area, birds were vaccinated against Newcastle disease and infectious bursal disease. Fresh water and feed were always accessible, and other management procedures were closely adhered to.

By deducting the feed denied from the feed offered, the amount of feed consumed per bird was determined. Feed offered and denied was weighed at the end of the experiment and documented every day. Body weight gain was divided by the number of days in the experiment to determine the daily growth. Total feed consumption was divided by the number of days in the experiment to determine daily feed consumption. By dividing the entire amount of feed consumed by the body weight gain, the feed conversion ratio was calculated. Deaths were noted as they happened. The techniques described by the Association of Analytical Chemists (2019) were used to analyze the experimental diet. The study lasted six weeks and used a completely randomized experimental design.

Collection and Analysis of Haematological Constituents

Five milliliters of blood were drawn from the wing vein of four randomly chosen birds per replicate at the conclusion of the experiment and placed in two sample vials containing anticoagulant. Samples were collected, put in an ice pack, and then examined in a lab with a Sog Auto-Haemo Analyzer® (HC-800, China). As advised by the manufacturer, the kit was kept between 15 and 30 °C and between 50 and 80 % humidity for best results. Hematocrit count, platelets, total erythrocyte count, hemoglobin, and total white blood cells are among the parameters analyzed for haematology.

METHODOLOGY

Statistical Analysis

The SAS General Linear Model techniques were used to analyze the collected data (2004). Tukey's test was used to distinguish treatment mean differences, and $p < 0.05$ was used to declare significant differences.

The analysis was conducted using the following model: $Y_{ij} = \mu + T_i + e_{ij}$ where Y_{ij} is each bird's observation μ is the overall mean effect. e_{ij} is the experimental random error, and T_i is the effect of the i th dietary interventions.

Table 1. Ingredient and Chemical Composition of Starters Mash (% DM)

Ingredients	T1	T2	T3	T4
Maize	50.00	50.00	50.00	50.00
Wheat bran	2.00	2.00	2.00	2.00
Soyabean meal	39.00	37.05	35.1	33.15
Dried <i>Sphenocentrum jollyanum</i> seed	0.00	1.95	3.90	5.85
Fish meal (Imported)	2.00	2.00	2.00	2.00
Bone meal	3.80	3.80	3.80	3.80
Limestone	1.80	1.80	1.80	1.80
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25
Toxin binder	0.50	0.50	0.50	0.50
Salt	0.30	0.30	0.30	0.30
Total	100.0	100.0	100.0	100.0
Analyzed analysis				
Crude protein	23.08	22.97	22.88	22.75
Crude fibre	3.90	3.92	3.95	3.98
Ether extract	3.17	3.12	3.10	3.09
Ash	2.43	2.47	2.49	2.50
Energy (Kcal/kg)	2998.6	3000.1	3005.5	3008.4

Each 2.5 kg of vitamins/ Minerals premix mixture contains 12,000 IU vitamin A; 8,000 IU Vit.D3; 250 g vitamin E; 10 g Vit.K3; 100 g vitamin B1; 15 g vitamin B2 ; 20 mg vitamin B12 ; 1.0 g vitamin B6; 50 g Niacin ; 10 g Pantothenic acid ; 10g Folic acid; 60 mg Biotin ; 350 g Choline chloride; 80 g Zinc; 40 g Copper; 0.70 g Iodine ; 20 g Iron; 0.5 g Selenium; 80g Manganese ; 0.50 g Cobalt

Table 2. Ingredient and Chemical Composition of Finishers Mash (% DM)

Ingredients	T1	T2	T3	T4
Maize	54.00	54.00	54.00	54.00
Wheat bran	2.00	2.00	2.00	2.00
Soyabean meal	35.00	33.25	31.5	29.75
Dried <i>Sphenocentrum jollyanum</i> seed	0.00	1.75	3.50	5.25
Fish meal (Imported)	2.00	2.00	2.00	2.00
Bone meal	3.80	3.80	3.80	3.80
Limestone	1.80	1.80	1.80	1.80
Lysine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25
Toxin binder	0.50	0.50	0.50	0.50
Salt	0.3	0.3	0.3	0.3
Total	100.05	100.05	100.05	100.05
Analyzed analysis				
Crude protein	21.18	20.96	20.85	20.64
Crude fibre	4.87	4.95	4.98	5.00
Ether extract	3.51	3.43	3.41	3.40
Ash	2.58	2.62	2.65	2.71
Energy (Kcal/kg)	3200.7	3198.2	3195.6	3191.7

Each 2.5 kg of vitamins/ Minerals premix mixture contains 10,000 IU vitamin A; 6,000 IU Vit.D3;200 g vitamin E; 10 g Vit.K3; 100 g vitamin B1; 15 g vitamin B2 ;20 mg vitamin B12 ; 1.0 g vitamin B6; 50 g Niacin ;10 g Pantothenic acid ;10g Folic acid;60 mg Biotin ; 350 g Choline chloride; 80 g Zinc; 40 g Copper; 0.70 g Iodine ; 20 g Iron; 0.5 g Selenium; 80g Manganese ;0.50 g Cobalt

Table 3. Proximate Composition of *Sphenocentrum Jollyanum* Seed Meal

Constituents	% Concentration
Dry matter	89.02
Crude protein	35.17
Crude fibre	5.91
Ether extract	2.07
Ash	9.08
Energy (Kcal/kg)	2555.4

Table 4. Phytochemical Composition of *Sphenocentrum Jollyanum* Seed Meal

Constituents	Concentration (mg/100g)
Saponins	35.18
Alkaloids	8.66
Flavonoids	57.95
Phenols	28.01
Steroids	5.76
Tannins	12.93

Table 5. Growth Performance of Broiler Chicken Fed Different Levels of *Sphenocentrum Jollyanum* Seed Meal

Parameters	T1	T2	T3	T4	SEM	p-value
Body weight (g)						
1 week	125.8b	124.5b	135.3a	138.2a	0.95	0.06
3 week	815.9b	813.6b	891.6a	896.1a	2.08	0.02
6 week	2102.7 b	2100.9 b	2300.2 a	2340.2 a	37.90	0.03
Body weight gain (g/d)						
1 week	45.12b	44.88b	58.56a	60.41a	0.21	0.01
3 week	65.19b	64.73b	76.21a	78.09a	0.42	0.01
6 week	56.08b	55.16b	65.09a	69.01a	0.19	0.02
Feedconsumption (g/d)						
1 week	69.17b	69.01b	71.11a	73.08a	0.55	0.01
3 week	116.2b	118.9b	123.4a	125.2a	1.98	0.02
6 week	98.17b	99.18b	100.2a	100.5a	1.49	0.05
Feed conversion ratio						
1 week	2.02b	2.03b	1.95a	1.91a	0.09	0.03
3 week	2.00b	2.01b	1.88a	1.89a	0.11	0.01
6 week	2.15b	2.18b	1.91a	1.90a	0.04	0.01

a,b,c: Means within a row with different superscripts are significantly different ($p < 0.05$); treatment 1: basal diet only; Treatment 2,3 and 4, *Sphenocentrum jollyanum* seed meal was used to replace soya at 5 %, 10 % and 15 % ; SEM: Standard error of mean.

Table 6. Haematological Parameters of Broiler Chicken Fed Different Levels of *Sphenocentrum Jollyanum* Seed Meal

Parameters	T1	T2	T3	T4	SEM	P-value
Pack cell volume (%)	31.44	30.97	30.16	35.11	0.93	0.06
Haemoglobin (g/dL)	9.95	9.21	9.17	9.15	0.44	0.03
Platelet ($\times 10^9/L$)	111.5	110.9	119.5	119.1	3.86	0.01
Red blood cell ($\times 10^{12}/L$)	10.95	10.3	10.21	10.12	0.08	0.02
White blood cell ($\times 10^9/L$)	11.08c	12.96b	15.64a	15.90a	0.12	0.05

a,b,c: Means within a row with different superscripts are significantly different ($p < 0.05$); treatment 1: basal diet only; Treatment 2,3 and 4, *Sphenocentrum jollyanum* seed meal was used to replace soya at 5 %, 10 % and 15 % ; SEM: Standard error of mean

RESULTS AND DISCUSSION

Table 3 shows the approximate composition of *Sphenocentrum jollyanum* seed meal. There are 35.17 percent crude protein, 89.02 percent dry matter, 5.91 percent crude fiber, 2.07 percent ether extract, 9.08 percent ash, and 2555.4

kcal/kg of energy in the sample. This study's crude protein level exceeded the 20.00% and 7.35% reported by Ugwu et al. (2018) and Ekpano et al. (2008). The results were similar to the 39.08 percent that Moyo et al. (2011) reported for *Moringa oleifera* seed. According to the findings of Yakubu et al. (2007), the energy and ash content of *Sphenocentrum jollyanum* seed meal are 2509.1 Kcal/kg and 9.88%, respectively.

The outcome shown that *Sphenocentrum jollyanum* seed meal can be added to birds' diets as a beneficial source of protein and energy. Musa et al. (2020) and Omokore and Alagbe (2019) state that protein supplements typically have levels above 30%. A variety of minerals that are essential for metabolic processes are also present in the sample. The crude fiber content of *Sphenocentrum jollyanum* seed meal was less than the 8.44% that Yakubu et al. (2007) reported. This small variance may be explained by the plant's age, variations in geographic location, and processing techniques (John, 2024a). Birds with high dietary fiber have better feed digestion in their gastrointestinal tracts (Adewale et al., 2021; John, 2024b). Lower value in the ether extract content of *Sphenocentrum jollyanum* seed meal erodes the fear of cardiovascular disease in birds (John, 2024c).

Table 4 displays the phytochemical makeup of *Sphenocentrum jollyanum* seed meal. The largest concentration was found in flavonoids (57.95 mg/100g), which were followed by alkaloids (8.66 mg/100g), tannins (12.93 mg/100g), phenols (28.01 mg/100g), saponins (35.18 mg/100g), and steroids (5.76 mg/100g). The outcome demonstrated the presence of chemicals with pharmacological and nutritional potential in *Sphenocentrum jollyanum* seed meal (John, 2024c). Phenolic compounds and saponins, for example, have been proposed to suppress pain mediators, neutralize free radicals at their source (Shittu et al., 2021), stabilize liver cells (Hernandez and Alagbe, 2025a), block inflammatory pathways, and protect against oxidative stress (Alagbe, 2025; Singh et al., 2022). Alkaloids and tannins have a wide range of effects and strengthen the immune system to combat the growth of microorganisms (John, 2024d). By decreasing low density lipoprotein (LDL) and increasing high density lipoprotein, flavonoids cut blood cholesterol and control blood sugar (Hernandez and Alagbe, 2025b). Steroids improve blood sugar management, tissue healing, and protein synthesis without interfering with human hormones (Alagbe, 2024). The findings of this study's phytochemical analysis are consistent with those of Moody et al. (2005) and Nia et al. (2004).

Table 5 shows the growth performance of broiler chickens fed varying amounts of *Sphenocentrum jollyanum* seed meal. When compared to treatment 3 (58.56 g, 76.21 g, and 65.09 g/d) and treatment 4 (60.41 g, 78.09 g, and 69.01 g), the daily body weight of birds in treatment 1 (42.12 g, 65.19 g, and 56.08 g) and treatment 2 (44.88 g, 64.73 g, and 55.16 g/d) during weeks 1, 3, and 6 was lower ($p < 0.05$). The study's findings indicate that, because of the presence of phytochemicals, raising the amount of *Sphenocentrum jollyanum* seed meal in treatments 3 and 4 from 10% to 15% promotes the release of digestive enzymes, enhances nutritional absorption, and controls stomach acidity (John, 2024d).

When *Leucaena leucocephala* leaf meal was added to chickens' diets, the results were consistent with the findings of Ayssiwede et al. (2010). For weeks 1, 3, and 6, the average daily feed consumption ranged from 69.17 to 73.08 g/d, 116.2 to 125.2 g/d, and 98.17 to 100.5 g/d, respectively. Birds receiving treatments 3 and 4 had greater average daily feed intake values, while birds receiving treatments 1 and 2 had lower average daily feed consumption values ($p < 0.05$). The experiment's results show that adding *Sphenocentrum jollyanum* seed meal enhanced the feed's flavor and aroma, which encouraged birds to eat more and improved the feed conversion ratio.

Feed conversion ratio was affected ($p < 0.05$); as the amount of *Sphenocentrum jollyanum* seed meal increased, the ratio decreased. This outcome is consistent with Abbas and Ahmed's (2012) findings regarding the use of *Moringa* seed meal in broiler chicken diets. Table 6 shows the haematological characteristics of broiler chickens fed varying amounts of *Sphenocentrum jollyanum* seed meal. With the exception of white blood cells ($p < 0.05$), the medication had no effect on pack cell volume, hemoglobin, platelet, or red blood cell values ($p > 0.05$). Nevertheless, the pack cell volume value found in this investigation fell between 27.00 to 36.00%, as reported by Café et al. (2012) and Islam et al. (2004).

Haemoglobin and platelet concentration were within 8.0 – 15.00 (g/dL) and 100.0 – 180.0 ($\times 10^9/L$) respectively cited by Riddel et al. (2012) and Thrall (2007). Red blood cell values were within the normal range 9.00 – 15.00 ($\times 10^{12}/L$) cited by Pampori et al. (2007) while white blood cell values were within 10.00 – 25.00 ($\times 10^9/L$) cited by Etim et al. (2014). Result obtained on revealed that increasing the levels of *Sphenocentrum jollyanum* seed meal in the diet of birds strengthened the blood vessels and protects their body against infectious disease (Omokore and Alagbe, 2019). Therefore, it had no detrimental effect on the health of birds. Slight increase in white blood cell values suggests that *Sphenocentrum jollyanum* seed meal can support immune health and fight oxidative stress in birds (Alagbe, 2024). This hepato-protective features can be attributed to the presence of phyto-compounds in *Sphenocentrum jollyanum* seed meal which possess therapeutic properties like, antioxidant, antimicrobial, antifungal, antiviral, anti-tumor, antihelminthic, anti-diarrhea, gastro-protective, cardio-protective amongst others (Singh et al., 2021).

CONCLUSIONS AND RECOMMENDATIONS

It was concluded that *Sphenocentrum jollyanum* seed meal possess both nutritional and medicinal properties necessary for the optimal performance of birds. It can be used to replace soyabean meal up to 15 % without compromising their performance and health status. This information will help to reduce pressure on conventional feedstuffs as a result of the increase in global population.

FURTHER STUDY

This research still has limitations, so further research is needed related to the topic of Effect of Partial Replacement of Soy Meal with *Sphenocentrum Jollyanum* Seed Meal on the Growth Performance and Hematological

Constituents of Broiler Chicken in order to perfect this research and increase insight for readers.

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