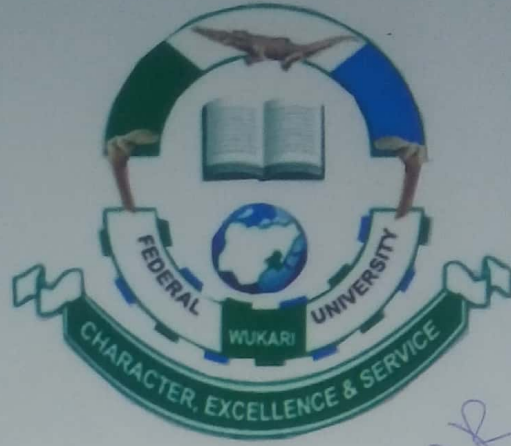


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EFFECT OF FEEDING GRADED LEVELS OF *Saccharomyces cerevisiae*-TREATED RICE HUSK ON THE PERFORMANCE OF SOKOTO RED GOATS

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ABSTRACT

Eight-week study was carried out using eighteen (18) Sokoto Red goats of mixed sexes in a Completely Randomized Design (CRD) to determine the effects of feeding graded levels of *Saccharomyces cerevisiae*-Treated Rice Husk (ScTRH) on their performance. The body weight changes, haematological and serum biochemical parameters, nutrients intake and digestibilities were determined. The encouraging nutrient intake, digestibility, and growth performance of animals in this experiment suggests that *Saccharomyces cerevisiae*-Treated Rice Husk (ScTRH) can serve as a valuable alternative and cheap feed ingredient for goat production. It was concluded that 40 % inclusion of ScTRH in the diets of goats is an effective means of reducing the level of dependence and competition for conventional feedstuffs between man and livestock.

Keywords: *Saccharomyces cerevisiae*, nutrient intake, haematological parameters, digestibility

1.0 INTRODUCTION

Agricultural residue is used to describe all organic materials or by-products resulting from harvesting and processing agricultural crops. These residues are further categorized into primary and secondary residues. Asadi et al. (2017) defined primary agricultural residues as those generated from the field at the time of harvest of agricultural produce while secondary residues of which rice husk belongs are those co-produced during processing of agricultural produce (Asadi et al., 2017). Rice husk is one of the most widely available agricultural wastes in many rice-producing countries all over the world. It is generated in very large amounts and according to Zemke and Woods (2008), rice husk which is the by-product of rice processing at rice mills is a potential material

which is amenable for value addition. The usage of rice husk either in its raw form or in ash form is high. Most of the husk from the rice mills is either burnt or dumped as waste in open fields and a small amount is used as fuel for boilers, electricity generation, bulking agents for composting of animal manure and so on (Bronzeoak et al., 2003). Goats are small ruminant animals whose products comprises of meat, skin and leather (De Villiers, 1996). The milk of goat is easily digestible and serves as an alternative milk source for humans that are allergic to cow milk (Steele, 1996). Nutrient digestibility is most accurately defined as the nutrient proportion which is not excreted in the faeces and which is therefore assumed to be absorbed by animal. The digestibility of any nutrient is affected by both biological and



environmental factors. However, unlike the influence of biological and environmental factors on metabolic activities such as respiration, that on digestibility is less well defined and little understood. This is because of less attention given to the aspect of digestibility during research (Joseph et al., 2004). The digestibility of a feed is closely related to its chemical composition. The fibre fraction of feeds has the greatest influence on its digestibility, and both the amount and chemical composition of the fibre are important. According to Madhumita et al. (2009), the composition of rice husks includes minerals such as silica, alkali, alkaline earth metals and trace elements. This is in addition to 40 – 50 % cellulose, 24 – 29 % hemicellulose, 25 – 30 % lignin, 15 – 20 % ash and 8 – 15 % moisture as reported by Hwang and Chandra (1997). The present study was carried out to evaluate the feed intake, growth performance, nutrient digestibility coefficients and haematological characteristics of Sokoto Red goats fed graded levels of *Saccharomyces cerevisiae*-Treated Rice Husk.

2.0 MATERIALS AND METHODS

The eight (8) week study was carried out at the Teaching and Research Farm of Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Niger State, Nigeria. The yeast (*Saccharomyces cerevisiae*) was purchased from Minna Township. It was cultured on potato dextrose agar (PDA) – containing petri dishes. The rice husk was purchased from the rice millers in and around Minna. Other ingredients used in formulating the experimental diets (cassava peel, groundnut cake (GNC), vitamin premix, salt lick and

millers. The potato dextrose agar (PDA) dissolved into distilled water according to manufacturer's instructions and the medium was sterilized with an autoclave at 121°C for fifteen minutes to eliminate any existing microorganisms. It was then put into a conical flask and inoculated with *Saccharomyces cerevisiae* and then incubated at 80°C for three to five days to enhance growth. The rice husk was soaked in water for twenty-four hours after which it was strained using a muslin cloth. It was then packed into polythene bags at 500 g per bag and autoclaved at 121°C for thirty minutes in order to eliminate all existing microorganisms. It was allowed to cool before which it was inoculated with the fungus at 1 ml per package of the rice husk in a plastic container in layers and covered with polythene bags to enhance growth and ramification of the fungus. Growth of the fungus was terminated by sun drying until the entire substrate had been covered by fungal growth. Three experimental treatments designated as T₁, T₂, and T₃ were formulated with the fermented rice husk included at 20 % and 40 % respectively as shown in Table 1 with T₁ serving as the control diet. Eighteen (18) Sokoto Red goats with an average weight of 10.47 kg which were bought from the School Teaching and Research Farm, School of Agriculture and Agricultural Technology, of Federal University of Technology, Minna were randomly allotted to three (3) treatments each of which had three (3) replicates with each replicate having one (1) male and one (1) female animal after being given prophylactic treatment prior to commencement of the study. A completely randomized design was adopted for the study. The animals were fed with the experimental diets in the morning.



measured daily. On a fortnightly basis, five (5) milliliters of blood was collected from the experimental animals using syringes and needles. Two (2) milliliters of the blood was put into EDTA-coated bottles while three (3) milliliters of the collected blood was put in plain bottles. They were taken to the laboratory for haematological and serum biochemical analysis, respectively. The study was concluded with a digestibility trial. A representative animal from each replicate was placed in metabolic cages and starved of feed for twenty-four (24) hours. The feed was later re-introduced to them and the feed intake and faecal output were measured daily throughout the seven (7) day digestibility trial period.

2.1 Analytical Methods

The unfermented rice husk, the fermented rice husk, the experimental diets and faecal samples were analysed for Crude protein, Ether extract, Ash content, Dry matter, crude fiber, fiber fractions and Nitrogen free extract using the methods of AOAC (2000).

2.2 Statistical Analysis

All data obtained from this study were subjected to one-way analysis of variance (ANOVA) and differences in means were separated by Duncan Multiple Range Test (DMRT) using the Statistical Package for Social Scientists (SPSS 16.0).

3.0 RESULTS AND DISCUSSION

The proximate composition of the unfermented rice husk and *Saccharomyces cerevisiae*-Treated Rice Husk (ScTRH) Table 1 showed that the crude protein and ether extract increased while the crude fiber, ash and nitrogen free extract declined in the *Saccharomyces cerevisiae*-Treated Rice Husk. In the experimental diets, the dry matter, crude protein, ether extract and nitrogen free extracts reduced with increase in dietary levels of the ScTRH when compared to the control diets while the crude fiber and ash contents increased with increase in the dietary levels of ScTRH.

Table 1: Proximate composition of the untreated rice husk, *Saccharomyces cerevisiae*-Treated Rice Husk (ScTRH) and the experimental diets

Parameters (%)	Unfermented rice husk	ScTRH	T ₁	T ₂	T ₃
Dry matter	94.40	88.20	92.20	91.00	88.80
Crude protein	10.10	15.05	11.05	17.75	17.50
Crude fiber	31.00	23.68	3.50	11.50	16.50
NDF	47.53	44.35	41.72	39.61	36.53
ADF	39.83	35.81	36.79	34.55	32.37
ADL	21.86	19.79	18.54	18.72	18.79
Ash	10.00	14.00	8.00	11.00	14.00
Organic matter	43.30	41.15	69.65	50.75	40.80

ScTRH = *Saccharomyces cerevisiae*-Treated Rice Husk, T₁ = control, T₂ = 20 % inclusion of ScTRH, T₃ = 40 % inclusion of ScTRH, NDF = Neutral Detergent Fiber, ADF = Acid Detergent Fiber, ADL = Acid Detergent Lignin



The average daily feed intake over the experimental period revealed that it differed significantly ($p < 0.05$) among the treatment groups. It was highest (695 g) in T₁ (control) diet and the lowest (531 g) in T₃ (40 % ScTRH) diet. The haematological parameters and serum biochemical parameters did not differ significantly ($p > 0.05$) among the treatment groups. The result of the haematological performance in this research showed that the values obtained are lower than those reported by Oluwayemisi et al. (2017). The serum biochemistry results in this work were lower than those reported by Anbarasu et al. (2002). However, the values obtained are within the healthy recommended

ranges implying that the animals are apparently healthy. The nutrient digestibility results of this study revealed that there was no significant difference ($p > 0.05$) in crude protein and ether extract digestibilities. However, there were significant differences ($p < 0.05$) in crude fibre, nitrogen free extract and dry matter digestibilities. Crude fibre digestibility was highest in T₃ (40 % ScTRH) diet and lowest in T₁ (control) diet. Nitrogen Free Extract digestibility was highest in T₁ (control) diet and lowest in T₃ (40 % ScTRH) diet. The dry matter digestibility was highest in T₂ (20 % ScTRH) diet and lowest in T₃ (40 % ScTRH) diet.

Table 2: Nutrient intake and growth performance of Sokoto Red goats fed dietary levels of Saccharomyces cerevisiae-Treated Rice Husk (ScTRH)

Parameters (g/animal/day)	T ₁	T ₂	T ₃	SEM	LS
Dry matter intake	640.79 ^a	588.77 ^b	471.53 ^c	0.68	*
Crude protein intake	70.81 ^b	104.51 ^a	82.52 ^b	0.73	*
Crude fiber intake	22.43 ^c	67.71 ^b	77.80 ^a	0.52	*
NDF	31.52 ^c	95.16 ^b	109.34 ^a	0.85	*
ADF	25.53 ^c	77.09 ^b	88.57 ^a	0.77	*
ADL	13.78 ^c	41.57 ^b	47.78 ^a	0.54	*
Ash intake	51.26 ^b	64.76 ^a	66.01 ^a	0.61	*
Organic matter intake	446.31 ^a	298.80 ^b	192.38 ^c	0.74	*
Final body weight (kg)	10.60	10.27	10.53	0.31	NS
Body weight gain (kg)	0.02	0.03	0.03	0.05	NS
Feed conversion ratio (FCR)	5.73 ^{ab}	7.43 ^a	3.22 ^b	0.41	*

Means within the same row with different superscripts differed significantly at ($p < 0.05$), LS = Least Squares, NS = not significantly different ($p > 0.05$), ScTRH = Saccharomyces cerevisiae-Treated Rice Husk, T₁ = control, T₂ = 20 % inclusion of ScTRH, T₃ = 40 % inclusion of ScTRH, NDF = Neutral Detergent Fiber, ADF = Acid Detergent Fiber, ADL = Acid Detergent Lignin



Table 3: Haematology and serum biochemistry of Sokoto Red goats fed dietary levels of Saccharomyces cerevisiae-Treated Rice Husk (ScTRH)

Parameters	T ₁	T ₂	T ₃	SEM	LS
RBC (g/dl)	12.85	11.18	10.89	0.40	NS
PCV (%)	27.01	29.66	28.60	0.87	NS
WBC ($\times 10^9/L$)	14.34	14.27	14.46	0.75	NS
Neutrophils (%)	53.16	59.16	54.50	1.60	NS
Lymphocytes (%)	42.66	40.16	44.50	1.41	NS
Monocytes (%)	1.16	0.66	1.00	0.24	NS
Albumin (g/dl)	3.10	2.96	2.95	0.18	NS
Alkaline phosphatase (iu/L)	2.33	3.76	3.46	0.23	NS
SGOT (iu/L)	68.98	58.02	57.23	10.11	NS
SGPT (iu/L)	27.12	28.05	23.33	1.37	NS
Total protein (g/dl)	7.23	7.10	7.91	0.26	NS
Total bilirubin (u/m)	5.80	6.98	6.71	0.34	NS
Conjugated bilirubin (u/m)	3.63	4.20	3.96	0.16	NS

Means within the same row with different superscripts differed significantly at ($p < 0.05$), LS = level of significance, NS = not significantly different ($p > 0.05$), ScTRH = Saccharomyces cerevisiae-Treated Rice Husk, T₁ = control, T₂ = 20 % inclusion of ScTRH, T₃ = 40 % inclusion of ScTRH, SGOT = Serum glutamate oxalo transaminase, SGPT = Serum glutamate pyruvate transaminase, NDF = Neutral Detergent Fiber, ADF = Acid Detergent Fiber, ADL = Acid Detergent Lignin



Table 4: Dry matter and nutrients digestibility of Sokoto Red goats fed dietary levels of Saccharomyces cerevisiae-Treated Rice Husk (ScTRH)

Parameters	T ₁	T ₂	T ₃	SEM
Dry matter	86.65 ^{ab}	86.83 ^a	85.76 ^b	0.21
Crude protein	85.02	87.72	88.31	0.68
Crude fiber	75.41 ^b	85.16 ^a	86.05 ^a	1.76
NDF	67.79 ^b	76.56 ^a	77.36 ^a	1.47
ADF	66.15 ^b	74.71 ^a	75.49 ^a	1.63
ADL	60.88 ^b	68.74 ^a	69.47 ^a	0.74
Ether extract	87.97	87.86	87.35	0.16
Nitrogen free extract	88.33 ^a	87.91 ^a	85.76 ^b	0.41

Means within the same row with different superscripts differed significantly at ($p < 0.05$), LS = least significant difference, NS = not significantly different ($p > 0.05$), ScTRH = Saccharomyces cerevisiae-Treated Rice Husk, T₁ = control, T₂ = 20 % inclusion of ScTRH, T₃ = 40 % inclusion of ScTRH NDF = Neutral Detergent Fiber, ADF = Acid Detergent Fiber, ADL = Acid Detergent Lignin

4.0 CONCLUSION AND RECOMMENDATION

It was concluded from this study that Saccharomyces cerevisiae-Treated Rice Husk (ScTRH) can serve as a cheap and alternative feed ingredient to meet the nutritional requirements of goats. As such, Saccharomyces cerevisiae-Treated Rice Husk can therefore be recommended at up to 40 % inclusion to feed goats with no detrimental effects on their performance.

REFERENCES

- Anbarasu, C., Dutta, N., Sharma, K. and Naulia, U. (2002). Blood biochemical profile and rumen fermentation pattern of goats fed leaf meal mixture or conventional cakes as dietary protein supplements. *Asian-Australasian Journal of Animal Sciences*, 15 (5), 665 – 670
- AOAC. (2000). Association of Official Analytical Chemist Official Methods of Analysis. 17th Version, Washington, D.C.
- Asadi, N. and Zilouei, H. (2016). Optimization of organic pretreatment of rice straw enhanced biohydrogen production using *Enterobacter aerogenes*. *Bioresource Technology*, 227: 334-344. doi: 10.1016/j.biortech.2016.12.073
- Bronzeoak, (2003). Rice Husk Ash Market Study. DTI, London, p. 62
- De Villiers, J. F. (1996). Goat production in Kwazulu-Natal. In Brigid Letty & Cedara report goats.
- Hwang, C. and Chandra, L. (1997). Properties of cement paste containing rice husk ash on high strength concrete. *Construction institute Sp* 114: 765.
- Joseph, J. A., Arendash, G., Gordon-Diamond, D., Shukitt-Hale, B. and Morgan, D. (2004). Blueberry supplementation enhances signaling and prevent behavioural deficits in an Alzheimer disease model. *Journal of Nutrition*, 6: 63-153.



- Madhumita, S., Bhattacharyya, S. and Behera, R. C. (2009). Rice Effect of temperature on morphology and phase transformations of nanocrystalline silica obtained from rice husk. 2009:82 (5): 377 – 386.
- Oluwayemisi, F.O. and Anthony, O.O. (2017). The use of fermented Cassava (*Manihot esculenta*) and ripe plantain peels (*Musa paradisiaca*) on the histological parameters of Albino Rats.
- Steele, M. (1996). Goats, Rene coste and A.J. Smith (Eds.) The Tropical Agriculturalist CTA. Macmillian. 152pp.
- Zemke, N. and Woods, E. (2009). Rice Husk Ash. California state polytechnic University pp 30 – 35.

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