Growth performance and carcass characteristics of broilers fed graded levels of dry distilled cassava with soluble

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Abstract

This study was carried out to investigate the performance of broilers fed graded levels of Dry Distilled Cassava with Soluble (DDCS). In a 28-day trial, one hundred and forty-four (144), 5-week old, un-sexed Arbor acre strain broiler chicks (average weight of 1.09 ± 0.02 kg) were randomly allocated to four dietary treatments of wheat offal (WO) and DDCS (12% WO + 0% DDCS = 0% DDCS; 8% WO + 4% DDCS = 4% DDCS; 4% WO + 8% DDCS = 8% DDCS and 0% WO + 12% DDCS = 12% DDCS) in completely randomized design. Each treatment had 2 replicates of 18 birds each. Dry matter feed intake (FI g/day), daily weight gain (g/day) and total weight gain (kg) decreases with increase in the levels of DDCS, while the feed conversion ratio (FCR) increases with increase in levels of DDCS, respectively. However, there was no significant ($P > 0.05$) differences in the carcass evaluation measured. It was concluded that DDCS could replace wheat offal in the diets of broilers up to 8% without significant difference in growth and feed intake without detrimental effects on carcass quality of the birds.

Keywords: Dry Distilled Cassava with Soluble, Growth performance, Carcass characteristics

Performance de croissance et caractéristiques de la carcasse des poulets de chair nourris à des niveaux gradués de manioc distillé sec avec soluble.

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Résumé

Cette étude a été réalisée pour étudier la performance des poulets de chair nourris à des niveaux échelonnés de manioc distillé sec avec soluble (le 'DDCS'). Dans un essai de 28 jours, cent quarante-quatre (144) poussins de chair de la souche Arbor acre non sexés de 5 semaines (poids moyen de $1,09 \pm 0,02$ kg) ont été répartis au hasard dans quatre traitements diététiques d'abats de blé (WO) et DDCS (12% WO + 0% DDCS = 0% DDCS; 8% WO + 4% DDCS = 4% DDCS; 4% WO + 8% DDCS = 8% DDCS et 0% WO + 12% DDCS = 12 % DDCS) dans une conception complètement aléatoire. Chaque traitement comportait 2 répétitions de 18 oiseaux chacun. L'apport alimentaire en matière sèche (FI g / jour), le gain de poids quotidien (g / jour) et le gain de poids total (kg) diminuent avec l'augmentation des niveaux de DDCS, tandis que le taux de conversion alimentaire (FCR) augmente avec l'augmentation des niveaux de DDCS, respectivement. Cependant, il n'y avait aucune différence significative ($P > 0,05$) dans l'évaluation de la carcasse mesurée. Il a été conclu que le DDCS pouvait remplacer les abats de blé dans l'alimentation des poulets de chair jusqu'à 8% sans différence significative de croissance et de consommation alimentaire sans effets néfastes sur la qualité de la carcasse des oiseaux.

Mots clés : Manioc distillé sec avec soluble, performance de croissance, caractéristiques de la carcasse

Introduction

The poultry industry has enjoyed great genetic improvement globally, with proper feeding regimen; birds reach target weight in shorter time frame. However, the ever-increasing cost of poultry feeds with attendant increase in cost of poultry products (meat and eggs) makes it necessary to explore the use of alternative feed ingredients that are cheaper, locally available and have little or no human preference since cost of feed accounts for 70-80% of poultry production in the country (Tuleun *et al.*, 2009; Mahmud *et al.*, 2016). Industrial dry distillers waste product obtained from fermentation of raw materials rich in carbohydrate and sugars (Trautwein *et al.*, 2008) considered as non-conventional feedstock, are not universally used in animal feed, but if they are properly processed they could be an important element in the sustainable production systems (Martínez *et al.*, 2010). These wastes such as vinasse is obtained from the fermentation process of alcohol distilling, from raw materials such as molasses or juices of sugarcane, maize, beet, among others, and with the usage of yeasts (Robertiello, 1981; Hernández *et al.*, 2008) which has potential to cause major environmental problems across the world (Vadivel *et al.*, 2014). The composition of this by-product varies according to the conditions of the fermentation and distillation process and the raw materials used. In this study, cassava was the substrate used and the by-product of this fermentation is referred to as Dry Distilled Cassava with Soluble (DDCS) an agro-industrial waste that can serve as source of nutrient for animals. The objective of this study is to assess the potentials of DDCS as

a feed resource in the poultry feedstock system by evaluating its effect on growth performance and carcass characteristics of broilers.

Materials and methods

Study area

The experiment was conducted at the poultry section of the Bioresources Development Centre (BIODEC), Ogbomoso. It lasted for four weeks (28 days). The DDCS used in this study was obtained from Bio-ethanol Production plant of National Biotechnology Development Agency (NABDA), located in BIODEC, Onipannu, Ogbomoso, Nigeria.

Processing of DDCS

The samples were collected from production plant stored in tank using the outlet faucet (hose) of the storage tank. They were collected into jute bags; the water was allowed to drain out then sundried for two days and air dried for two days. The processed samples were stored in a sack at room temperature prior to proximate analysis by standard methods (AOAC, 1990).

Experimental diets

Four dietary treatments were formulated with 0, 4, 8 and 12% DDCS inclusion (Table 1). One hundred and forty-four (144), 5-week un-sexed Arbor acre strain broiler chicks were used. The birds were randomly allotted to four dietary treatments in a completely randomized design. Each treatment had 2 replicate of 18 birds each. The mean initial weight was 1.09g. Data were collected on weight gain, feed intake, feed conversion ratio (FCR) and carcass characteristics.

Table 1: Composition of experimental diets

Ingredients	0% DDCS	4% DDCS	8% DDCS	12% DDCS
Maize	54.75	54.75	54.75	54.75
Soybean meal	28.00	28.00	28.00	28.00
Wheat offal	12.00	8.00	4.00	-
DDCS	-	4.00	8.00	12.00
Bone Meal	3.00	3.00	3.00	3.00
Oyster shell	1.50	1.50	1.50	1.50
Salt	0.20	0.20	0.20	0.20
Vitamin Premix	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15
Methionine	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00
Calculated % CP	19.65	19.71	19.41	19.10
Metabolizable energy (Kcal/Kg)	2,874.22	2,789.42	2,714.62	2,639.82
Crude fibre (%)	3.73	4.97	6.17	7.38

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) using SAS Statistical Package, SAS 2008. The means were separated using Duncan's multiple range test.

Results and discussion

The chemical composition and the anti-nutritional factors of DDCS are as shown in Tables 2 and 3, respectively. The crude

protein and organic matter content of DDCS showed that it can serve as good source of nutrients for broilers when incorporated in their diets. The results showed the possibility of using this residue in animal feed due to its essential nutrients content for proper metabolism, thus suggesting DDCS as good source of broilers feed ingredient for sustainable development.

Table 2: Composition of dry distilled cassava with soluble

Parameter	DDCS
Dry matter (DM)	85.52
Analysis % of DM	
Organic matter	94.54
Crude protein	9.88
Crude fibre	45.09
Ether extract	0.35
Ash	5.46
Nitrogen free extract	24.74

Table 3: Anti-nutritional factors of dry distilled cassava with soluble

Parameter	DDCS
Saponin (%)	0.05
Alkaloid (%)	0.09
Flavonoid (%)	0.03
Tannin (mg/100g)	0.43
Polyphenol (mg/100g)	0.12
Cyanide (mg/kg)	15.14
Phytate (mg/g)	79.83
Oxalate (mg/g)	0.71

Growth performance and carcass characteristics of broilers

The results of chemical composition of the diets fed to experimental broilers are shown in Table 4. The crude protein and crude fibre content increased with increase in the inclusion levels of DDGS. The crude

protein range was 25.81-26.25%. There is significant ($P<0.05$) difference in growth performance of the broilers fed different levels of DDGS in terms of final weight, body weight gain, feed intake and feed conversion ratio (Table 5).

Table 4: Composition of diets fed to experimental broilers

Parameter	0% DDGS	4% DDGS	8% DDGS	12% DDGS
Dry matter (DM)	93.18	92.94	93.49	93.33
<u>Analysis % of DM</u>				
Organic matter	88.85	92.61	91.04	89.56
Crude protein	25.81	26.25	26.25	26.25
Crude fibre	2.49	3.29	3.93	4.70
Ether extract	3.72	4.29	4.27	3.43
Ash	13.15	7.39	8.96	10.44
Nitrogen free extract	48.01	51.72	50.08	48.51

Table 5: Growth performance of broilers graded levels of dry distilled cassava with soluble

Parameter	0% DDGS	4% DDGS	8% DDGS	12% DDGS	SEM	PROB
Initial weight	1.10 ^a	1.11 ^a	1.07 ^a	1.08 ^a	0.01	0.21
Final weight	2.14 ^a	1.98 ^b	1.95 ^b	1.74 ^c	0.02	<0.0001
Body weight gain (kg)	1.03 ^a	0.87 ^b	0.89 ^b	0.67 ^c	0.02	<0.0001
Body weight gain (g/day)	36.92 ^a	31.07 ^b	31.61 ^b	23.81 ^c	0.61	<0.0001
Feed intake (g/day)	130.00 ^a	129.00 ^b	129.00 ^b	122.14 ^c	0.26	<0.0001
Feed conversion ratio	3.60 ^c	4.29 ^b	4.16 ^b	5.67 ^a	0.11	<0.0001

^{a, b, c, d} : Means within each row with different superscript are significantly different ($p<0.05$)

SEM = Standard error of mean, PROB = Probability

Final weight and weight gain of experimental birds declined significantly ($P<0.05$) as the inclusion levels of DDGS increases in diets with significant increase in feed conversion ratio (FCR). Feed conversion ratio is a measure of how well a flock converts feed intake into weight gain and it is also the ability of the livestock to turn feed mass to body mass (Adeyemo *et al.*, 2013). Efficiency of feed utilization decreased with increase in addition of DDGS to the diets. This could be as a result

of increase in crude fibre content and anti-nutritional factors as the inclusion level of DDGS increase from 0-12%. Similarly decrease in weight gain and elevated feed conversion ratios have been linked to the contents of anti-nutritional factors in the diets (Ahmad *et al.*, 2000; Kumar, 2003). Rodriguez *et al.* (2013) reported similar observation from broilers fed 0% to 30% of *Vinasse torula* yeast. The result of the carcass characteristics analysis of broilers is presented in Table 6.

Table 6 : Carcass characteristic of broilers fed graded levels of dry distilled cassava with soluble

Parameter	0% DDCS	4% DDCS	8% DDCS	12% DDCS	SEM	PROB
Live-weight (kg)	2.52	2.49	2.63	2.49	0.04	0.64
Carcass weight (%)	63.68	63.27	64.39	63.37	0.76	0.65
Head (%)	2.87	2.85	2.96	2.90	0.04	0.39
Neck (%)	3.76	3.99	3.60	4.09	0.10	0.79
Shank (%)	4.69	4.70	4.41	4.54	0.05	0.79
Breast (%)	19.89	18.51	20.20	18.10	0.33	0.18
Back (%)	12.87	13.29	13.34	13.83	0.14	0.56
Thigh (%)	11.73	11.66	11.86	11.22	0.13	0.37
Drumstick (%)	9.86	9.83	10.07	9.44	0.13	0.33
Wing (%)	8.17	8.13	8.12	7.98	0.09	0.64
Tail (%)	0.97	0.96	1.04	0.98	0.03	0.79
Heart (%)	0.52	0.56	0.59	0.57	0.02	0.48
Liver (%)	1.98	1.99	2.01	2.22	0.05	0.58
Kidney (%)	0.24	0.21	0.19	0.27	0.01	0.26
Spleen (%)	0.21	0.15	0.12	0.13	0.01	0.08
Lungs (%)	0.65	0.55	0.57	0.60	0.02	0.35
Crop (%)	0.58	0.60	0.47	0.54	0.04	0.84
Bile (%)	0.09	0.14	0.14	0.15	0.02	0.57
Proventriculus (%)	0.46	0.50	0.48	0.53	0.02	0.45
Whole gizzard (%)	3.15	3.06	2.71	2.98	0.09	0.54
Empty gizzard (%)	2.13	2.03	1.87	2.01	0.06	0.76
Gizzard fat (%)	0.14	0.23	0.21	0.35	0.03	0.17
Intestine (%)	7.06	6.63	5.91	7.16	0.20	0.09
Abdominal fat (%)	0.64	0.83	0.97	1.23	0.09	0.10

^{a, b, c, d} : Means within each row with different superscript are significantly different ($p < 0.05$)

SEM = Standard error of mean, PROB = Probability

There were no significant ($P > 0.05$) difference across the dietary treatments in all the carcass characteristics. The highest carcass weight (64.39%) obtained from birds fed the 8% DDCS diet was not significantly ($P > 0.05$) different from those fed 0% DDCS, 12% DDCS and 5% DDCS diets with respective values of 63.68%, 63.37% and 63.27%. Agbede and Aletor (1997) noted that the insignificant impact of percentage bled weight and defeathered weight showed an indication that the different diets promoted the fairly similar development of carcass traits. The groups fed different levels of DDCS recorded non-significant higher Back (%), Heart (%), Liver (%), Bile (%), Proventriculus (%), Gizzard fat (%) and Abdominal fat (%) as

compared to the 0% DDCS group.

Conclusion

The chemical composition of DDCS showed that it can serve as good source of nutrients for broilers when incorporated in their diets. It was concluded that DDCS can replace wheat offal in the diets of broilers up to 12% without any deleterious effect on carcass quality of the birds. Further studies are needed in respect to the effect of this residue on other livestock.

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Received: 16th July, 2020

Accepted: 21st November, 2020