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RESEARCH ARTICLE

EFFECT OF DEHULLING SORGHUM GRAINS ON BROILER PERFORMANCE AND CARCASS CHARACTERISTICS

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ABSTRACT

Hundred and eighty broiler chicks were divided into three treatment groups of six replicates each to study the effect of dehulling sorghum grains as a method of reducing its tannin content on broiler performance and carcass characteristics. Three isocaloric, isonitrogenous diets were formulated to contain whole sorghum grains (A), dehulld sorghum grains (B) and equal proportion of dehulled and whole sorghum grains (C). Diets were randomly divided into the three chicks treatment groups. Chicks fed dehulled sorghum grains (diet B) had lower live weight gain, lower final weight and highest mortality rate and feed conversion efficiency, whilst the chick fed on 50:50 sorghum grains (diet C) had the best performance, heavier slaughter and carcass weight and significantly ($p<0.05$) heavier abdominal fat and greater dressing percentage that those given diet A and B. Chick given diet B had the least slaughter and carcass weights. Carcass wholesale cuts were not significantly different among the three dietary treatments other than the drum stick which was significantly ($p<0.05$) greater in treatment B. Meat chemical composition though not significantly different among the three dietary treatment groups. Treatment A had higher moisture and protein and the treatment C had the highest fat. It could be concluded that dehulling 50% of the sorghum grains for broiler diet removed the depressing effect of tannins on broiler performance and carcass characteristics.

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INTRODUCTION

Sorghum (Sorghum bicolor) is an important cereal staple in the semiarid zones because of its drought resistance and ability to yield grains during drought stress. some sorghum cultivars have high concentration of tannins which impart agronomic advantages such as bird and mold resistance .However such cultivars were found to be nutritionally inferior as they reduce intake, digestibility and feed conversion efficiency of animals and birds (Rostagno *et at.,* 1973, Aramstrong *et at.,*1974 and Mole *et at.,* 1993). The primary anti-nutritionl activity of tannins is not via digestibility reduction, but tannins are suggested to inhibit the metabolic events occurring after the digestion and absorption of nutrients i.e. systemic effect (Mode *et at.,* 1990). Different techniques were employed to reduce tannins in sorghum as germination, moisturizing the grain with alkali, soaking in wood ash, supplementation with dicalcium phosphate or sodium bicarbonate.

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As tannins are located mainly in the testa mechanical abrasive dehulling is reported to reduce grain content of tannins significantly (Mwasaru *et al.,* 1980). The objective of this study is to compare machinery dehulling of sorghum grains with whole sorghum grains in broiler diets.

MATERIALS AND METHODS

180 day old unsexed commercial broiler chicks (lohmann) were randomly divided into 18 groups of similar number and weight. The groups were then allocated to three dietary treatments, each with six replicates. Each replicate was kept in pen (1x1 m) provided with a tubular feeder and a fountain drinker. Three isocaloric and isonitrogenous diets containing whole sorghum grains (A), dehulled sorghum grains (B) and 50:50 dehulled and whole sorghum grains were formulated and assigned randomly to the experimental pens. The formulation and chemical composition of the diets are given in table 1.Diets in mash from and water were offered Adlibitum. Feed intake was recorded daily and live weight gain of each pen was taken weekly before feeding. At the end of 42 days birds were

individually weighed after an overnight fast except for water and slaughtered without stunning. Birds were then scalded, manually plucked, washed and allowed to drain on a wooden table. Evisceration was performed by a ventral cut and viscera as well as thoracic organs were removed. After evisceration internal organs and head and shanks were weighed. Eviscerated carcasses were weighed hot and then following chilling for 12 hours at 4°C. Five carcasses were randomly selected for each pen for cutting and dissection. Three major cuts: breast, thigh and drum stick were cut from the left carcass side, weighed separately and each weight was expressed as a percentage of carcass side weight .Each cut was dissected into meat (muscles, skin, tendons and fat) and bone and each component was expressed as percentage of cut weight .Meat from leg and drum stick of each carcass was minced and chemically analyzed for moisture, protein, fat and ash. Data was statistically analyzed according to the analysis of variance applicable to complete randomized design as described by Gomez and Gomez (1984).

RESULTS

Table 2 gives data on chic performance fed the diets containing whole sorghum grains, dehulled sorghum grains or an equal proportion mixture of whole and dehulled Sorghum grains. Feed Intake was not significantly different among the three diets used, yet it was greater in diet C which contained equal proportions of whole and dehulled sorghum grains followed by diet B (dehulled sorghum) and was least in diet A (whole sorghum grains). Final live weight and live weight gain were not significantly different among the three diets used and chicks raised on died C had the heaviest final weight and live weight gain.

Table 1. Dietary ingredient proportions and their calculated nutrient contents

Ingredient	Diets		
	A	B	C
Sorghum grains	64.00	--	32.00
Dehulled sorghum grains	--	62.10	31.00
Sesame Cake	10.00	15.00	12.00
Groundnut cake	16.00	10.00	13.00
Super concentrate*	5.00	5.00	5.00
Wheat bran	3.20	5.50	4.50
Oyster shell	1.00	1.60	1.70
Salt	0.25	0.25	0.25
Dicalcium phosphate	0.50	0.50	0.50
Anti-oxidants	0.05	0.05	0.05
Total	100	100	100
Calculated Diets composition ME (MJ/ Kg)	12.74	12.74	12.76
Crude protein (%)	22.92	22.20	23.08

* Super concentrate composition: protein 45%, fibre 3%, calcium 12%, phosphorus 6%, methionine + cystine 4.75%, lysine 11%, Nacl 2.8-3% and M.E. Kcl/Kg 2000.

Table 2. Performance of broiler chicks on the different experimental diets

Item	Chick groups			
	A	B	C	S.E
Number of chicks	60	60	60	_
Initial live weight (g)	49.9	49.8	49.1	1.33
Final live weight (g)	1480.00	1466.30	1525.50	77.65
Live weight gain (g)	1430.20	1416.50	1476.4	77.65
Feed intake (g/ bird)	2867.50	2963.00	3002.00	168.73
Feed conversion ratio (kg feed / kg weight)	2.10	2.20	2.00	0.14
Mortality (%)	3.00	8.00	4.00	-

In this and subsequent tables means in the same row having different superscripts are significantly different ($p<0.05$).

Chicks raised on diet A were intermediate in these parameters. Feed conversion ratio was not significantly different between the three diets used, but deteriorated greatly in the chicks group fed diet (B). Dressing percentage was only significantly ($p<0.05$) greater in chicks fed diet C. Mortality rate in chicks fed diet (B) was double those fed diet A or C. Table 4 shows body weight organ proportions of broiler chicks fed on the experimental diets. Slaughter weight though not significantly different among the various dietary treatments, yet it was greater in chicks fed diet C, followed by those on diet B. Head and shanks, total viscera, liver and heart as well as gizzard were not significantly different among the different diets used. Only abdominal fat was significantly ($p<0.05$) greater in chicks fed diet C than those fed diet A and B. Carcass wholesale cuts are given in table 5. Breast cut was similar in proportion among the three dietary groups, however, thigh and drum stick proportions were significantly ($p<0.05$) greater in the carcasses from chicks raised on diet (B). Muscle and bone of these cuts were not significantly different among the different diets used.

Table 3.Slaughter characteristics of broiler chicks fed different experimental diets

Item	Chick groups			
	A	B	C	S.E
Slaughter weight (g/bird)	1639.30	1496.50	I662.10	93.68
Carcass weight (g/bird)	1096.88	1052.73	1103.00	60.85
Head and Shanks*	11.32	11.05	11.44	0.33
Total Viscera*	12.74	12.51	13.21	0.79
Abdominal fat *	1.33^{a}	1.32^{a}	1.66^{b}	0.22
Liver and heart*	2.92	2.80	2.92	0.20
Gizzard *	2.35	2.40	2.45	0.67
Liver and heart*	20	21	20	0.0003
Dressing Percentage	64.37^{a} %	64.62^{a}%	66.72^{b}%	1.32

Table 4. Carcass characteristics and meat chemical composition of broiler chicks receiving the different experimental diets.

Item	Chick groups			
	A	B	C	S.E
Carcass weight (g)	1096.88	1052.73	1103.00	60.85
Breast (%)	30.55	34.27	32.25	3.14
Breast muscle (%)	81.61	80.80	81.20	1.93
Breast bone (%)	16.40	16.90	15.40	1.67
Thigh (%)	85.20	85.60	85.70	1.70
Thigh muscle (%)	8.30	9.20	9.20	0.05
Thigh bone (%)	12.10	11.30	12.40	1.16
Drum stick (%)	7.78^{a}	9.50^{b}	8.20^{ab}	1.04
Muscle (%)	75.47	75.58	78.57	1.23
Bone (%)	20.60	19.50	20.90	1.36
Meat Chemical CompositionMoisture (%)	74.86	75.58	78.57	-
Protein (%)	21.00	20.94	19.25	-
Fat (%)	1.45	1.68	1.75	-
Ash (%)	1.11	1.09	1.05	-

DISCUSSION

Feed intake reduction observed in the diet which contained the whole sorghum grains could partly be due to the presence of tannins which are stringent and bitter plant polyphenols that reduce dietary dry matter intake, digestibility and metabolism (Rostango *et al.,* 1973 and Mole *et at.,*1993). Live weight gain though expected to be greater in chicks fed dehulled grains but were found to be least so. Loss of nutrients by dehulling could be the reason. Chibber *et at.,* (1978) indicated that mechanical dehulling would result in considerable loss in nutrient of the grain sorghum. Feed conversion ratio also deteriorated more in the chick group fed the diet that contained dehulled sorghum.

This could be due to lower live weight gain. Mortality doubled in the chick fed diet containing dehulled sorghum and here loss of nutrient by dehulling could be implicated. Slaughter weight reduction in the chick group given dehulled sorghum in their diet could be a consequence of their depressed live weight gain. Organ proportions were reduced in the chick group fed the diet that contained dehulled sorghum and the reduction was significant for abdominal fat and here again live weight reduction could be implicated. Carcass weight was reduced in the chicks fed diet B due to reduction of slaughter weight. The significant reduction in dressing percentage could be a result of reduction in carcass weight and degree of fatness as reflected by decreased abdominal fat.

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