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Effect of substituting peanut cake for soybean cake in the ration on broiler growth performance

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Abstract

Between January and April 2023, a study was conducted at the Ferme de Espoir de Baten'll chieferies with the aim of evaluating the effects of the total substitution of soybean meal by peanut meal on growth performance and production costs. The general objective of this work was to contribute to the improvement of knowledge on the search for alternative resources through economic formulations for the improvement of the diet of broiler chickens. For this, two fair bands of 1500 broiler chicks of the Hubbard strain and respective average weights of 37 ± 0.09 g and 43 ± 0.03 g were used. These two bands followed for a period of seven weeks were subjected to two separate rations. The first band received a ration containing soybean cake (R1) and the second, a ration based on groundnut meal (R2). Weight gain and live weight throughout the rearing period were high in subjects receiving peanut meal, while feed consumption and feed conversion remained low in animals receiving ration with peanut cake. On the other hand, whatever the type of ration, no significant difference was observed with carcass weight 2, head weight, liver, pancreas and abdominal fat. Similarly, no ration had a significant effect on the weight of the gizzard, the intestine and on the density of the intestine. Intestine length (225.75 ± 22.40) increased significantly with soybean meal. The cost of food consumption (1537.7 FCFA) and the cost of production per kilogram of chicken (848.8 FCFA) were lower with the ration containing groundnut cake. The results of this study showed that in the event of a shortage of soybean cake, a total substitution for peanut cake can be made without fear because the rations with peanut cake make it possible to increase weight gain at a lower cost.

Keywords: Soybean Cake; Peanut Cake; Broiler Chicken; Production Performance

1. Introduction

Agriculture, livestock breeding and fishing account for over 70% of Cameroon's working population. This population of around 27,224,262 has an estimated growth rate of 2.6% (World Bank, 2022). This demographic explosion, which characterizes developing countries, poses the problem of food supply, and consequently a growing demand for animal protein (Kevin, 2011). Faced with such an imbalance, the production of animals with short production cycles, such as broilers, is recommended. In Cameroon, poultry farming accounts for 71% of meat production, far ahead of cattle farming (BMN, 2019). Poultry farming has become a very important part of the agricultural sector, providing farmers with substantial financing due to its ease of production and relatively limited investment (Douha, 2017). Better meat

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production requires a secure feed supply, which accounts for 70% of production costs. Their feed requires a large supply of various resources, both energy and protein.

However, the supply of these essential resources for animal feed in general, and poultry feed in particular, is becoming increasingly perplexing. This is justified by the glaring scarcity, fluctuation and high cost of certain feed resources in recent years. Foremost among these is soybean meal, an undisputed source of protein for poultry farming, whose purchase price per kg rose from 350 to 600 FCFA between October 2021 and April 2022. Yet Cameroon has many local products that can be used in poultry feed. Faced with such a situation, it would be imperative to take an interest in available and inexpensive local resources. One such resource is the groundnut (Arachis hypogaea), a legume grown almost everywhere in Cameroon. According to the FAO (2004), the average production yield of groundnuts over 10 years (2003 to 2013) is 1.36t/ha. In view of this high potential, it would be conceivable to use groundnut meal as a substitute for soya in animal feed. However, very little is known about the use of peanut meal in broiler feed as a total substitute. With this in mind, this study was initiated to contribute to the improvement of knowledge on the search for alternative resources through economical formulations for the improvement of broiler feed.

2. Material And Methods

2.1. Presentation of the study area

The Espoir Batseng'la poultry farm is located in the West Cameroon Region, Menoua Department, Nkong-Ni Arrondissement, in the village of Batseng'la and more precisely in the Suelah district. The farm is located between latitudes 5°24'-5°27'30'' N and longitudes 10°05'30'' - 10°8' E, with an average altitude of 1,500 m; it is 11 km from the town of Dschang. The village of Batseng'la is bordered to the east by Fokamezo, to the west by Foto, to the southwest by Fonakeukeu, to the north by Bafou (Aghang, Tsingfouh and Tsingbeu) and to the south by the villages of Njilih, Baletet and Balefock. The Batseng'la poultry farm benefits from an equatorial Guinean and Cameroonian mountain microclimate with two seasons. The average annual temperature is 23.19°c, with average annual rainfall of 2,600 mm. The region is swept by two winds: the harmattan (dry season) and the monsoon (rainy season) (Tamgnoue, 2017).

2.2. Animal material

3000-day-old chicks from two successive bands of Hubbard strain, with respective average weights of 37± 0.09g and 43± 0.03g, were used. These two flocks were followed successively, respecting the sanitary vacuum period.

2.2.1. Housing

The study was carried out in the poultry house at the ferme de l'Espoir de Batseng'la. The building is 37 m long and 10 m wide. The interior comprises an office 4 m long and 2 m wide, and a store 7 m long and 3 m wide with a circulation corridor. The rearing room consists of two areas: a 9 m long, 7 m wide starter room heated with wood, and a 12.5 m long, 11 m wide finishing room.

2.2.2. Prophylaxis

On arrival, the chicks were given anti-stress medication in their drinking water for 3 consecutive days, and the same was done before, during and after each manipulation (weighing, transfer, vaccinations). It should be noted that the chicks had already been vaccinated against Newcastle disease and infectious bronchitis. The booster vaccination was given on the 19th day. The Gumboro vaccine (IBA Gumboro®) was also administered on day 9, with a booster on day 14. A foot bath was placed at the entrance to the barn, disinfected with cresyl and renewed every two days.

2.3. Trial conduct

2.3.1. Preparation of the nursery and rearing area

The nursery housed the chicks from day 1 to day 21. Before the chicks arrived, the floor was covered with 5 cm thick shavings, and the first-age feeders and drinkers were installed. The drinkers contained water and anti-stress medication. The room was previously heated using a wood-fired oven. When the chicks arrived, their size, quality (liveliness, downiness) and weight (50 per batch) were assessed and noted. The chicks were then fed. On day 21, the chicks were transferred to the finishing room, where there was no heating. Weekly weighing of chicks and feed (served and refused) was carried out for each band. Transitions were made; the first transition from start-up to growth took place over 4 days:

- Day 14 with 75% starter feed and 25% grower feed

- Day 15 with 50% starter feed and 50% growth feed
- Day 16 with 25% starter feed and 75% growth feed, and day 17 with 0% starter feed and 100% growth feed.

The second transition (growth-finishing) took place in the same way from day 33 to day 36.

2.3.2. Feed preparation

The two flocks of chicks, each numbering 1,500, received different rations. The first group received a soybean meal-based ration, while the second received a peanut meal-based ration. The formulation of each ration took into account certain criteria, namely nutritional requirements, the age of the animals and the availability of the various ingredients. The ration provided all the nutrients the animal would need for proper development. A 100g sample of the different rations was taken and sent to the laboratory for chemical composition analysis.

Table 1 shows the formulas of the different rations and their chemical composition.

Table 1 Ration formulas

Ingredients (kg)	**Startup**		**Growth**		**Finishes**	
	R1	R2	R1	R2	R1	R2
Corn	63	62	66	66	71	67
Soybean cake	20	-	20	-	18	-
Peanut cake	-	22	-	22	-	22
Fish meal	5	5	2	1.5	0	0
Meal shell	1	0.5	1	0.5	0	0
Bigophone	1	1	1	1	1	1
Eliot	0.1	0.1	0.1	0.1	0.1	0.1
Concentrate 10%	10	10	10	10	10	10
Total	100	100	100	100	100	100
Chemical composition						
Crude Protein (%DM)	22.39	22.39	20.85	20.46	19.6	19.8
Crude Cellulose (%DM)	2.25	4.24	2.27	4.26	2.46	4.31
Metabolizable energy (kcal/kg DM)	2963	2986	2981	2991	3043.5	3017
Ca (%DM)	1.78	1.5	1.58	1.26	1.10	1.06
P (%DM)	0.81	0.86	0.71	0.70	0.64	0.69

R1=soybean meal-based ration; R2=peanut meal-based ration; DM=dry matter.

2.4. Data collection and parameters studied

2.4.1. Broiler production performance

Growth performance

Feed consumption (FC)
Animals were served twice a day, and before each service the feed was weighed. Refusals were collected and weighed the following day. Feed consumption was calculated as the difference between the quantity served and the collected rejects

CA= amount of feed served - amount of feed rejected

Live weight and weight gain
At the start of the trial and every 7 days thereafter, the animals in each band were weighed fasting. Weight gain was calculated as the difference between 2 consecutive live weights.

Feed conversion ratio (FCR)
The feed conversion ratio (FCR) was calculated by dividing the amount of feed consumed during the week by the weight gain for the same week.

$$\text{FCR} = \frac{\text{Quantity of food consumed per weekg (g)}}{\text{weight gain per week (g)}}$$

2.5. Carcass characteristics

At 49 days of age, 20 chickens from each flock were fasted for 24 hours, then weighed, bled, scalded, plucked and eviscerated as per Kana et *al.* (2014) to determine carcass yields and organ weights. Two carcasses were evaluated: cacasse1 (classic) which takes into account the ready-to-cook animal and the various organs (head, legs, heart, gizzard) and carcass 2 (commercial) consisting solely of the ready-to-cook animal.

Carcass yield 1 (CY1) was calculated taking into account all parts consumed by the local population, using the following formula

$$\text{CY1 (\%)} = \frac{\text{Ready-to-cook carcass weight (g) + heart (g) + gizzard (g) + legs (g) + head(g)}}{\text{fasting weight(g)}} x100$$

Carcass yield 2 (Rat 2) was calculated using the following formula:

$$\text{CY2 (\%)} = \frac{\text{Ready-to-cook carcass weight (g)}}{\text{fasting weight(g)}} x100$$

2.5.1. Relative organ weight (RO)

After slaughter and evisceration, the various organs (liver, heart, pancreas, intestine, gizzard, head, and legs) were weighed to determine their respective weights.

- **Live weight (LW):** this is the weight of the animal while still alive
- **Carcass weight (CW):** weight of the animal after slaughter.
- **Intestine length:** measured from the duodenal loupe to the cloaca, using a tape measure graduated in centimetres.
- **Intestinal weight**
- **Intestinal density:** calculated using the following formula:

$$\text{Intestinal density (g /cm)} = \frac{\text{Weight of intestine(g)}}{\text{Length of intestine(cm)}}$$

2.5.2. Economic performance

The data collected were the prices of the various ingredients in each ration plus the costs of prophylaxis and feed transport. The cost of feed consumption and production per kg of chickens were determined. The cost of consumption was evaluated by summing the cost of feed consumed per bird, the cost of transporting the feed and the cost of prophylaxis. The production cost per Kg of chicken was obtained by dividing the production cost of the chicken by its slaughter weight.

2.6. Statistical analysis

Statistical analysis enabled us to compare the technical and economic performance of broiler production in the two flocks. Data on feed consumption, live weight, weight gain, feed conversion ratio and carcass characteristics were entered and processed in Microsoft Excel 2013, and then calculated. These data were then subjected to Student's t test at the 5% significance level. The software used was SPSS 20.0.

3. Results

3.1. Effect of total substitution of peanut meal for soybean meal in the ration on broiler feed consumption

Figure 1 illustrates the effect of total substitution of peanut meal for soybean meal in the ration on broiler feed consumption. It shows that feed consumption increases over time for all rations, with a similar trend between the first and second week. Furthermore, between the second and fifth week, feed consumption was lower in broilers fed a soybean meal ration than in broilers fed a peanut meal ration. The opposite was observed between the sixth and seventh weeks. At the end of the period, feed consumption was higher in hens fed the soybean meal ration.

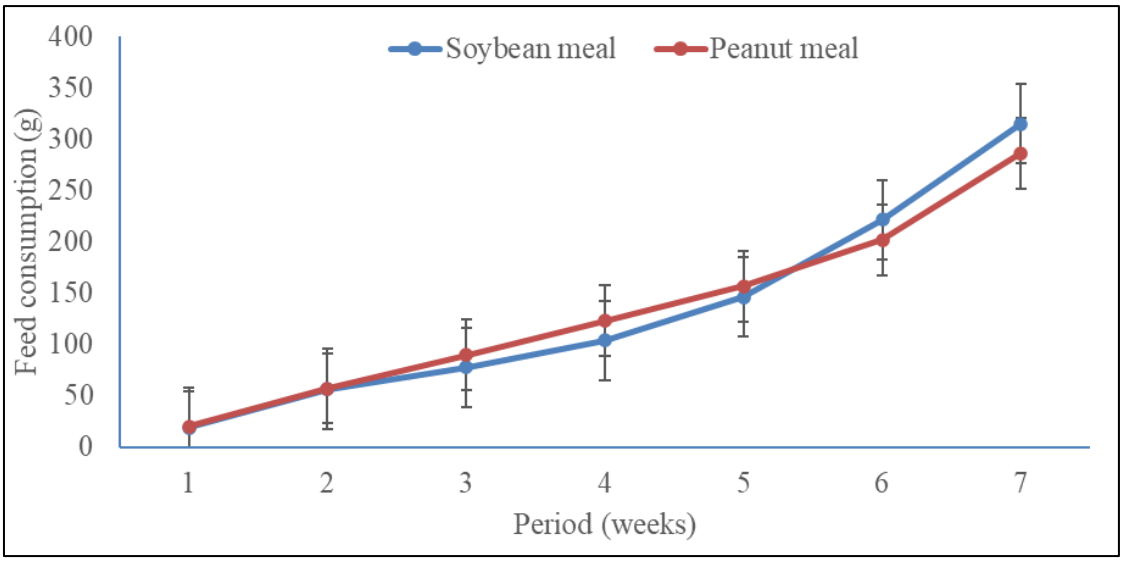

Figure 1 Effect of total substitution of peanut meal for soybean meal in the ration on feed consumption

3.2. Effect of total substitution of peanut meal for soybean meal in the ration on broiler live weight

The effect of total substitution of peanut meal for soybean meal in the ration on the live weight of broilers is illustrated in figure 2. It can be seen that the live weight of the animals evolved positively throughout the trial, with a slight similarity between the first and second weeks. On the other hand, between the second and seventh week, the live weight of chickens fed the peanut meal ration was higher than that of chickens fed the soybean meal ration. At the end of our trial, chickens fed the peanut meal had a higher live weight than those fed the soybean meal.

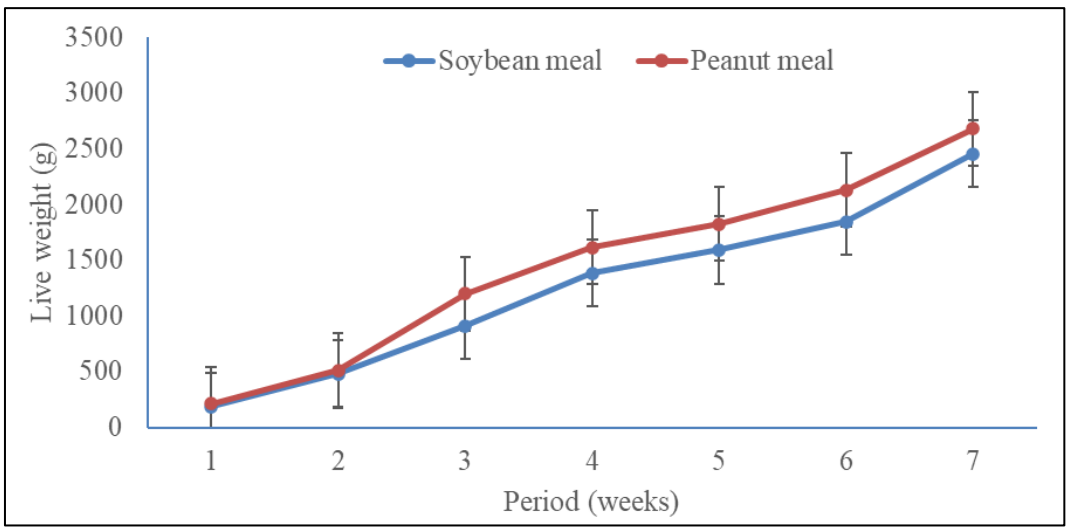

Figure 2 Effect of total substitution of peanut meal for soybean meal in the ration on live weight

3.3. Effect of total substitution of peanut meal for soybean meal in the ration on broiler weight gain

Figure 3 illustrates the effect of total substitution of peanut meal for soybean meal in the ration on broiler weight gain. It can be seen that from the first to the end week, weight gain evolved positively, with a superiority of weight gain for subjects receiving the ration containing peanut meal. Indeed, between the fifth and seventh weeks, the curve shows a similar pattern and, live weight gain was higher for hens fed the peanut meal ration.

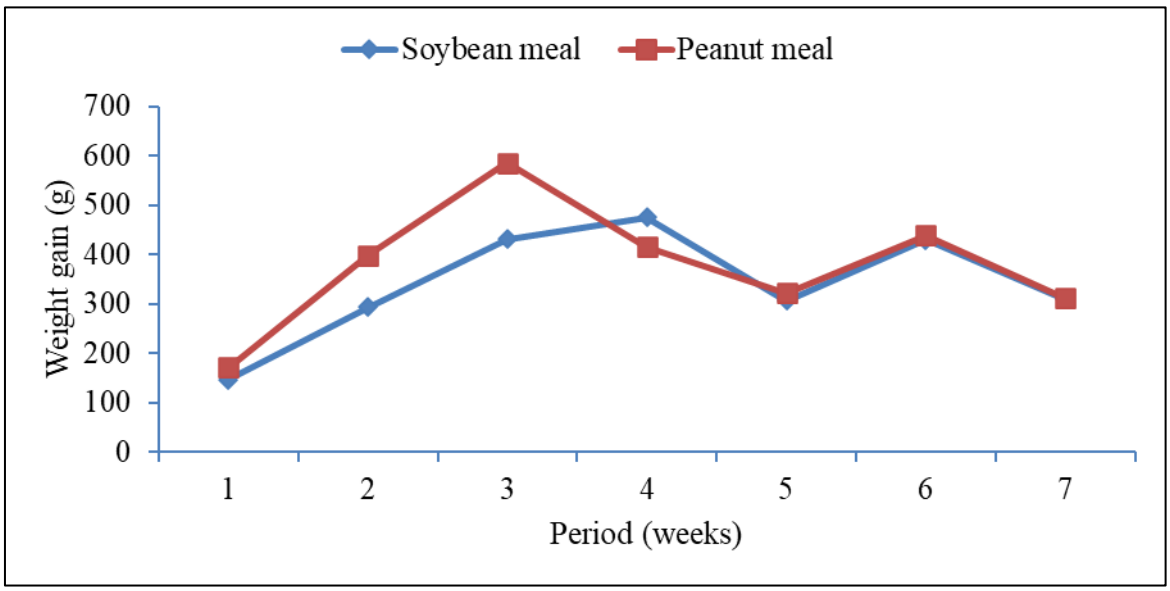

Figure 3 Effect of total substitution of peanut meal for soybean meal in the ration on weight gain

3.4. Effect of total substitution of peanut meal for soybean meal in the ration on the feed conversion ratio for broilers

Figure 4 illustrates the effect of total substitution of peanut meal for soybean meal in the ration on feed conversion. From the first to the third week, animals fed peanut meal had a lower feed conversion than those fed the soybean meal ration. However, the opposite was observed between the third and fourth weeks. On the other hand, between the fourth and seventh weeks, subjects fed soybean meal had a higher feed conversion than those fed the peanut meal ration. At the end of the trial, chickens fed the peanut meal ration had the lowest feed conversion ratio.

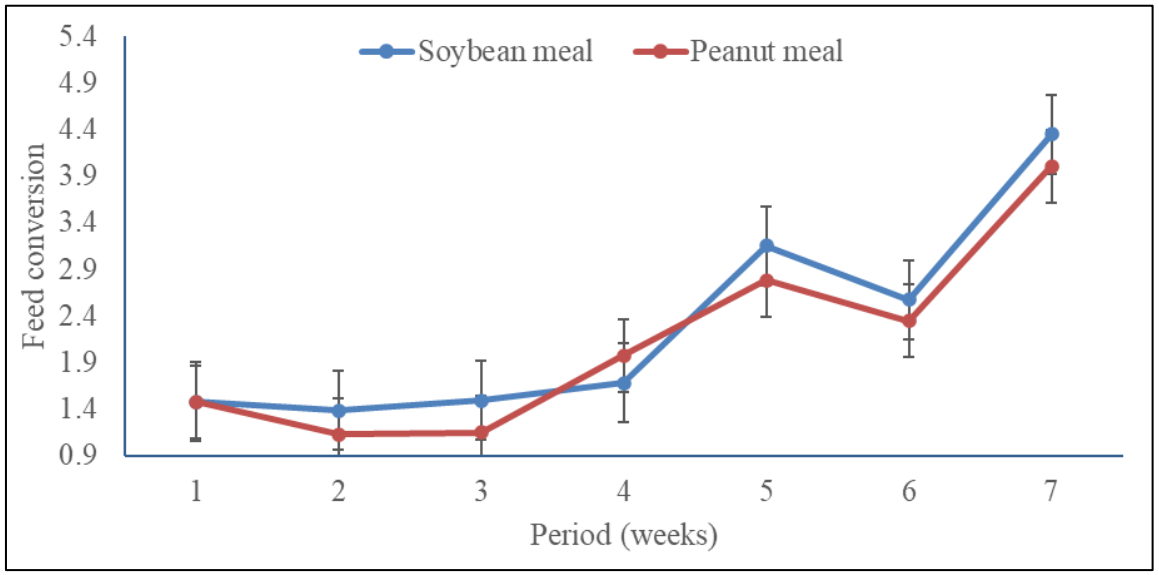

Figure 4 Effect of total substitution of peanut meal for soybean meal in the ration on feed conversion ratio

3.5. Effect of total substitution of peanut meal for soybean meal on broiler carcass characteristics

The results of the effect of total substitution of peanut meal for soybean meal on carcass characteristics are shown in Table 2. This shows that animals fed the peanut meal ration had carcass weights 1, carcass yields 1 and 2 significantly ($p<0.05$) higher than those fed the soybean meal ration. The same observation was made for heart weight. On the other hand, carcass 2 weight, head weight, leg weight, liver weight, pancreas weight and abdominal fat weight of animals on all rations showed no significant difference ($p>0.05$).

Table 2 Effect of total substitution of peanut meal for soybean meal on carcass characteristics

	Treatments		
Parameters (g)	Soybean meal	Peanut meal	*P*
Carcass weight 1 Carcass yield 1	1980.05 ± 171.96[a] 87.04 ± 3.34 [a]	1915.95 ± 96.15[b] 82.19 ± 6.8[b]	0,014 0,004
Carcass weight 2 Carcass yield 2	1709.25 ± 147.60 78.83 ± 6.3 [a]	1681.75 ± 108.54 75.42 ± 2.1[b]	0,131 0,000
Head	50.66 ± 6.01	49.77 ± 4.23	0,255
Legs	81.97 ± 9.10	82.66 ± 8.23	0,663
Liver	43.34 ± 6.19	41.84 ± 7.09	0,377
Heart	14.88 ± 2.56[a]	11.66 ± 1.52[b]	0.008
Pancreas	5.16 ± 0.89	5.34 ± 1.02	0.809
Abdominal fat	32.80 ± 11.01	23.38 ± 8.48	0.749

A, B: means bearing the same letters on the same line are not significantly different ($P > 0.05$).

Table 3 shows the effect of total substitution of soybean meal by peanut meal on variations in broiler digestive organ weight and gut density. The table shows that animals fed the soybean meal ration had significantly longer intestines than those fed the peanut meal ration. On the other hand, gizzard weight, intestinal weight and intestinal density of animals fed either ration had no significant effect ($p>0.05$).

Table 3 Effect of total substitution of peanut meal for soybean meal on changes in digestive organ weight and gut density in chickens

Parameters	**Treatments**		
	Soybean meal	Peanut meal	*p*
Gizzard (g)	50.95 ± 6.81	46.16 ± 7.95	0.163
Intestine length (cm)	214.50 ± 11.19[b]	225.75 ± 22.40[a]	0.041
Intestine weight (g)	92.44 ± 7.83	95.20 ± 11.31	0.108
Intestine density (g/cm)	0.43 ± 0.34	0.42 ± 0.36	0.699
Intestine pH	6.67± 0.08	6.57± 0.11	0.343
Cecum pH	7.035± 0.29	6.73 ± 0.4	0.091

A, B: means bearing the same letters on the same line are not significantly different ($P > 0.05$).

3.6. Effect of total substitution of soybean meal for groundnut meal on production costs

The effect of total substitution of soybean meal by groundnut meal on feed consumption costs is shown in Table 4. Feed consumption costs increase throughout the animal production cycle. During the start-up period, the feed consumption cost of broilers fed the soybean meal ration is lower than those fed the peanut meal ration. On the other hand, from growth to finishing, the feed consumption cost of broilers fed a ration containing peanut meal was lower than that of broilers fed a ration containing soybean meal.

Table 4 Feed consumption costs

	R1 S	**R2 S**	**R1 G**	**R2 G**	**R1 F**	**R2 F**
Cost for 50kg (FCFA)	16012.5	14731.25	15712.5	14431.25	15250	14200
Q F C (kg)	0.850	0.959	1.860	1.868	2.82	2.519
F C A (FCFA)	272.39	282.64	584.70	539.549	860.1	715.520
T C (FCFA)	4.2528	4.796	9.3032	9.344	14.13	12.59
P C	35	35	39	39	37	39
Total cost	311.644	322.439	633.009	587.894	911.23	767.110

R1S: soybean meal ration 1 start-up; R2S: peanut meal ration 2 start-up; G: growth; F: finishing; Q F C: quantity of feed consumed; F C A: feed cost per animal; T C: transport cost and P C: prophylaxis cost

Table 5 shows the effect of total substitution of soybean meal by peanut meal on the production cost per kg live chicken. It shows that animals fed peanut meal had a lower production cost per kg of chicken than those fed soybean meal.

Table 5 Cost (FCFA) of production per kg of chicken

Cost	**Soybean meal**	**Peanut meal**
Feed cost	1717.19	1537.7
Transport cost	27.6	26.7
Prophylaxis cost	111	113
Chick cost	600	600
Chicken production cost	2398.5	2277.4
Slaughter weight	2.457	2.683
Production cost per kg of chicken	999.5	848.8

It can be seen that animals fed peanut meal had a lower production cost than those fed soya.

4. Discussion

At the end of the experiment, food consumption increased with age. The incorporation of peanut meal into the ration led to a drop in feed consumption. This can be explained by the high energy content of the peanut meal ration. As the animal's first priority is to cover its energy needs, a feed with high energy content will tend to reduce feed intake. These results are contrary to those of Diack (2015), who showed that subjects receiving the ration containing peanut meal supplemented with threonine had a higher feed intake than those receiving soybean meals. On the other hand, these results corroborate those of Coulibaly (2019), who reported that chickens fed a ration containing 100% soybean meal had a higher feed intake than those fed 50% soybean meal and 50% groundnut meal.

Broiler weight increases with age. The live weights (2.376kg and 2.145kg) we obtained with peanut meal and soybean meal are higher than those of the animals of Diaw et *al.* (2012), who presented a live weight of 1.1029kg at 6 weeks of age fed with the ration containing glandless cotton bean as protein source. This could be due to the feed quality, chicken strain and rearing techniques used. Rossilet (2001), on the other hand, draws attention to the adoption of a single feed for start-up and growth in the field. According to him, zootechnie performance is better with the use of three feed formulas. Our results show that subjects fed peanut meal as a protein source in the ration have a higher live weight than those fed the ration containing soybean meal. This can be explained by the high energy content of the peanut meal ration. This is because the energy level of the ration is the main factor influencing feed intake and consequently growth performance.

Total substitution of peanut meal for soybean meal improves broiler weight gain. These results corroborate those of Diack (2015), whose peanut meal supplemented with threonine increased weight gain compared with soybean meal. Similarly, Mebanga et *al.* (2021) obtained a high weight gain in subjects fed the ration containing dried maggot meal compared with control subjects fed the ration containing only soybean meal. This high weight gain is thought to be due

to ration efficiency and better feed conversion, as the feed conversion ratio was lower with the ration containing peanut meal.

The feed conversion ratio increases progressively with each type of ration. However, we found that chickens receiving peanut meal in their ration had a low feed conversion ratio. This could be explained by the low feed intake and high weight gain of broilers receiving the ration containing peanut meal. In addition, a low feed conversion ratio leads to better ration utilization. These results contradict those of Diack (2015), who showed that broilers fed peanut meal supplemented with threonine had a higher feed conversion ratio than those fed soybean meal. However, these results corroborate those of Okandza et *al.* (2017), who reported that animals fed a ration containing 3, 9 and 12% faba bean had a lower feed conversion ratio than those fed soybean meal.

The total substitution of peanut meal for soybean meal in the broiler ration resulted in an improvement in carcass weight 1 and carcass yields 1 and 2, but no significant increase in carcass weight 2 between the two rations. Carcass weight 2 (1709.25g) of chickens fed the peanut meal ration was higher than that of Diack (2015), who obtained a live weight of 1412.18g with a ration containing peanut meal enriched with threonine as a protein source in Senegal. On the other hand, the carcase 2 yield (78.83%) of subjects receiving the ration containing groundnut meal was lower than that of Diack (83.86%), who had substituted soybean meal with threonine-enriched groundnut meal, and that of Coulibaly (2019) 81.19%, who had substituted 50% soybean meal with groundnut meal. This result would be due to improved feed conversion, which increases weight gain and consequently carcass yield.

Peanut meal increased heart weight. This is explained by the very high aflatoxin content of this meal, which is tolerated by animals at low doses. The protein source did not significantly affect intestinal pH. This is due to the fact that the minerals present in both soy and peanut meals are comparable.

Peanut meal as the main source of protein in the ration led to a reduction in the cost of feed consumption (1537.7 FCFA vs. 1717.19 FCFA). These results are contrary to those of Ayssiwede et *al.* (2014), who reported that the incorporation of sesame cake led to an increase in the cost of feed consumption (1070 FCFA versus 1043 FCFA). This result can be explained by the extremely high cost of soybean meal compared with groundnut meal. The cost of production per kg of live weight fell with the ration containing groundnut meal (848.8 FCFA versus 999.50 FCFA). The same is true for Abasse et *al* (2017), who obtained a significantly lower production cost per kg live weight (490.82 FCFA and 423.85 FCFA vs. 527.24 FCFA) with the 2.5 and 4% supplementation of Moringa oleifera leaf meal in the broiler ration. The results of this study could be explained by a better valorization of the feed, reflected in its low feed conversion ratio.

5. Conclusion

At the end of this study on the effect of total substitution of soybean meal by peanut meal in the ration on broiler production performance, it was found that broiler growth performance differed according to the type of ration used. Carcass characteristics were significantly influenced by ration type. However, carcass weight 2, head, leg, liver, pancreas, gizzard, intestine and intestine density were not significantly influenced by ration type. The cost of production was lower with rations containing peanut meal.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no competing interest.

funding

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Availability of data and materials

The Data and materials are available upon demand.

References

[1] Abasse T, Diallo D, Habba W, and Maigachi I (2017). Effet de la supplémentation de la farine des feuilles de Moringa oleifera (Lam.) dans la production des poulets de chair au Niger, Int. J. Biol. Chem. Sci ,11(2): 722-729.

[2] Ayssiwede SB, Issa YA, Missoho A and Zotom C (2014). Effets de la substitution du tourteau d'arachide par du tourteau de graines de sésame (Sesamum indicum) dans la ration sur les performances zootechnico-économiques des poulets de chair au Sénégal. Revue Africaine de Santé et de Productions Animales 12 (02):103-110

[3] Banque mondiale (2022). La population camerounaise. En ligne http://donnees.banque mondiale.org.

[4] BMN (Bureau de Mise à niveau de Entreprises Camerounaises) (2019). Les difficultés à importés les œufs à couver et poussin d'un jour menace la filière avicole. En ligne http://www.investiraucameroun.com.

[5] Coulibaly O (2019). Effet d'une substitution du tourteau de soja par le tourteau d'arachide dans l'aliment sur les performances zootechniques du poulet de chair dans la région de Dakar au Sénégal. Thèse médecine vétérinaire, École Inter-états des Sciences et Médecine, 31:121p.

[6] Dayon JF, and Arbelot B (1997). Guide D'élevage Des Volailles au Sénégal. Dakar : ISRA-LNERV , 122 p.

[7] Diack S (2015). Effet d'une substitution du tourteau de soja par du tourteau d'arachide enrichi en thréonine dans la ration alimentaire, sur les performances de croissance du poulet de chair, Thèse médecine vétérinaire, Université Cheikh Anta Diop de Dakar, Sénégal, 35:111p.

[8] Diaw MT, Dieng A, Mergeai G, Camara A, Hornick JL (2012). Effets de la substitution totale du tourteau d'arachide par la fève de coton glandless sur les performances zootechniques de poulets de chair au Sénégal. Revue d'élevage et de médecine vétérinaire des pays tropicaux, 65(1-2):17-23.

[9] Douha (2017). L'aviculture urbaine familiale au Sénégal : caractérisation et rôle socio-économique dans la commune de Thiès, Rev CAMES, 4(2):6-11.

[10] FAO, Chambre d'Agriculture, Debazou Y (2004). Vers un mécanisme national d'action collective des agriculteurs paysans du Cameroun

[11] Kana JR, Ngouana TR, Mube KH, Tefack Y, Zambou H, and Teguia Al (2014). Valorisation des résidus de manioc en substitution du maïs dans la ration alimentaire du poulet de chair, Livestock Research for Rural Development.

[12] Kevin T (2011). La conférence économique africaine : Économie verte et transformation structurelle. Cinquième séance : La sécurité alimentaire en Afrique (pp113) Adis-Abeba

[13] Mebanga SA, Mballa JE and Abdoulmoumini M (2021). Effets comparés de la substitution partielle du tourteau de soja par la farine d'asticots séchés dans des rations alimentaires sur les performances zootechniques des poulets de chair à Ngaoundéré au Cameroun, Int. J. Biol. Chem. Sci. 15(6): 2543-2553.

[14] Okandza Y, Mopoundza P, Dimi Ngatse S, Halbouche M and Akouango P (2017). Influence de la substitution graduelle de tourteau de soja par la féverole sur la croissance et la conformation de la carcasse chez les poulets de chair. Journal of Applied Biosciences, 110: 10714-10720

[15] Rossilet A (2001). Aviculture. Afrique Agriculture, 292p.

[16] Tamgnoue D (2017). Regards croisés sur le village Batseng'la et son chef édition 2016 Pp10-16