HAEMATOLOGICAL AND SERUM INDICES OF MARADI BUCKS FED RATIONS CONTAINING YEAST AND CRUSHED WHOLE COTTON SEED

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ABSTRACT

The study was conducted to evaluate the effect of yeast (Sacchromyces cerevisiae) inclusion in rations of Maradi bucks containing varied levels of Crushed Whole Cotton Seed (CWCS). A total of 20 bucks weighing 12kg±0.25 were randomly assigned to five diets formulated to contain 14% Crude Protein in complete diets at varied level of 10% CWCS without yeast, 10, 15, 20 & 25% CWCS and 500g yeast (Y) inclusion across treatment groups in a completely randomized design where the means were separated using Duncan Multiple Range Test. Bucks were fed rations at 3.5%live weights throughout the trial period of 90 days. Blood samples were collected via jugular vein puncture at three intervals and immediately analyzed at each sampling time. Parameters measured differed significantly (P<0.05). Total Protein (TP) values ranged from (5.53-6.54g/day), Blood Urea Nitrogen (BUN) values were within (4.30-4.81mmol/l), creatinine values were within (0.64-0.83 µmol/l) while White Blood Cell (WBC) values were within (12.71-20.2%) across treatment groups and parameters measured were significantly different (P<0.05). The AST values range from (50.51-59.19 IU/L), ALT (25.26-31.54IU/L) and ALP (75.8-81.76 IU/L) across treatment group. It can be concluded that yeast inclusion reduced the severity of immunological impairment in bucks as such, can be used as supplements in small ruminant diets containing gossypol.

Key words: blood, cottonseed, immunology, Maradi goat, yeast

INTRODUCTION

Whole cottonseed is one of the several oil seeds with low competition with human consumption although it has been reported to be clinically useful (Ivana *et al.*, 2014) for some life threatening illnesses. Cottonseeds are also good supplement for mature, dairy and fattening ruminants due to the high content of energy (mostly fat), crude protein and fibre (Heuze *et al.*, 2015).Despite these advantages, its gossypol content has limited it use. The use of improved cotton seed varieties (Soto-Blanco, 2008), microbial fermentation to bind dietary gossypol to protein (Fischer *et al.*, 1988), heat treatments (Shawrang *et al.*, 2011), Mechanical processing (Braga, *et al.*, 2012) and feed additives (Zhang *et al.*, 2006) as methods of alleviating gossypol toxicity in animals have shown improvement in the utilization of diets containing gossypol from cottonseed products. Baker's yeast as a probiotic is frequently used in ruminants (Chaucheyras-Durand *et al.*, 2008) and are known to improve ruminant productivity through better nutrient digestibility, enhance growth, increase milk yield and help reduce the severity of some health conditions such as ruminal acidosis (FAO, 2016).This study therefore, aimed at determining the effect of in cooperating yeast in diets containing crushed whole cotton seed at varied levels fed to Maradi bucks.

MATERIALS AND METHOD

Experimental site: The study was conducted at the teaching and research farm Department of Animal Science, Ahmadu Bello University Zaria. It's located within the Northern Guinea Savannah Zone between latitudes $110^0$12'N and longitudes $70^0$33'E at an altitude of 610m above sea level. The wet/rainy season starts from May to September, and a mean annual rainfall of 700-1400mm per annum (IAR, 2019). The study was carried out during the rainy season (May to September, 2019).

Animal source and management: Twenty Maradi goats within the ages of weighing 12±0.25kg were sourced from Giwa Local Government Area Council, Kaduna State. Bucks were quarantined on arrival and vaccinated against PPR with TCRV, administered ivermectin against internal and external parasites and also Tetracycline LA against bacterial infections. The bucks were weighed and randomly grouped into 5 with four animals per group where a buck represented a replicate and housed in pens. Each group was later randomly assigned to one of the five dietary treatments. The animals were weighed forth nightly throughout the 90days trial period.

Experimental design, diets and treatment: A completely randomized design was used for the study. Rations were formulated to contain 14%CP comprising; maize offal, brewer's dried grain, *Digitaria smutsii*, mollases, bone meal, common salt, premix, yeast and crushed whole cotton seed (CWCS) at varied inclusion levels of 10%CWCS without yeast, 10,15,20 and 25%CWCS with yeast where each inclusion level served as a treatment as shown in Table 1. Bucks were fed 3.5% rations based on their live weights and water was administered *ad-libitum*.

Table 1: Ingredient composition of crushed WCS diets supplemented with yeast

Parameters	Inclusion level of CWCS (%)				
	10	10+Y	15+Y	20+Y	25+Y
Maize offal	28.75	28.25	28.25	28.30	27.25
Crushed WCS	10.00	10.00	15.00	20.00	25.00
Digitaria smutsii	30.00	30.00	30.00	30.00	30.00
Brewer's dried grain	27.00	27.00	22.00	17.00	13.00
Molasses	2.00	2.00	2.00	2.00	2.00
Bone meal	1.50	1.50	1.50	1.50	1.50
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25	0.25
Yeast (*S.cerevisae)*	-	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
Calculated analysis					
CP (%)	14.00	14.00	14.00	14.0	14.00
EE (%)	4.14	4.14	4.27	4.4	4.54
CF (%)	19.42	19.42	19.58	19.74	19.93

Y=yeast, Whole cotton seed = WCS

Blood collection: Five (5) millilitre of blood was collected via jugular vein puncture using a 5mlshyperdemic syringe from 3 bucks per treatment at the beginning, middle and end of the study. Out of the 5mls of blood collected, 2mls was collected over EDTA tubes for haematological analysis as described by (Hawk, 1965) and 3mls into tubes without anticoagulant for serum biochemical analysis as described by Hultmann, (1989); Wotton, (1964) and Doumas *et al.,* (1971) for glucose, total serum protein and albumin respectively. Serum urea was estimated by improved diacetymonoxine method (Rahmatulla and Boyde, 1980) and serum enzymes activity was estimated base on standard methods described by Reitman and Frankel (1957).

***Statistical analysis*:** Data collected on blood and serum metabolites were analyzed using the GLM procedure of SAS (2002). Means with significant differences were separated using Duncan Multiple Range Test as sited in Dafaallah, (2019).

RESULTS AND DISCUSSION

The result of blood metabolites presented in Table 2 show significant difference ($P<0.05$) for parameters measured except for RBC. Values obtained for TP, BUN and RBC were lower compared to reference range. Creatinine, Albumin and Haemoglobin had some values within reference range while WBC and glucose recorded values above the reference range. This result defers from the findings of Piva *et al.*, (1993),the authors reported no significant difference ($p>0.05$) although it had higher values in blood metabolites, electrolytes and or enzymes between control diet and that treated with Yeast culture in lactating cows. Yakubu, (2015) also reported higher values for albumin and BUN, lower values for glucose while TP values were similar to those obtained in this study. The decrease level of BUN and

Creatinine in this study may be an indication of the efficacy of gossypol clearance in the kidney and liver, implying the organs' functionality not to have being impaired (Barraza *et al.*, 1991).

Table 2: Effect of crushed WCS supplemented with baker's yeast (*S. cerevisae*) on Blood Metabolites of growing Red Sokoto bucks

Parameters	Inclusion level of CWCS (%)					SEM	Reference Value
	10	**10+Y**	**15+Y**	**20+Y**	**25+Y**		
Total P (g/day)	5.53[a]	5.18[b]	5.24[b]	5.37[b]	6.54[a]	0.15	6.4-7.8
BUN (mmol/l)	4.49[b]	4.30[c]	4.58[b]	4.81[a]	4.57[b]	0.09	12.6-28
Creatinine (umol/L)	0.76[b]	0.82[a]	0.64[c]	0.83[a]	0.82[a]	0.02	0.9-1.8
Glucose (mmol/L)	116.37[b]	116.11[b]	118.63[b]	113.61[b]	127.65[a]	1.82	60-100
Albumin(g/dl)	1.85[b]	1.97[b]	2.15[b]	2.35[b]	2.60[a]	0.09	2.4-4.4
Globulin(g/dl)	3.26[b]	3.05[b]	2.8[c]	3.01[b]	4.11[a]	0.16	N/A
RBC (%)	4.76	5.73	5.50	5.19	4.81	0.27	8-18[ns]
WBC (%)	17.62[a]	16.87[a]	20.20[a]	12.71[b]	18.64[a]	1.07	4-13
Haemoglobin	9.48[a]	6.78[c]	8.22[b]	7.41[c]	8.53[b]	0.38	8-12

[a,b,c]Means with different super script along same row differed significantly (P<0.05), SEM; Standard error of means, P; protein, RBC; red blood cell, WBC; white blood cell, BUN; Blood urea Nitrogen, Reference values: Peter & Peter, (2002).

Table 3 shows the results of some liver function indices in bucks fed diets with varied inclusion levels of CWCS and baker's yeast supplementation. Significant (P<0.05) difference was observed for all measured parameters. Values obtained for ALT and ALP fell within reference range while AST values were below. Braga *et al.*, (2012) reported no significant difference (P>0.05) between treatment groups on enzymes parameters measured when sheep were fed extruded-expelled cotton seed at varied levels of 0-45% in a 9weeks experiment. It was deduced that the result obtained may be as a result of the decrease in the residual quantity of free gossypol from the processing method. The result obtained from this study however, shows significant difference (P<0.05) which could be an indication of the different effect/mechanism of action for the alleviation techniques used, specie difference, or physiological differences of the animals. While there may not be notable effect of gossypol toxicity on some serum parameters, the ingestion of gossypol in cottonseed and its products may promote clinical poisoning, liver damage, reproductive toxicity and immunological impairment (this occurs by the decrease in the animal's ability to resist infections) as was observed in some of the animals in this study, Ivana *et al.*, (2014). Also, Yakubu, (2015) recorded massive vacuolation and congestion with destruction of liver cell, focal infiltration around blood vessels, edema of liver cells, degeneration of haematocytes, fat vacuolation of cell, focal inflammation of empathic cells and fabriosis of the liver indicating the level of damage done in the liver by feeding gossypol from cotton products.

Table 3: Effect of crushed WCS supplemented with baker's yeast (*S. cerevisae*) on Some Liver function Indices of growing Red Sokoto bucks

Parameters	Inclusion level of CWCS (%)					SEM	Reference value
	10	10+Y	15+Y	20+Y	25+Y		
AST (IU/L)	59.19[a]	55.26[b]	49.93[c]	52.13[c]	50.51[c]	1.36	66-230
ALT (IU/L)	28.79[a]	29.78[a]	29.87[a]	25.56[b]	31.54[a]	1.21	15.3-52.3
ALP (IU/L)	76.40[c]	78.28[b]	81.34[a]	75.80[c]	81.76[a]	1.32	66-230

[a,b,c]Means with different super script along same row differed significantly (P<0.05), SEM; Standard error of means, AST; Aspartate aminotransferase, ALT; Alanine aminotransferase, ALP; Alkaline Phosphatase, Reference: Peter & Peter, (2002).

CONCLUSION AND RECOMMENDATION

Yeast inclusion in diets caused a reduction in the severity of gossypol toxicity on blood and liver function. Therefore, addition of yeast may be encouraged when diets containing gossypol from cottonseed are to be fed to Maradi goats.

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