GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILERS FED GRADED LEVELS OF DRY DISTILLED CASSAVA WITH THE SOLUBLE

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ABSTRACT
The performance of broilers fed graded levels of Dry Distilled Cassava with Soluble (DDCS) as a partial substitute for wheat offal was investigated in a 28 day study. One hundred and forty four (144) 5-week old broiler chickens of similar average weight were randomly allocated to four dietary treatments. Each treatment had 2 replicate of 18 birds each. Four experimental diets with 0, 4, 8 and 12% inclusion of DDCS were formulated. Feed and water were fed *ad libitum*. Parameters measured include growth performance and carcass characteristics. Body weight and feed consumption were measured weekly and carcass characteristics were evaluated at the termination of experiment. Six birds from each treatment were randomly selected and slaughtered for carcass evaluation. The average daily weight gain (g/day) for broilers on 0% DDCS was significantly ($P<0.05$) higher than that of others. The carcass analysis investigated were not significant ($P>0.05$) for all experimental diets. It was concluded that DDCS could replace wheat offal in the diets of broilers up to 12% without any deleterious effect on carcass quality of the birds

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

INTRODUCTION
The poultry industry has enjoyed great genetic improvement globally, with proper feeding regiment; birds reach target weight at 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 (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 feeds stocks, are not universally used in animal feed, but if they are properly used they could be an important element in the sustainable production systems (Martínez *et al.*, 2010). 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
The experiment was conducted at the poultry section of the Bioresources Development Centre (BIODEC), Ogbomoso. It lasted for 4 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. 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).

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. Data obtained were subjected to analysis of variance (ANOVA) using SAS Statistical Package, SAS 2008. The means were separated using Duncan 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. 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 DDCS. 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 DDCS in terms of final weight, body weight gain, feed intake and feed conversion ratio (Table 5). Final weight and weight gain declined significantly ($P<0.05$) with increase in inclusion levels of DDCS. Efficiency of feed utilization decreased with increase in addition of DDCS to the diets. This could be as a result of increase in anti-nutritional factors as the inclusion level of DDCS 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). 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. 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 which 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%.

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 the different animal species.

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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	25.00	25.00	25.00	25.00
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

Table 2: Chemical composition of dry distilled cassava with the 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 the soluble

Parameter	DDCS
Saponin (%)	0.05
Alkaliod (%)	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

Table 4: Chemical composition of diets fed to experimental broilers

Parameter	0% DDCS	4% DDCS	8% DDCS	12% DDCS
Dry matter (DM)	93.18	92.94	93.49	93.33
Analysis % of DM				
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 the soluble

Parameter	0% DDCS	4% DDCS	8% DDCS	12% DDCS	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

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

Parameter	0% DDCS	4% DDCS	8% DDCS	12% DDCS	SEM	PROB
Liveweight (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