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Levels of Galiang (*Xanthosoma saggitifolium*) corm meal as replacement of corn in broiler ration

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Abstract Galiang Corm Meal is one nutrient-dense feed ingredient that is a potential partial substitute for corn. Corn contains 4.38% crude protein, 2.61% crude fiber, 1.25% ether extract, 4.68% minerals & 8.08% moisture while GCM may be better than corn since both were used together to formulate feed; hen flock bands had larger final body weights (1.565 kg) and were heavier than their counterparts receiving only corn weight gain (1.518 kg) at the end of the feeding trial. Statistically significant was revealed more feed consumed by birds compared to others with the lowest amount of feed needed/kg gain for birds that received GCM at 50% inclusion level. GCM added between 25%-75% levels resulted in growth performance, feed usage efficiency & carcass yield of broilers that were fed both products compared to commercial rations. Economically GCM available at a 50% substitution level provided the highest gross margin/bird making this level of dietary inclusion the best cost-benefit ratio of the dietary treatments evaluated.

Keywords: Corn, Energy, Feed conversion ratio, Formulated ration, Galiang corm meal

Introduction

The U.S. broiler industry is responsible for an estimated 85% of all poultry meat production in the country, and it has been continually challenged by rising input costs related to both traditional agricultural feed supply and household consumption patterns, as well as geographical limitations to access many types of feed ingredient. The increasing demand for poultry has caused many producers to seek alternative feed ingredients to provide insulated protection from the many environmental challenges faced by producers due to bio-fuel production and agricultural practices. Various nations have initiated numerous studies and projects looking into many alternatives for poultry feed, primarily using corn-based products because corn is the primary ingredient of poultry diets globally (Iji *et al.,* 2011).

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Poultry feed represents the single largest expense incurred when producing poultry, with 75% of poultry production's total costs being used for feed costs. Much of this feed cost is composed of energy and protein sources that make up a large part of the total feed cost for poultry, as shown in Ahaotu *et al.* (2010). The poultry industry has relied primarily upon corn for feed for many years, therefore there has been a considerable increase in research and experimentation aimed to discover other sources of energy for poultry including some corms, tubers and roots, as indicated in Ahiwe *et al*. (2018).

Starchy tubers and roots from tropical regions are a major source of dietary energy both for animals and for humans as they contain a significant amount of carbohydrate. Even though energy in the form of carbohydrates is used by poultry for energy storage and utilization in metabolism, other energy sources are being utilized and moving to the forefront of the nutritional study and formulation of poultry animal feed types. The use of starch produced from starch-type tubers and/or roots, as well as the introduction of starch-based products from sources such as sweet potato and yam, into poultry diets lead to a more efficient method of meeting the energy needs of poultry and ultimately result in a reduction of feed cost for production of poultry.

Materials and methods

The Poultry Project tested the use of 200 observational broilers in March - April 2020. These birds were randomly assigned to five treatment categories (Complete Control Treatment, yellow corn processed at 100%, yellow corn processed at 75%, feedstuffs added at 25% and/or processed yellow corn at 75% (mixed), and Feedstuff added at 25% then primarily milked out depending upon body weight) and the experiments were replicated in groups of 5. The chicks were raised to 35 days of age.

Preparation and management of experimental cages

All cages were thoroughly cleaned, disinfected, and subsequently allowed to air dry for three full days prior to being used in this study. Electric light were employed to maintain appropriate temperatures (37-37.5 degrees Celsius), for the duration of the two-week brooding period, by surrounding empty sacks around the cages to reduce draft. The brooding area floors were covered with rice hulls, which were replaced every other day, for sanitary reasons. The chicks had free access to food from day-old until day 14, received a booster ration during their first two weeks, and were then switched to the starter ration and maintained on it until the conclusion of the experiment on day 35.

Preparation for galiang meal

The poultry project started off by harvesting galiang corms from various locations on campus such as locations used for the poultry project. The corms were first cleaned with water, and then peeled and cut into 1 cm segments, before drying in the sunshine for around 5 to 7 days. Once thoroughly dehydrated, the corms were pulverized into powder using grinding equipment and stored in polyethylene bags for protection against moisture. Chickens used for brooding were purchased from a reputable local poultry producer, and each chicken was housed at a density of 1 bird/ft.^{2} within its respective housing unit. Each housing unit contained a drinking dish filled with clean water, a feeding container containing the proper feed for the age of the chickens, and electric incandescent lamps to create a warm environment for the chickens. As such, all chickens purchased for the poultry project were reared in similar environments and under identical management protocols.

Formulation of the experimental ration

Experimental ration was created by a trial-and-error approach that was manual formulated composition of the booster ration (Table 1), and formulated composition of the starter ration (Table 2). The nutrient content of the experimental formulated diets (crude protein, metabolizable energy, calcium, and phosphorus) was determined by PCARRD in 2006 using proximate analysis. The birds were fed the experimentally formulated feeds developed by this study from day old to 35 days after hatching; the control birds were fed 100% commercial feeds.

Table 1. Formulated composition of the booster ration

Feed Ingredients	T_0	T_1	T_2	T_3	T_4
	Commercial feeds	**100% Corn**	**75% Corn, 25% GPC**	**50% Corn, 50% GPC**	**25% Corn, 75% GPC**
Base Mix	0.0	25	17.20	16.0	11.45
Soybean oil meal	0.0	21.95	28.80	30.95	35.50
Rice bran (D1)	0.0	3.5	3.5	3.50	3.50
Ground yellow corn	0.0	48	36.75	24.0	12
Galiang corm meal	0.0	-	12.25	24.0	36
Salt	0.0	0.57	0.55	0.57	0.57
Limestone	0.0	0.98	0.95	0.98	0.98
TOTAL	0.0	100.0	100.0	100.0	100.0
Nutrient Composition (%)					
Crude Protein	21.50	22.46	22.48	22.46	22.47
Metabolizable Energy	0.0	2,864.63	2,871.72	2,859.23	2,856.50
Calcium	0.90-1.10	0.87	0.87	0.87	0.87
Phosphorus	0.55	0.45	0.45	0.44	0.44

Table 2. Formulated composition of the starter ration

Feed Ingredients	T_0	T_1	T_2	T_3	T_4
	Commercial feeds	100% Corn	75% Corn, 25% GPC	50% Corn, 50%GPC	25% Corn, 75% GPC
Base Mix	0.0	18.50	13.20	8.28	15.15
Soybean oil meal	0.0	20.50	25.80	30.80	27.40
Rice bran, D1	0.0	3.50	3.52	3.48	3.50
Ground yellow corn	0.0	56.0	42.00	28.0	13.13
Galiang corm meal	0.0	-	14.00	28.0	39.38
Salt	0.0	0.57	0.55	0.55	0.55
Limestone	0.0	0.93	0.93	0.89	0.89
TOTAL	0.0	100.0	100.0	100.0	100.0
Nutrient Composition (%)					
Crude Protein	21.0	20.36	20.37	20.36	20.37
Metabolizable Energy	0.0	2,946.70	2,944.20	2,941.76	2,908.76
Calcium	0.90-1.10	0.87	0.87	0.87	0.87
Phosphorus	0.55	0.52	0.51	0.44	0.40

Data analysis

The information collected from this study was analyzed utilizing ANOVA with a fully randomized experimental design. To evaluate significant differences between treatment means, Tukey's HSD tests were performed at the 5 percent level of significance. The means and percentages calculated from the data were also analyzed.

Results

Growth performance

Final weight

The findings presented on average, the final weight of birds fed a diet containing both corn and corm meal (T3) was 1.57 kg and that the final weight of birds receiving a diet consisting solely of 100% corn (T1) was 1.34 kg, that birds received the combined diet of corn and corm meals which had statistically higher average weights than all other test groups with the exception of those receiving commercial diets (Table 3). There were not significant differed in average weights of birds receiving commercial diets compared to those receiving various levels of Galiang meal.

Weight

The weight had similar trends in all treatments (Table3). The averaged weight for birds fed on 50% corn and 50% galiang tuber (T3) was 1.52 kg, whereas for birds fed on 100% corn (T1). It was 1.30 kg. birds fed on T3 was 0.22 kg which higher than T1 commercial feed birds. However, when compared to other treatments' averages, galiang tuber meal group's weight were virtually the same as commercial feed group. The data suggested that 25-75% of galiang tuber meal mixed with corn was sufficiently replaced ommercial feed without interfering with broiler gain in weight.

Table 3. Mean final body weight and average weight gain of broiler chickens (kg)

Treatment	Final Weight *(kg)*	Gain in Weight *(kg)*
T0-Pure commercial feeds (Control)	1.49 ab	1.44 ab
T1-100% corn	1.34 b	1.30 b
T2-75% corn meal, 25% GCM	1.48 ab	1.44 ab
T3-50% corn meal, 50% GCM	1.57 a	1.52 a
T4-25% corn meal, 75% GCM	1.41 ab	1.37 ab

Within a column, means denoted by unlike superscript letters differ significantly at α = 0.05 according to Tukey's HSD.

Feed consumption

The mean feed consumption from the ANOVA analysis are showed in Table 4. The results indicated that there was significant variation in the average overall feed consumption of the various treatment groups. The mean feed intake from the commercial feed group was the highest at 3.012 kg, followed closely by the mean feed intakes for treatments T4 (2.965 kg), T2 (2.962 kg) and T3 (2.960 kg). A numerical difference existed between the mean total feed consumption of the treatment groups. However, it indicated that the treatment groups were significant impact on total feed consumption of birds. Therefore, these results indicated that the experimental diets did not negatively impact the total feed intake versus the commercial feed group.

Table 4. Mean feed intake over a 35-day period as influenced by GCP (kg)

Treatment	Average Feeds Consumed (*kg/head)*
T0-Pure commercial feeds (Control)	3.012a
T1-100% corn	2.892b
T2-75% corn, 25% GCP	2.962 a
T3-50% corn, 50% GCP	2.960 a
T4-25% corn, 75% GCP	2.965 a

Within a column, means denoted by unlike superscript letters differ significantly at α = 0.05 according to Tukey's HSD.

Feed conversion ratio

The average feed conversion ratios (FCRs) for the birds are shown in Table 5. According to the results, T3 had the best FCR, with the lowest value of FCR, 1.95, followed by T2 (2.06), T0 (2.08), T4 (2.17), and T1 had the highest value of 2.24. In terms of FCR, better performance can be attributed to improved nutrient density of the diet because chickens regulate their food intake according to the availability of nutrients. When adequate amounts of essential nutrients are provided, chickens will eat less and continue to gain weight at a constant daily rate, resulting in an improved FCR. This finding is consistent with the study conducted by Anyaegbu *et al*. (2018), who reported that adding cocoyam tuber meal (*Xanthosoma sagittifolium*) to the diet of broilers increased their performance without negatively affecting their body weight, weight gain, feed intake, or FCR.

Table 5. Average feed conversion ratio per treatment

Treatment	Average Feed Conversion Ratio *(kg feed/kg of weight gain)*
T0-Pure commercial feeds (Control)	2.08 ab
T1-100% corn	2.24 a
T2-75% corn, 25% GCP	2.06 ab
T3-50% corn, 50% GCP	1.95 b
T4-25% corn, 75% GCP	2.17 ab

Within a column, means denoted by unlike superscript letters differ significantly at α = 0.05 according to Tukey's HSD.

Dressing percentage

No significant differences were observed in dressing percentage (Table 6). Birds fed 25% galiang corm had the highest value **(**79.05%**),** while those on 100% corn had the lowest **(**73.56%**),** below the broiler average.

Table 6. Carcass dressing percentage of broilers as affected by galiang corm powder (%)

Treatment	Average Dressing Percentage *(%)*
T0- Pure commercial feeds (Control)	75.78
T1- 100% corn	73.56
T2-75% corn, 25% GCP	79.05
T3-50% corn , 50% GCP	78.70
T4-25% corn, 75% GCP	75.96

Potential profit per head

Analysis of the data showed that the T0 group had the highest average profit per bird **(**₱79.54**),** followed by T3 (₱53.20) and T4 (₱46.74)**.** The lowest profits were recorded for T2 (₱38.21) and T1 (₱18.29)**.** Replacing corn with galiang tuber increased profit per bird up to threefold, whereas birds fed 100% corn had the lowest profit (Table 7).

Table 7. Treatment average profit per head (PhP)

Treatment	Average Profit per Head (PhP)
T0-Pure commercial feeds (Control)	79.54 a
T1-100% corn	18.29 c
T2-75% corn , 25% GCP	38.21 bc
T3-50% corn, 50% GCP	53.20 b
T4-25% corn, 75% GCP	46.74 b

Within a column, means denoted by unlike superscript letters differ significantly at α = 0.05 according to Tukey’s HSD.

Discussion

The introduction of galiang corm meal at differing ratios did not have a negative impact on broiler performance; this is likely due to the level of energy content comparable to those of commercial feeds. The greatest difference detected between T1 and T3 treatment groups (100% corn vs. 50% corn and 50%

galiang) appeared to result from galiang increasing the nutrient density of the diet. This is consistent with the results of Johnson (2000) who showed that up to 65% taro could substitute for grains without negatively affecting performance, meat quality, or health. Poultry performance relies heavily on energy and nutrient availability in the diet as the level of nutrients and energy available in the feed directly correlates with growth performance (Hossain *et al*., 2012).

Feed consumption was similar across treatment groups even though the average daily feed intake for the T1 treatment group (100% corn ration) was the lowest at 2.892 kg/day potentially due to the decreased palatability of rations. Banser *et al.* (2000) indicated that feed intake may decrease due to a low degree of ration acceptance. Providing an ad libitum feeding regimen allows birds to consume enough feed to support their energy requirements (Gillespie and Flanders, 2010). Corn rations are typically higher in metabolizable energy than cocoyam/roots/tubers feedstuffs (Uchegbu *et al*., 2010).

The T3 treatment group (50% corn and 50% galiang corm) had the best feed conversion rates. This is consistent with the findings of Apata and Babalola (2012) that roots and tubers can be partially substituted for maize in non-ruminants without reducing growth performance. Dressing percentages were similar across all treatments. From a profit standpoint, the use of commercial feed produced the highest profit margin.

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Conflicts of interest

The authors declare no conflict of interest.

References

Abdulrashid, M. A. and Agwunobi, L. N. (2012). Utilization of taro cocoyam (*Colocasia esculenta*) meal as a poultry feed ingredient in Pakistan. Pakistan Journal of Nutrition, 8:668-673.

Adebayo, A. A., Salami, R. I. and Oloyinde, L. (2002). Factors influencing poultry farmers' choice of commercial and/or self-compounded feed in Lagos State, Nigeria. Nigerian Journal of Animal Production, 29:226-233.

Ahaotu, E. O., Guang-Hai, Q., Ekenyem, B. U., Korie, A. U. and Madubuike, F. N. (2010). Replacement value of feather meal for fishmeal on the performance of starter cockerels. Animal Production Research Advances, 6:53-57.

Ahiwe, E. U., Omede, A. A., Abdallh, M. B. and Iji, P. A. (2018). Managing dietary energy intake by broiler chickens to reduce production costs and improve product quality. Animal Husbandry and Nutrition, 115:115-145.

Anyaegbu, B. C., Ogbonna, A. C., Adedokun, O. O. and Onunkwo, D. N. (2018). Dietary evaluation of fermented cocoyam tuber meal (*Xanthosoma sagitifolium*) as energy source in place of maize in broiler chicken production. Nigerian Journal of Animal Production, 45:114-123.

Apata, D. F. and Babalola, T. O. (2012). The use of cassava, sweet potatoes, cocoyam and their by-products in non-ruminant animal feeding. International Journal of Food Science and Nutrition Engineering, 2:54-62.

Banser, J. T., Fomunyam, R. T., Pone, D. K., Fai, E. N. and Panigrahi, S. (2000). Effect of meals of sweet potato and cassava varieties formulated with soya meal or cottonseed meal on broiler production. Journal of Food Technology in Africa, 5:115-119.

Bown, D. (1995). Encyclopedia of herbs and their uses. Dorling Kindersley.

de la Cruz, C. P. P. (2016). Production performance of finisher broilers fed cocoyam corm meal as a partial energy replacement for maize. Veterinary World, 9:1107-1112. https://doi.org/10.14202/vetworld.2016.1107-1112

Du Thanh, H. and Nguyen, T. K. (2012). Taro (*Alocasia odora* (C.) Koch, *Xanthosoma nigra* (Vell.) Stellfeld, and *Colocasia esculenta* (L.) Schott) in Central Vietnam: Biomass yield, digestibility, and nutritive value. Livestock Research for Rural Development, 24.

Gillespie, J. R. and Flanders, F. B. (2010). Modern livestock and poultry production (8th ed.). Delmar Cengage Learning.

Hossain, M. A., Islam, A. F. and Iji, P. A. (2012). Energy utilization and performance of broiler chickens raised on diets with vegetable proteins or conventional feeds. Asian Journal of Poultry Science, 6:117-128.

Iji, P. A., Bhuiyan, M. M., Chauynarong, N., Barekatain, M. R. and Widodo, A. P. (2011). Improving the nutritive value of alternative feed ingredients for poultry. In Proceedings of the Recent Advances in Animal Nutrition. University of New England, pp.115-122.

Johnson (2000). Statement regarding taro inclusion levels in poultry diets. (Cited in discussion; full bibliographic details not provided.) Opara, L. U. (2003). Edible aroids: Post-harvest operations. Food and Agriculture Organization of the United Nations.

Uchegbu, M. C., Omede, A. A., Chiedozie, J. C., Nwaodu, C. H. and Ezeokeke, C. T. (2010). Performance of finisher broilers fed varying levels of raw (sun-dried) cocoyam (*Xanthosoma sagittifolium*) corm meals. Report and Opinion*,* 2:22-25.

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