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Response of Broiler Chicken Fed Graded Levels of Cassava Peel Leaf Meal (CPLM) Mix on Carcass Characteristics and Organ Weights

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ABSTRACT

This experiment was conducted to evaluate the effects of replacing maize with different levels of Cassava Peel Leaf Meal mix on carcass traits and relative organ weights of broiler chickens. The study determined an optimum level of maize replacement by CPLM that would not compromise growth performance, carcass yield, and organ health. The broiler chicken were fed 0%, 10%, 20%, 30%, 40%, and 50% maize replaced by CPLM mix (9:1 ratio) diets for a certain duration of time. Variations in DW% and EW%; even the relative organ weights like heart, liver, and gizzard showed significant differences. The outcome indicated that up to 50% maize replacement with the CPLM mix seemed feasible without showing any negative impact on the performance of broiler chickens and eventually providing a possibly low-cost alternative feed resource.

Keywords: Maize, Alternative Feed stuff, Poultry, Carcass, Organ

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1. INTRODUCTION

Maize is the major energy component in poultry diets but its cost is rising significantly, hence the need to look for alternative feedstuffs. The poultry industry is always trying to find ways to bring down the cost of producing chickens, and one of the approaches is to source out feed alternatives that are not only cheap but are also nutritionally sound so as to reduce its reliance on traditional feed ingredients such as maize.

It is hence indicated that cassava peel and leaf meal (CPLM) is a cassava processing byproduct that is rich in nutrient potential, hence a possible alternative to maize. Lately, a lot of beneficial and limiting studies in broiler diets have focused on cassava by-products inclusions (Abubakar & Ohiaege, 2011; Olowoyeye et al., 2019; Kehinde et al., 2020). This study was conducted to evaluate the impact of graded levels of CPLM in replacing maize on broiler performance with more emphasis on the carcass traits and organ weights that are very vital health and production efficiency indicators for the bird

2. MATERIALS AND METHODS

300 broiler chickens were randomly allotted to six dietary treatments, each with five replicates. Levels of maize replaced by CPLM were 0, 10, 20, 30, 40% and 50%. The CPLM mix was prepared in 9:1 cassava peel: leaf meal ratio. Diets were formulated isonitrogenous and isocaloric. The experiment was carried out for 42 days, and the birds were fed ad libitum. At the end of the experiment, ten birds per treatment group were sacrificed to determine the carcass characteristics. Dressing weight percentage (DW%) and eviscerated weight percentage (EW%) were measured. The weights of heart, liver, lungs, kidney, spleen, gizzard, and length of intestine (LI) were also measured.

Table:1 Gross Composition of Experimental Diet (g/100g) for broiler –starters fed diets in which maize was replaced with CPLM (9:1) mix

Level of maize replaced by cassava peel – leaf meal mix (9:1)						
Ingredient	0	10	20	30	40	50
Maize	51.19	46.07	40.95	35.83	30.71	25.60
CPLM	0. 00	5.12	10.24	15.36	20.48	25.60
SBM	30. 00	30. 00	29. 00	29. 00	28.50	28.50
GNC	9. 00	9. 00	9. 00	9. 00	9. 00	9. 00
FM	4. 00	4. 00	4. 00	4. 00	4. 00	4. 00
B/meal	2. 00	2. 00	2. 00	2. 00	2. 00	2. 00
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.13	0.13	0.13	0.13	0.13	0.13
Methionine,	0.13	0.13	0.13	0.13	0.13	0.13
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Vegetable oil	2.50	2.50	3.50	3.50	4.00	4.00
Calculated analysis						
Crude protein	23.23	23.39	23.49	23.60	23.76	23.85
ME(kcal/kg)	3092.8	3044.2	3004.9	2980.3	2887.3	2839.02
Calcium%	1.54	1.44	1.36	1.34	1.24	1.23
Av. Phosphorus %	0.61	0.6	0.59	0.59	0.58	0.58

Table 2. Gross Composition of Experimental Diet (g/100g) for Broiler-Finisher fed diets in which maize was replaced with CPLM (9:1) mix

Ingredient	Level of maize replaced by cassava peel /leaf meal mixture (9:1)					
	0	10	20	30	40	50
Maize	58.23	52.41	46.58	40.76	34.94	29.12
CPLM	0.00	5.82	11.65	17.47	23.29	29.12
SBM	24.00	24.00	24.00	24.00	24.00	24.00
GNC	9.00	9.00	9.00	9.00	9.00	9.00
FM	3.50	3.50	3.50	3.50	3.50	3.50
B/Meal	2.00	2. 00	2. 00	2. 00	2. 00	2. 00
Oyster shell	0.50	0.50	0.50	0.50	0.50	0.50
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.11	0.11	0.11	0.11	0.11	0.11
Methionine	0.11	0.11	0.11	0.11	0.11	0.11
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Vegetable Oil	2.00	2.00	2.00	2.00	2.00	2.00
Total %	**100**	**100**	**100**	**100**	**100**	**100**
Calculated Analysis						
Crude protein %	20.21	20.40	20.59	20.77	20.96	21.15
M.E (kcal/kg)	3109.2	3053.9	2968.49	2943.2	2887.9	2832.86
Calcium %	1.44	1.40	1.38	1.32	1.24	1.22
Av. Phosphorus %	0.57	0.56	0.56	0.55	0.55	0.54

2.1 Data Collection

a) Carcass Traits: Dressing weight percentage and eviscerated weight percentage were calculated for each diet. These data were analyzed using statistics to determine whether there were significant differences between treatments.

b) Relative Organ Weights: The heart, liver, lungs, kidney, spleen, gizzard, and length of intestine (LI) weights were expressed in g/kg of body weight. Statistical analysis was done to point out treatments that showed significant variations.

3. RESULTS

Carcass Traits

Table 3: Some Carcass traits of broiler-chicken fed graded levels of CPLM (9:1) mix in place of maize

Diet	%maize replaced by CPLM (9:1) mix	DW%	EW%
1.	0	85.48	71.95
2.	10	84.58	71.29
3.	20	85.14	70.47
4.	30	85.99	70.45
5.	40	82.65	67.20
6	50	86.87	71.48
	±SEM	0.73	0.65

a,b,c d: Mean within rows having different superscripts are significantly different (P<0.05)
DW%= Dressing Weight Percentage, EW%= Eviscerated Weight percentage

The dressing weight percentage (DW%) and eviscerated weight percentage (EW%) of broilers fed different levels of replacement of CPLM mixture is presented in Table 3. The differences of DW% and EW% in treatment groups were significant (P<0.05). The highest DW% was recorded in the 50 % replacement level which is group F (86.87%). The lowest was in the 40 % replacement level which is group D (82.65%). EW% showed the same trend with its peak in the control group (71.95%), and its minimum value in the group with 40% substitution (67.20%).

Relative Organ Weights

Table 4; Relative organ weight (g/kg body weight) of broiler-chicken fed graded levels of CPLM (9:1)
mix as a replacement for maize

Diet	%maize replaced by CPLM (9:1) mix	HEART	LIVER	LUNGS	KIDNEY	SPLEEN	GIZZARD	LI(cm)
1.	0	4.29^{b}	16.68^{a}	5.60	5.19	0.86^{ab}	19.62^{b}	222.17^{a}
2.	10	5.25^{ab}	19.12^{b}	5.36	5.13	1.30^{a}	24.99^{a}	200.17^{a} ^{b}
3.	20	4.24^{b}	19.95^{b}	5.66	6.04	1.17^{ab}	22.33^{ab}	201.17^{a} ^{b}
4.	30	5.41a	21.82 b	4.89	5.31	0.63^{b}	26.36^{a}	205.17^{a} ^{b}
5.	40	5.22^{ab}	22.45^{b}	5.89	4.96	0.88^{ab}	23.22^{ab}	186.67^{b}
6.	50	5.33^{ab}	21.41^{b}	5.87	6.49	0.99^{ab}	*A. 23.54^{a} b*	203.33^{a} ^{b}
	±SEM	0.15	0.52	0.18	0.21	0.08	0.63	3.97

a,b,c d: Mean within rows having different superscripts are significantly different (P<0.05)
LI=

Length of Intestine

Table 4 shows the relative organ weights of broilers fed the various dietary treatments. The weight of the heart, liver, and gizzard, as well as the length of the intestine, were statistically different at $P<0.05$. The liver weight registered a peak level at 40% replacement group (22.45 g/kg body weight); the gizzard weight peaked at 30% replacement (26.36 g/kg body weight).

4. DISCUSSION

The importance of dressed weight is crucial for poultry meat consumers, as it accurately represents the amount of saleable meat, unlike live weight, which is inflated by feathers. Dressed weight directly reflects the value of the meat available for sale, making it more significant for consumers and industry profitability. Typically, the dressing percentage for broiler chickens ranges between 80-84%, a standard regarded as optimal for maximizing profit margins (Meat Institute, 2024).

Recent studies continue to highlight the superiority of dressed weight over live weight in poultry production, underlining its relevance to consumer preferences and its economic impact (Okunlola, 2021; Nyalala et al., 2021; Mutibvu et al., 2019). In a recent analysis, the dressing percentage for birds on both control and test diets was between 82.65% and 86.87%, aligning well with industry standards. Notably, birds consuming a diet with 50% Cassava Peel Leaf Meal (CPLM) recorded the lowest live weight but the highest dressing percentage among the test groups. This outcome indicates that live weight does not always correlate with performance traits or dressing percentage, as supported by earlier observations (USDA, 2023). It also shows that greater weight gain does not necessarily translate into a proportional increase in dressed weight percentage.

The eviscerated weight, which measures the bird's weight after removing internal organs, feathers, and the head, was notably higher in birds fed the control diet (71.95%) compared to those on experimental diets. In this study, eviscerated weights ranged from 67.20% to 71.95%, exceeding the 65-70% range typically reported for broilers (Galanakis, 2024). These results suggest that birds on the control diet processed nutrients more efficiently, free from the toxic effects of HCN, resulting in a greater yield of edible meat (Olajide, 2012).

Significant weight variations were observed in organs like the liver, heart, spleen, and gizzard across the different groups. Birds on the test diets exhibited heavier livers and hearts, likely due to toxic elements such as HCN, which put extra strain on these organs as they worked to detoxify the body (USDA, 2023). This finding aligns with earlier studies by Atuachene et al. (1986) and Bamgbose and Niba (1995), which documented similar effects with diets containing raw cottonseed meal. The increase in heart weights observed with higher levels of CPLM in the diet may be attributed to the heightened need for the heart to pump more oxygenated blood to aid in detoxification (Okpanachi et al., 2014).

Heavier gizzard weights were observed in birds on test diets, consistent with research indicating that high-fiber diets increase the gizzard's workload (Foods Journal, 2024; Obun et al., 2008). This is because the gizzard's muscular walls must work harder to thoroughly break down fibrous feed particles (Abdelsamic et al., 1983). Additional studies have similarly noted variations in broiler performance and organ weights when birds were given cassava-based diets (Abubakar & Ohiaege, 2011; Kehinde et al., 2020; Nwosu et al., 2023).

In summary, the current data highlights the significance of prioritizing dressed weight over live weight in poultry production. These findings are in line with both past and present research, emphasizing the need for precise diet formulation to optimize meat yield and improve nutrient efficiency.

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