Scholars Academic Journal of Biosciences
Abbreviated Key Title: Sch Acad J Biosci
ISSN 2347-9515 (Print) | ISSN 2321-6883 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Agronomy

Effect of Incorporating *Manihot glaziovii* Leaf Meal into Finishing Feed on Growth Performance in Hubbard Broilers Reared in Brazzaville

MBOU Amine Saklibakima[1], MOPOUNDZA Paul[1*], DIMI NGATSE Silvère[1], Parisse AKOUANGO[1]

[1]Animal Production and Biodiversity Laboratory, National Higher School of Agronomy and Forestry, Marien Ngouabi University, BP. 69, Brazzaville, Congo

DOI: https://doi.org/10.36347/sajb.2025.v13i03.001 | **Received:** 08.12.2024 | **Accepted:** 13.01.2025 | **Published:** 08.03.2025

***Corresponding author:** MOPOUNDZA Paul
Animal Production and Biodiversity Laboratory, National Higher School of Agronomy and Forestry, Marien Ngouabi University, BP. 69, Brazzaville, Congo

Abstract **Original Research Article**

The aim of this study was to reduce the high cost of raw materials (soybean meal, wheat bran and others) which is hampering the growth of livestock development in the Republic of Congo. It was also to promote the use of local resources in poultry farming. For this purpose, the growth performance of Hubbard strain broilers was evaluated by the introduction of *Manihot glaziovii* leaf meal into the diet. To do this, 72 chickens were divided into three (3) batches of 24 subjects each fed with 0% control food, 10% cassava leaf flour food, and leaf flour food of cassava at 15% corresponding respectively to rations containing 0%, 10% and 15% of cassava leaf flour. During the experiment, data related to food consumption were recorded every day, and live weight data every week. The results showed that food consumption was more elevated ($p<0.05$) in chickens fed with feed containing 10% (193.9±9.5g) and 15% (202.1±24.1g) of cassava leaf flour. Regarding the average weight gain (2072 ±134.9g) was recorded in the subjects fed with the food containing 10% cassava leaf flour and (2022.0 ±395.2g) for that of 15%. The latter is low ($p<0.05$). Concerning the consumption index of chickens fed with rations containing 10% and 15% of cassava leaf flour; this was 2.0 and 2.3 respectively. As for the control batch, the chickens obtained an average live weight of 2719 ±404.6g and a consumption index of 1.2. Although, growth performance was slightly altered in subjects who received the food containing 10% and 15% of flour from the leaf organ of cassava. The Hubbard subjects studied reached the commercial weight of (2072 ±134.9g) in 45 days. Our results show that cassava leaf flour can be incorporated into broiler feed at around 10 to 15%.

Keywords: Cassava Leaves, Feed, Broiler Chicken, Growth Performance, Brazzaville.

INTRODUCTION

Livestock farming in general and poultry farming in particular is one of the key elements in reducing hunger in developing countries. It faces a problem of supplying raw materials that can meet the needs of the animals (Akouango *et al*., 2010; FAO, 2014).

The low availability of cereals and oilseeds has led to strong fluctuations in the prices of raw materials used in the composition of food formulas (Gowda 2000; Nesseim 2009; Steyaert *et al*., 2019).

Poultry feed costs amount to almost 70%. The best economic returns have led scientists and industrialists in the poultry sector to seek optimal nutrition (INRA 2019; Larbier 2020; ITAVI, 2002).

Cassava is grown in parts of Africa. It is mainly cultivated for its roots which are tuberous. (Diallo 2013; Bulakali *et al*., 2014; Gomez 2016). However, these leaves, rich in protein, can be incorporated into poultry feed without damaging its productivity (Regnier, 2011; Busson, 2015;).

Soybean meal is incorporated at approximately 20% into poultry feed. The difficulty of importing it, especially during the COVID-19 pandemic, has made the supply of raw materials difficult (Fabienne 2020).

Thus, with a view to promoting local resources, this study was carried out in the henhouse of the Alegria farm, located in district 9, Djiri in Brazzaville from October 26 to December 10, 2023.

He general objective of this study was to improve the growth performance of Hubbard strain broilers fed with M. glaziovii leaf powder in their finishing feed.

The specific objectives revolved around:

- Determine the average live weight, ADG (average daily gain), individual feed consumption, and feed consumption index of Hubbard chickens fed feed consisting of 10% and 15%% cassava leaf flour.

MATERIAL AND METHODS

MATERIAL

The present study was carried out using animal and plant material. It was carried out from January to February 2024.

The animal material consisted of 72 unsexed Hubbard strain broilers in the finishing phase and divided into three batches of 24 chickens each, illustrated in Figure 1.

The plant material concerned cassava leaf flour (figure 2). This had been introduced into the finishing feed at 10% and 15%.

Figure 1: Distribution of Hubbard strain broilers in three batches (MBOU, 2024)

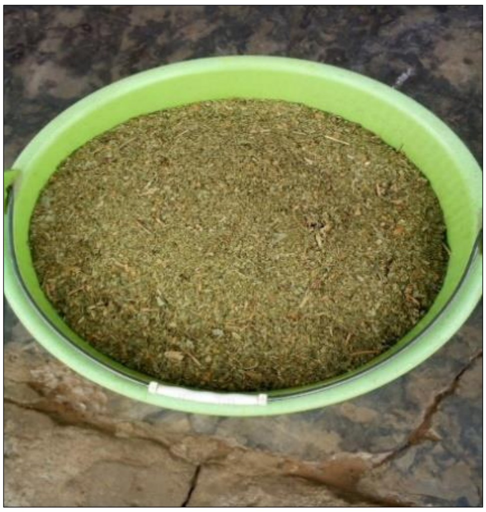

Figure 2: Cassava leaf flour in a bucket (MBOU, 2024)

Method

The breeding building had been the subject of a crawl space before the placement of the subjects. The breeding equipment was disinfected with bleach, then washed thoroughly with drinking water.

The Hubbard strain broilers in the finishing phase are weighed individually, ringed and distributed randomly into the three groups formed. The density was ten (10) subjects per square meter (m²) or 2.4 m2 for each batch. The chickens from each batch were fed with one type of food: control batch, 0% Control Food (AT 0%); batch of subjects fed 10% Cassava Leaf Flour Food

(AFFM 10%); batch of subjects fed 15% Cassava Leaf Flour Food (AFFM15%). These foods are formulated according to Tables 1, 2 and 3. Food and water were distributed ad libitum or ad libitum, twice a day, in the morning at 8 a.m. and in the evening at 4 p.m. The quantities of food served and refusals were weighed to deduce consumption. Also, weekly weights and maximum (between 12 p.m. and 4 p.m.) and minimum (from 7 p.m.) temperatures were noted. During breeding, the chickens were subjected to a prophylaxis program.

Table 1: Formula for 0% Cassava Leaf Flour Control Feed (CLFCF 0%)

Raw material	IR%	Contribution in						
		ME kcal/kg	CP % g	Lys. %	Méth. %	Ca %	P %	Quantity/kg
Maize	50	1650	4.85	0.16	0.10	0.005	0.03	10
Wheat bran	12.5	277.5	1.95	0.08	0.03	0.01	0.04	2.5
Soybean meal	25	625	8.38	0.59	0.14	0.003	0.08	5
Cassava Leaf Flour	0	0	0	0	0	0	0	0
Spent grain	0	0	0	0	0	0	0	0
Fish meal	8	248	5.02	0.38	0.14	0.40	0.20	1.6
Palm oil	3	277.5	0	0	0	0	0	0.6
Limestone	1	0	0	0	0	0.39	0	0.2
Sodium chloride	0.3	0	0	0	0	0	0	0.06
Vitamins	0.1	0	0	0	0	0	0	0.02
Aminogrown	0.1	0	0	0	0	0	0	0.02
Total contributions	**100**	**3078**	**20.19**	**1.20**	**0.41**	**0.82**	**0.34**	**20**

IR: Incorporation Rate; ME: Metabolizable energy

Table II: Formula for 10% Cassava Leaf Flour Feed (CLFF 10%)

Raw materials	IR%	Contribution in						
		ME kcal/kg	CP % g	Lys. %	Méth. %	Ca %	P %	Quantity/kg
Maize	48.5	1600.5	4.7	0.16	0.1	0.005	0.02	9.7
Wheat bran	11	244.2	1.7	0.07	0.03	0.01	0.04	2.2
Soya meal	15	646.6	5.0	0.35	0.08	0.002	0.05	3
M. Leaf meal	10	90	2.7	0.36	0.01	0.038	0.038	2
Spelt	0	0	0	0	0	0	0	0
Fish meal	10	330	6.27	0.47	0.1	0.51	0.26	2
Palm oil	4	370	0	0	0	0	0	0.8
Limestone	1	0	0	0	0	0.39	0	0.2
Sodium chloride	0.3	0	0	0	0	0	0	0.06
Vitamins	0.1	0	0	0	0	0	0	0.02
Aminogrown	0.1	0	0	0	0	0	0	0.02
Total contributions	**100**	**3281**	**20.4**	**1.4**	**0.40**	**0.95**	**0.40**	**20**

IR: Incorporation Rate; ME: Metabolizable energy

Table III: Formula for 15% Cassava Leaf Flour Feed (CLFF 15%).

Raw materials	IR %	Contribution in						
		EM kcal/kg	CP % g	Lys. %	Méth. %	Ca %	P %	Quantity/kg
Maize	48.5	1600.5	4.70	0.16	0.10	0.005	0.02	9.7
Wheat bran	11	244.2	1.72	0.07	0.03	0.01	0.04	2.2
Soya meal	10	431.1	3.35	0.23	0.056	0.001	0.03	2
M. Leaf meal	15	135	4.05	0.54	0.0225	0,057	0.057	3
Spelt	0	0	0	0	0	0	0	0
Fish meal	10	330	6.27	0.47	0.18	0.51	0.26	2
Palm oil	4	370	0	0	0	0	0	0.8
Limestone	1	0	0	0	0	0.39	0	0.2
Sodium chloride	0.3	0	0	0	0	0	0	0.06
Vitamins	0.1	0	0	0	0	0	0	0.02
Aminogrown	0.1	0	0	0	0	0	0	0.02
Total contributions	**100**	**3111**	**20.09**	**1.47**	**0.38**	**0.97**	**0.40**	**20**

IR: Incorporation Rate; Metabolizable Energy

The data collected after weighing was entered into an Excel spreadsheet, which was used to calculate the various zootechnical parameters and mortality.
These zootechnical parameters are evaluated according to the following formulas:

Individual Daily Feed Consumption
CAQ(g)/subject/d=(QAD(g)-QAR(g)) / (Number of subjects)
QAD : Quantity of feed Distributed;
QAR : Quantity of Feed Rejected.

Average Daily Gain (ADG)
A.D.G.(g/d) = (PV d-PV i) / (Number of days between dates i and j)
A.D.G. : Average Daily Gain (g/day);
PVi : Initial live weight at the start of the experiment (g);
PVj : Daily live weight at the end of the experiment (g).

The Consumption Index (CI)
CI= (quantity of food consumed during a period (g)) / (weight gain during the same period (g))

Mortality
Mortality Rate = (Initial Headcount-Final Headcount) / (Initial Headcount) x 100

The data collected were subjected to ANOVA using SPSS.22 software, following the repeated measures method (Davis, 2002). Means were separated using the Tukey test (P<0.05).

RESULTS

Effect of Incorporating Cassava Leaf Meal on Weight Growth

The results in Table 4 show that the average live weight of the chickens was 2719 ±404.6g for AT0%, 2072.7g ±134.9 for AFFM 10% and 2022.0g ±391.2 for AFFM 15%. A significant difference (p<0.05) was observed between the control subjects and the chickens fed the feeds containing 10 and 15% cassava leaf flour. This difference is at the 5% threshold.

Figure 3 below shows the change in average live weight in relation to the rate of incorporation of cassava leaf meal. It shows that the control batch fed with 0% cassava leaf meal (AT0%) reached an average live weight of 2719 ±404.6g at 45 days, whereas the subjects treated with 10 and 15% incorporation of cassava leaf meal had average live weights of 2072.7g ±134.9 and 2022.0g ±391.2 respectively after 45 days. The commercial weight (2000g) obtained at 45 days can be explained by the presence of proteinaceous matter in the Manihot glaziovii leaves.

These results indicate that the introduction of cassava leaf powder into a ration at a rate of 10% can contribute to obtaining commercial weight (2000g) at 45 days.

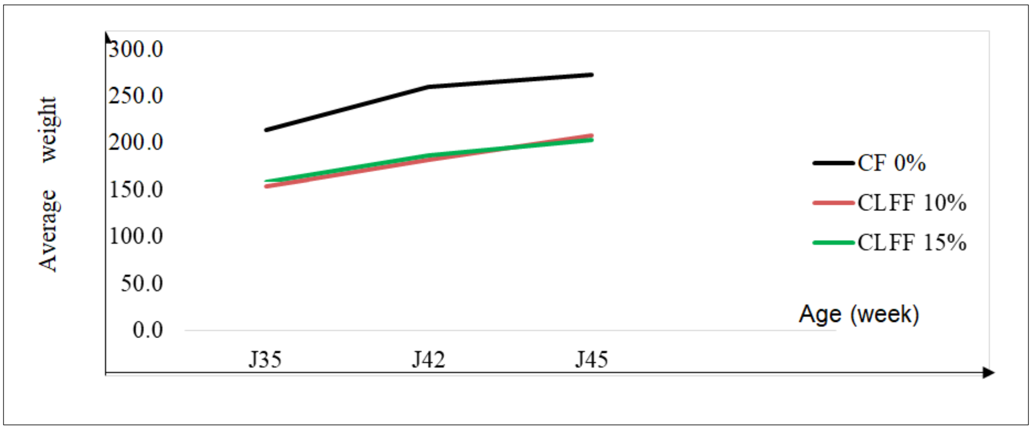

Figure 3: Evolution of the average live weight of chickens fed at different rates of introduction of cassava leaf powder over the course of the experiment as a function of time.

Table IV: Effect of introducing cassava leaf powder into the feed on weight

Statistics		
FC 0 %	Headcount	24
	Average	2719.7
	Standard deviation	404.6
CLFF 10%	Headcount	24
	Average	2072.7
	Standard deviation	134.9
CLFF 15%	Headcount	24
	Average	2022.0
	Standard deviation	391.2

Effect of Introducing Cassava Leaf Powder

Figure 4 shows a significant difference in the growth rate of subjects in the AFFM 10% (46.0g ±2.9) and AFFM15% (44.9g ±8.6) batches compared with the control batch (60.4g±8.9). The heat treatment of the cassava leaves certainly eliminated the anti-nutritional factors and favoured digestibility, which made it possible to obtain 2000g.

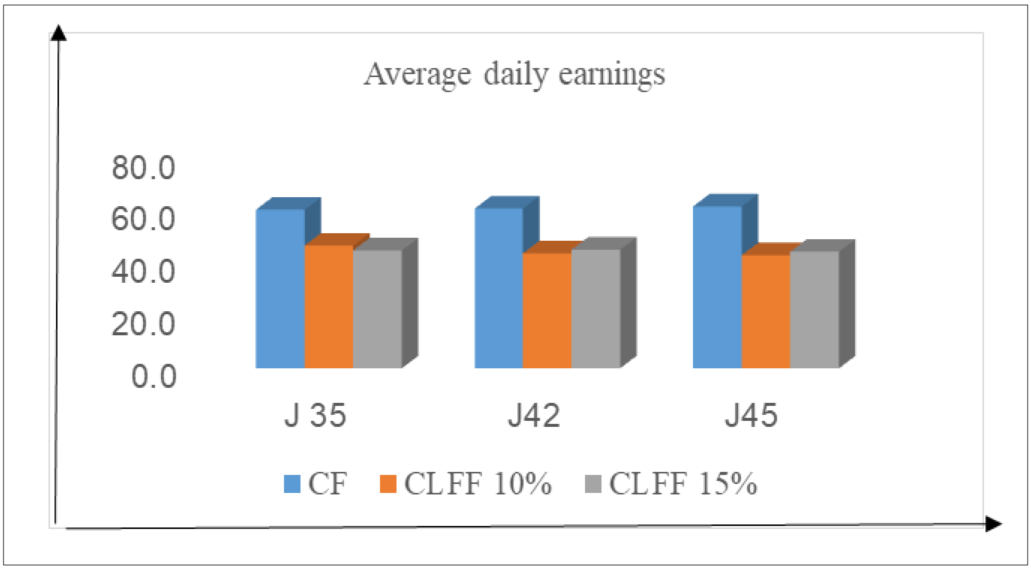

Figure 4 : Effect of *Manihot glaziovii* leaf powder on average daily earnings

The results in Table 5 show the GMQ of subjects fed at different rates of introduction of cassava leaf powder. Subjects fed 0% cassava leaf powder had an average daily gain of 60.4g ± 8.9, whereas those fed 10% and 15% cassava leaf powder had average daily gains of 46.0g ± 2.9 and 44.9g ± 8.6, respectively. The GMQ obtained by the treated subjects can be explained by the presence of protein substances, vitamins and mineral salts which accentuate weight growth.

Table V: Average daily gain (standard deviation)

Headcount	Average	Standard deviation	Standard error	95% confidence interval for the mean	
				Lower terminal	Upper terminal
Control batch (24)	60.440	8.9927 7	1.8751	56.551	64.328
Batch CLFF 10% (24)	46.061	2.9991 1	1.6394	44.731	47.390
Batch 15% CLFF (24)	44.934	8.6941 1	1.8536	41.080	48.789

Effect of Introducing Cassava Leaf Powder on Daily Food Consumption (DFC)

DFC was 193.9g±9.5 for the AFFM10% batch and 202.1g±24.1 for the AFFM15% batch. Figure 5 shows the progression of feed consumption in the finishing phase. From day 35 to day 42, the curves are almost identical. From the 42nd day onwards, the curves differ from one another. The curve for subjects fed AFFM15% is higher, the curve for subjects fed AFFM10% is in the middle and the curve for subjects fed 0% Manihot leaf powder is lower than the other two. This could be explained by the fact that the feed containing cassava leaf powder could increase the palatability of the feed. A significant difference ($p < 0.05$) was found between the feed containing the cassava leaves and the control feed.

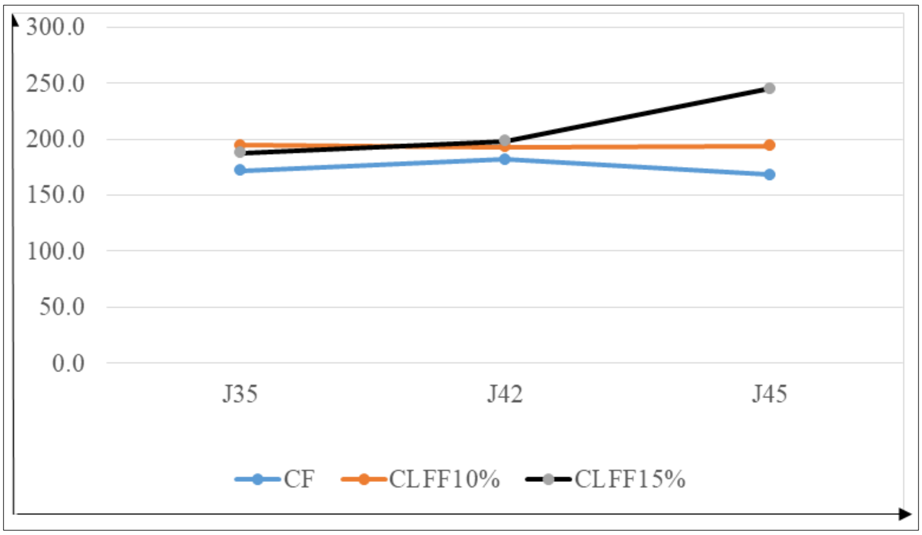

Figure 5: Effect of *Manihot glaziovii* leaf powder on feed consumption feed consumption

Effect pf Introducing Cassava Leaf Powder on the Consumption Index (CI)

The consumption index was 1.2 for the control batch, 2.0 for the AFFM 10% batch and 2.3 for the AFFM 15% batch (Figure 6). There was a significant difference ($p<0.05$) between the subjects given the cassava leaf powder and the control feed. The increase in CI in the AFF10% and AFFM15% batches could be explained by the fact that the chickens do not digest proteins that are bound to cellulose.

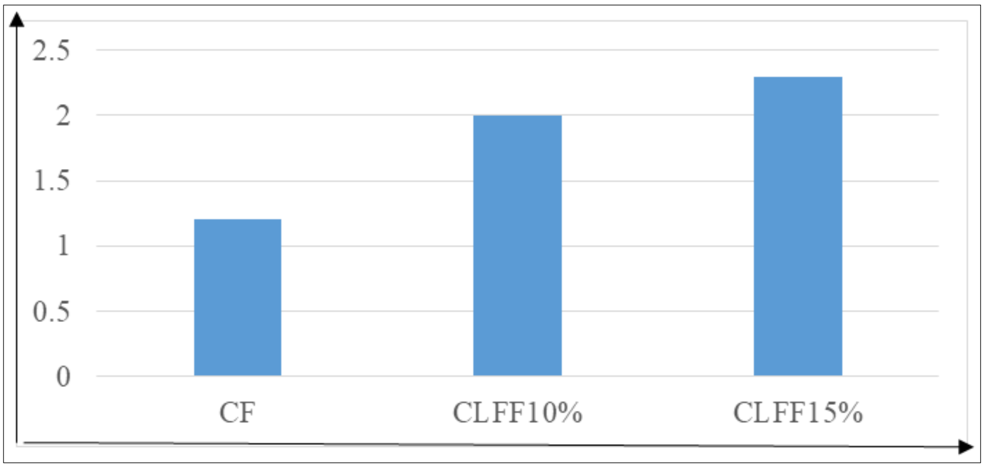

Figure 6: Effect of *Manihot glaziovii* leaf powder on CI

Effect of Introducing Cassava Leaf Powder on the Mortality Rate

Throughout the experiment, there was no mortality at finishing.

DISCUSSION

Effect of Introducing Cassava Leaf Powder on Weight Growth

The average live weight results of the present study 2072.7g ±134.9 for birds fed AFFM 10% and 2022.0g ±391.2 for those fed AFFM 15% are slightly higher than those obtained 1900g by Guembo *et al*., (2021) in their work entitled 'Separate feeding of post-harvest cassava leaves on the performance of finishing Hubbards'.

Fasuyi and Aletor, (2005) obtained 2000g of average live weight, these results are approximate to ours when they replaced maize by a mixture of root and powdered cassava leaves at a rate of 50% in the ration. However, our results are similar to those of Iheukwumere *et al*., (2007) who obtained 2073 g in their work evaluating the average live weight of finishing chickens.

Growth qualities are preserved with low levels of cassava leaf powder, as shown in the study by Trompiz *et al*., (2007) who obtained 2090 g of average live weight.

The study conducted by Khajarern (1991) revealed that weight growth was maintained with the introduction of 10 to 20% cassava leaf powder.

Our results are also similar to those of Akinfala *et al*., (2002) who obtained 2040g of average live weight, and Eruvbetine *et al*., (2003) who introduced a proportion of cassava leaf powder in a complete diet.

Effect of Leaf Powder Introduction on Daily Gain

Our results of average daily gain 46.0 g ±2.9 at 10% and 44.9 g ±8.6 at 15% are similar to those obtained by Eruvbetine *et al*., (2003) 40.5 g Trompiz *et al*., (2007) 41.1 g, Ngueda Djeuta and Tona, (2022) 45.8g. These authors tested the introduction of cassava leaf powder into feed rations at 5% and 15% on the GMQ.

Similarly, Ironkwe *et al*., (2012) and Guembo *et al*., (2021) found that adding 5% cassava leaf powder to the ration did not affect weight gain. Furthermore, the GMQ of 47.7 g in the work carried out by Iheukwumere *et al*., (2007) is higher than that observed by the authors cited above.

The inclusion of manihot leaf powder in the rations at rates of 10% and 15% in our study improves the GMQ.

Effect of Introducing Manihot Leaf Powder on Daily Food Consumption (DFC)

The introduction of manihot leaf powder at rates of 10% (193.9g±9.5) and 15% (202.1g±24.1) increased the CAQ in this study compared with that obtained by the control batch. This is certainly due to the fact that monogastric animals consume their feed primarily to cover their energy requirements and that the leaf organ of cassava is low in energy Guembo *et al*., (2021). There was no significant difference between the ration with 10% and 15% cassava leaves, whereas this was observed with the control ration. Our results are superior to those of Houndonougbo *et al*., (2012), 115 g. The latter state that the introduction of up to 10% dried cassava leaves into the pullets' ration does not significantly affect feed intake. However, the present results do not corroborate those obtained by Guembo *et al*., (2021), 153.9 g at the sixth week, who reported a decrease in CAQ when dried cassava leaves were presented separately from the feed ration.

Effect of Introducing Leaf Powder in Relation to CI

Regarding CI, the significant difference ($p > 0.05$) had not been seen between AFFM 10% (2.0) and AFFM 15% (2.3). On the contrary, this difference was significantly low at the 0.05 threshold for the control feed (1.2). Nideou *et al*., (2017) indicate that the increase in feed consumption index of feed with cassava leaves is observed in chickens that appreciated less the ration containing leaf organs of Manihot glaziovii. On the contrary, Guembo *et al*., (2021) obtained 2.5 at the sixth week and speak of the decrease in feed intake index when cassava foliage is distributed separately from the feed.

Effect of Introducing Leaf Powder in Relation to Mortality

There was no mortality at the end of this study, the same finding as in (Moukissi, 2015). Heat treatment of cassava leaves must have eliminated anti-nutritional factors.

CONCLUSION AND OUTLOOK

Hubbard chicken, with its short production cycle, high protein content and lack of religious restrictions, is a source of income for producers. It was against this backdrop that this study was carried out, with the aim of developing non-conventional local ingredients, in particular Manihot glazovii leaf powder, used in the feed of Hubbard broilers.

The study involved 72 Hubbard chickens in the finishing phase, grouped into batches of 24 birds each. The batches corresponded to three feed treatments: AT 0%; AFFM 10% and AFFM 15%, containing 0%, 10 and 15% Manihot glazovii leaf powder respectively. From week 5 to week 7, food was given twice a day and water was given ad libitum. The results of this study show the superiority in live weight of the control lot at 2719 ±404.6 g; 2072.7 ±134.9 g for the subjects treated with 10% Manihot leaf powder and 2022.0 ±391.2 g for the subjects treated with 15% Manihot leaf powder. Similarly, the GMQ of the control batch was 60.4 ± 8.9 g, whereas the AFFM 10% and AFFM 15% batches recorded GMQs of 46.0 ± 2.9 g and 44.9 ± 8.6 g respectively. In addition, food consumption was high in the subjects fed the Manihot leaf powder feed, while the AFFM10% batch had a consumption index of 2 and 2.3 for the AFFM15% batch compared with 1.2 for the control batch.

It should be noted that, at the end of this experiment, the introduction of up to 15% Manihot glazovii leaf powder into the ration did not have any adverse effects on health but resulted in a negligible increase in the chickens' feed conversion ratio.

In conclusion, the present results indicate that Manihot glazovii leaf powder can be incorporated up to 15% into chicken finishing feed.

Further studies could be carried out to determine a reasonable rate for the introduction of Manihot glazovii leaf powder into chicken finishing feed.

REFERENCES BIBLIOGRAPHIQUES

- Abu, O. A., Olaleru, I. F., & Omojola, A. B. (2015). Carcass characteristics and meat quality of broilers fed cassava peel and leaf meals as replacements for maize and soyabean meal.
- Akinfala, E. O., Aderibigbe, A. O., & Matanmi, O. (2002). Evaluation of the nutritive value of whole cassava plant as replacement for maize in the starter diets for broiler chicken. *Livestock Research for Rural Development*, *14*(6), 23-30.
- Anonyme. (2013). Alimentation des volailles : équilibrer l’énergie et les protéines de sa ration, les

fiches techniques du réseau gab/frab, [en ligne], sur : www.agrobio-bretagne.org, consulté le 28/07/2021.

- Bulakali, B. P., Aloni, J., Palata, J. C., & Mergeai, G. (2014). Performances de trois variétés de manioc (Manihot esculenta Crantz) cultivées en association avec Stylosanthes guianensis (Aublet) Swartz dans les conditions du plateau des Batéké (ville-province de Kinshasa, RDC). *Tropicultura*, *32*(4), 158-167.
- Busson, F., & Bergeret, B. (2015). Contribution à l'étude chimique des feuilles de manioc, 42-44.
- Dahouda, M., Toleba, S. S., Youssao, A. K. I., Mama Ali, A. A., Ahounou, S., & Hornick, J. L. (2009). Utilisation des cossettes et des feuilles de manioc en finition des pintades (Numida meleagris, L): performances zootechniques, coûts de production, caractéristiques de la carcasse et qualité de la viande. *Ann. Méd. Vét, 153*, 82-87.
- Davis, C. S. (2002). Statistical Methods for the Analysis of Repeated Measurements.
- Diallo, Y., Gueye, M. T., Sakho, M., Darboux, P. G., Kane, A., Barthelemy, J. P., & Lognay, G. (2013). Importance nutritionnelle du manioc et perspectives pour l'alimentation de base au Sénégal (synthèse bibliographique). *Biotechnologie, Agronomie, Société et Environnement*, *17*(4).
- Direction Générale d'Elevage, (DGE) 2010. Rapport d'activités de la direction générale de l'agriculture et de l'élevage, ministère de l'agriculture et de l'élevage, Brazzaville, Congo, 52p.
- Eruvbetine, D., Tajudeen, I. D., Adeosun, A. T., & Olojede, A. A. (2003). Cassava (Manihot esculenta) leaf and tuber concentrate in diets for broiler chickens. *Bioresource Technology*, *86*(3), 277-281.
- Fabienne, R. (2020). La supplémentation des aliments par des minéraux: intérêt nutritionnel. 221p. [en ligne], sur : bump-theses@univ-grenoble-alpes.fr, consulté le 30/07/2021.
- FAO. (2014). Les aliments du bétail sous les tropiques. Manuel technique. Rome, Italie, 542.
- Fasuyi, A. O., & Aletor, V. A. (2005). Protein replacement value of cassava (Manihot esculenta, Crantz) leaf protein concentrate (CLPC) in broiler starter: Effect on performance, muscle growth, haematology and serum metabolites. *International Journal of Poultry Science*, *4*(5), 339-349.
- Fulbert, A., Pierre, B., & Christophe, N. (2010). Croissance pondérale et productivité de la poule locale Gallus domesticus en élevage fermier au Congo. *Animal Genetic Resources/Resources génétiques animales/Recursos genéticos animales*, *46*, 61-65.
- Gowda, & Sastry. (2000). Neem (azadirachta indica) seed cake in animal feeding-scope and limitations. *Asian-australasian journal of animal sciences, 13*(5), 575-728.
- Guembo, J. R., Adzona, P. P., Bati, J. B., Saboukoulou, A. J., Ntsoumou, V. M., Mabanza-Mbanza, B. B., ... & Banga-Mboko, H. (2021). Effet de l'alimentation séparée à base des feuilles de manioc post-récolte sur les performances des poulets de chair en finition: Effect of cassava leaf wastes meal by using a separate feeding on the performance of broiler chicken in the finishing stage. *International Journal of Biological and Chemical Sciences*, *15*(5), 1937-1949.
- Houndonougbo, M. F., Chrysostome, C. A. A. M., & Houndonougbo, V. P. (2012). Performances bioéconomiques des poulettes alimentées avec des rations à base de feuilles séchées de manioc (Manihot esculenta). *International Journal of Biological and Chemical Sciences*, *6*(2), 670-676.
- Iheukwumere, F. C., Ndubuisi, E. C., Mazi, E. A., & Onyekwere, M. U. (2007). Growth, blood chemistry and carcass yield of broilers fed cassava leaf meal (Manihot esculenta Crantz). *International Journal of Poultry Science*, *6*(8), 555-559.
- INRA. (1989). (Institut National de la Recherche Agronomique). *Alimentation des Animaux Monogastriques: Porc, Lapin, Volailles* (2nd edn, révisée et corrigée). INRA : France.
- Ironkwe, M. O., & Ukanwoko, A. I. (2012). Growth performance of broiler finisher birds fed composite cassava meal (CCM). *Bulletin of Environment, Pharmacology and Life Sciences*, *1*(6), 30-34.
- ITAVI. (2002). L'aviculture biologique communautaire face au règlement européen pour les productions animales biologiques : compétitivité et perspectives d'évolution, tome 1 et 2.- paris : ITAVI.- 62p.
- ITAVI. (2010). Cahier technique de l'ITAVI. Alimentation rationnelle des poulets de chair et des pondeuses, paris, 30.
- Khajarern, S., & Khajarern, J. M. utilisation à base du manioc dans l'alimentation de la volaille.FAO, Rome.
- Larbier, M., & Leclercq, B. (2020). Nutrition et alimentation des volailles.- paris : INRA ed.- 355.
- MOUKISSI S, A. M. B. (2015). Performances comparées des poulets de chair standard nourris séparément avec trois aliments commerciaux et un aliment expérimental, mémoire pour l'obtention du diplôme Ingénieur des Travaux de Développement Rural, option productions santé animales, ENSAF, Université Marien Ngouabi, Congo, 53.
- National Research Council (NRC). 1994. *Nutrient Requirements of Poultry* (9th
- Nesseim T. D. T. (2016). Contribution à l'étude de la qualité nutritionnelle des aliments et matières premières utilisées en aviculture dans la zone périurbaine de Dakar. Mémoire de diplôme d'études approfondies de productions animales, université cheikh anta diop de Dakar, 28.
- Ngueda Djeuta, O. R., & Tona, K. (2022). Effets des feuilles de Manihot esculenta dans l'aliment sur les performances de croissance des poulets de chair Sasso (XL431NA). Quatorzièmes Journées de la

Recherche Avicole et Palmipèdes à Foie Gras, Tours, 9 et 10 mars 2022.

- Nideou, D., N'nanlé, O., Teteh, A., Decuypere, E., Gbeassor, M., & Tona, K. (2017). Efficacy of oil supplementation of productive physiologique. *Journal of poultry Science, 7*, 1682-8356.
- Ravindran, V. (1993). Cassava leaves as animal feed: Potential and limitations. *Journal of the Science of Food and Agriculture, 2*, 141-150.
- Revised edn). National Academy Press: USA.
- Springer-Verlag : New York, Inc ; 415.
- Steyaert, P., Puldgen, A., & Compere, R. (2019). Influence de la teneur des provendes en farine basse de riz sur les performances de croissance des poulets de chair au Sénégal. *Bull. Rech. Agron. Gembloux, 24*(4), 385-395.
- Trompiz, J., Gómez, Á., Rincón, H., Ventura, M., Bohórquez, N., & García, A. (2007). Effect of Rations with Cassava Leaf Flour on the Productive Performance of Broilers. *Revista Científica*, *17*(2), 143-149.