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THE EFFECT OF CASTOR SEEDS PROCESSED BY SOAKING AND FERMENTATION ON THE PERFORMANCE, BIOCHEMICAL PROFILE AND HAEMATOLOGICAL PARAMETERS OF RABBITS

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ABSTRACT

A feeding trial that lasted eight weeks was conducted to evaluate the nutritive value of castor seeds processed by soaking in water for 72hrs and fermentation on the performance of weaner rabbits. A total of 15 rabbits were used for the study, the rabbits were randomly allotted to three dietary treatments of five rabbits per treatment with three replicates in a complete randomized design. Diet 1 is the control formulated devoid of castor seeds while diets 2 and 3 have castor seeds processed by soaking and fermentation, respectively at 15% inclusion level. Rations formulated were isonitrogenous at 23% CP and the rabbits were caged individually where feed and water were provided ad libitum throughout the study period that lasted 56 days (8 wks). At the end of the study, three rabbits from each treatment were slaughtered for carcass analysis after taken 5ml blood samples from their jugular vein. Feed intake, water consumption, weight gain and mortality were recorded. The result shows that the final weight, feed intake, weight gain, feed to gain ratio and feed cost/kg gain were significantly (P> 0.05) higher in rabbits fed fermented castor seeds compared to all other treatments. There were no significant differences in mortality rate across the treatments. Result of the biochemical profile shows that there are no significant differences in total protein, triglyceride and cholesterol across treatments. Result of haematological parameters show that platelet count was significantly (P< 0.05) higher in the control group and those on fermented seeds than the soaked group. Basophiles were significantly (P> 0.05) higher in the soaked group than fermented and control while eosinophils were significantly higher (P> 0.05) in the fermented seeds group compared to the others. There were no significant differences in the packed cell volume, white blood cell count, neutrophils, lymphocytes and monocytes across the treatments. Fermented castor seeds gave a better performance in the weaner rabbits, it also does not have any adverse effect on the health status of the rabbits.

Keywords: castor seeds, rabbits, fermentation, soaking, haematology and performance.

INTRODUCTION

One of the greatest challenges facing Africa is the provision of sufficient food for the ever increasing population and this has direct influence on the demand for food products not only of plant origin but also of animal origin. Sub-optimal protein consumption in the developing world is a major cause of under-nourishment, a situation caused by acute shortage and high cost of feed ingredients. These are the major constraints against the livestock industry, therefore, there is need to search for alternative protein sources for both human and livestock feeding.

One of the novel ingredients is castor beans (*Ricinus communis*). It grows in tropical and temperate regions throughout the world, either wild or cultivated (Ken et al., 1990). Production of castor is increasing throughout the world. Rajarathinam and Parmar, (2011) reported about 5.79% annual increase in production in India, the world's largest producer due to combined effect of increase in area and productivity.

Three major products are obtained from castor; seeds, oil and cake. A tonne of castor seeds yields about 50kg of oil and 50kg of protein rich meal. In western Nigeria, two seed types are common, large and small seeded varieties. The dehulled seeds are processed for use as flavour enhancing food condiment (Ach, 1992; Enujiugha, 2009). Studies in animal nutrition have shown that castor bean meal can be used as protein supplements for ruminant, pigs and poultry (Ken et al, 1990. Ani and Okorie, 2005), However, with some limitations due to the presence of some anti-nutritional factors; ricin, ricinine and thermostable castor allergen (Darby et al, 2001; Olnes, 2004) and possible complicated processing procedures. Reports on detoxification to prepare acceptable product for animal feed are encouraging. Soaking and fermentation were used as means of improving the nutritive value of castor meal.

Rabbit meat production can supplement the prevailing animal protein shortage and reduce the common problem of mal-nutrition in African countries, especially the rural areas. Rabbits produce about ten times its own body weight of meat in a year and the meat is as good as poultry meat without any religious taboo (Aduku and Olukosi, 1990). The tractable nature and sensitivity of rabbits to diverse diets has prompted its use as model for nutritional studies and serve as experimental animals for this study.

MATERIALS AND METHODS

Small seeded variety of castor seeds were used for this study. They were purchased from a local market in Shika, Giwa Local Govt. Area of Kaduna state. The seeds were de-hulled before being subjected to the different processing methods of soaking in water and fermentation

Raw castor seeds 5kg were soaked in 1.25l of water in an open container and allowed for 72 hrs (3 days) with the water being changed constantly after 8hrs. The water was drained after 3 days and the seeds sun-dried on concrete floors for five days. 5kg of raw castor seeds were soaked for 24hrs and then the water drained. The soaked seeds are then bagged into an airtight polythene bag and allowed to ferment for three days, the seeds are then sun-dried on a concrete floor for five days.

The experiment was conducted in two phases; Phase 1 involves laboratory studies which involves the determination of proximate composition of the experimental diets, determination of bio-chemical profile and haematological parameters of the rabbits after the feeding trial. Phase II involves the feeding trial proper. This was done at the Rabbitry unit of the teaching and research farm of the department of animal science, ABU Zaria. Rabbits used for the study were five weeks old and of mixed sexes purchased from a local market in Samaru, Zaria.

Three experimental diets were formulated. Diet 1 is devoid of castor seeds while diets 2 and 3 had castor seeds soaked and fermented, respectively at 15% inclusion level. Rations were formulated to be isonitrogenous at 23% crude protein to meet the NRC (1995) nutrient requirement for rabbits.

Weaner rabbits used for the study were allowed one week adjustment period during which they were fed experimental diets to remove residues of previously fed feeds from the digestive tract. They were given 0.2 ml of lvomec injection intramuscularly to guard against ecto and endo parasites and all other routine management practices were carried out to avoid disease outbreak.

The rabbits were randomly allotted into three dietary treatments of five rabbits per treatment in a complete randomized design. Each rabbit is caged individually in well ventilated pens,

feed and clean drinking water were provided ad libitum throughout the experimental period. Initial weights of the rabbits were taken and then weighed subsequently on a weekly basis while mortality was recorded as it occur. Left over feeds were weighed to know daily feed intake, left over water was also measured to know daily water intake. Other data generated were feed to gain ratio and feed cost/kg gain (₦). The rabbits were weighed at the end of experiment to get the final weight.

RESULTS AND DISCUSSION

At the end of the experiment, 3 rabbits were selected from each treatment on the basis of equal weights. 5ml blood sample were obtained through the jugular vein into bottles containing EDTA to prevent coagulation, the blood samples are then taken to the clinical pathology laboratory at the faculty of Vet. Medicine, ABU Zaria for tests. These rabbits were fasted over-night and slaughtered and skinned. Head and legs were cut and the carcass weight taken before they are eviscerated and cut into retail parts and weighed. Internal organs such as heart, lungs, kidneys were weighed and the GIT length was also taken.

Performance of rabbits fed soaked and fermented castor seeds is presented in table 1. The results shows that the final weight, feed intake, feed to gain ratio, weight gain and feed cost /kg gain were significantly ($P< 0.05$) higher in rabbits fed fermented castor seeds compared to other treatments and there was no significant difference on mortality. This is in agreement with Ogunbiyi, (2009) who reported that in southeastern Nigeria, castor seeds are fermented and used as condiments in soups and stews. This may have been the reason for the high feed intake as the diet may be more palatable compared to soaked and the control. The high feed intake may have influence the daily weight gain and the final weight gain.

The good feed conversion ratio of the fermented seeds means proper utilization of the feeds. A lower feed conversion ratio implies that more feed is being retained in the animal body and less waste into the environment (Gehhart, 2001). The poor feed conversion ratio of the soaked diet may be due to inability of the rabbits to digest and absorb the nutrients due to residual effects of the toxic proteins not completely removed during soaking.

The soaked group have a very high feed cost/kg gain while the fermented group have a very low feed cost/kg gain which could be attributed to better rate of the feed conversion which may be due to efficient and optimum utilization in the diet. There was cost saving with the use of castor seeds processed by fermentation from this study.

Result of the biochemical profile is presented in table 2 where there are no significant differences in the total protein, triglycerides and cholesterol levels across treatments. The values are within the normal range, it shows the dietary treatments did not affect the bio-chemical profile of the rabbits.

Result of haematological parameters is presented in table 3. It shows a significant difference ($P< 0.05$) in the platelet count as fermented and control groups are similar but different from soaked group. Basophils were significantly ($P< 0.05$) higher in the soaked group than fermented and control while eosinophils are significantly higher in the fermented group compared to the other groups. However, the packed cell volume, white blood cells, neutrophils, lymphocytes and monocytes did not differ and are within the normal range reported by Swenson and Recce (1993) and Ani and Adiegwu (2005). The non significant differential blood count indicates the diets do not cause any health challenge to the rabbits. Haematological results implies the rabbits were in good health to combat foreign bodies in their circulatory system.

Table 1: Composition of Experimental Diets

	Treatments		
	Control	SCS	FCS
Maize	27.72	35.71	35.71
G/corn	20.00	20.00	20.00
G/Nut	33.38	10.39	10.39
Castor seed	0.00	15.00	15.00
Sayabeaus	5.00	5.00	5.00
Wheat offal	10.00	10.00	10.00
Bone meal	2.50	2.50	2.50
Limestone	0.50	0.50	0.50
Methionine	0.20	0.20	0.20
Lysine	0.15	0.15	0.15
Salt	0.35	0.35	0.35
Premix	0.25	0.25	0.25
Total	100	100	100
CALC. ANALYSIS			
ME (kcal/kg)	2986	2948	2945
Crude protein%	23.00	23.00	23.00
Ether extract%	5.08	7.30	7.30
Crude fibre %	3.91	5.87	5.87
Calcium	1.17	1.19	1.19
Phosphorus	0.88	0.96	0.96
Methionine	0.49	0.53	0.53
Cystein	0.19	0.25	0.25
Cost/kg	64.82	58.72	58.72

Table 2: Effects of soaked and fermented castor seeds on the performance of rabbits

Treatments

Parameter	T_1 (control)	T_2 (SCS)	T_3 (FCS)	SEM	LOS
Initial weight (g)	760.00	760.00	760.00	81.24	NS
Final weight (g)	1166.00^{6}	966.70^{c}	1400.00	117.19	NS
Av. Daily feed in take (g)	91.25^{b}	108.33^{c}	175.41^{a}	6.39	NS
Av. Daily weight gain (g)	50.00^{b}	10.67^{c}	126.67^{a}	10.76	NS
Feed to gain ratio	1.78^{b}	10.23^{a}	1.42^{b}	0.41	NS
Feed cost/kg gain (~~N~~)	115.38^{b}	600.51^{a}	83.38^{c}	24.76^{c}	NS
Mortality	6.00	0.40	0.40	0.22	NS

SCS=> soaked castor seeds
FCS => fermented castor seeds
SEM=> standard error of mean
LOS=> level of significance
NS=> not significance
P=> P0.05

Table 3: Biochemical profile of rabbits fed castor seeds processed by soaking and Fermentation

	Treatments				
Parameter	T_1 (control)	T_2 (SCS)	T_3 (FCS)	SEM	LOS
Total protein (g/l)	66.67	63.00	61.67	2.78	NS
Triglicerides (mmol)	1.66	1.63	4.27	1.02	NS
Cholesterol (Mmol)	5.17	4.57	3.77	0.62	NS

Table 4: Haematological parameters of rabbits fed castor seeds processed by soaking and fermentation

	Treatments				
	T_1 (control)	**T_2 (SCS)**	**T_3 (FES)**	**SEM**	**LOS**
Packed cell volume (%)	37.67	36.67	36.67	0.94	NS
Platelets	309.47^{9}	236.67^{b}	301.67^{a}	13.64	*
White blood cells	6.47	7.47	7.80	0.43	NS
Neutrophils	65.67	64.67	66.67	2.29	NS
Lymphocytes	32.67	34.67	29.00	2.28	NS
Monocytes	0.00	0.00	0.00	0.00	NS
Basophils	0.00^{b}	0.67^{a}	0.00^{b}	0.14	*
Eosinophils	0.00^{c}	0.67^{b}	1.67^{a}	0.24	*

CONCLUSION

Fermentation of castor seeds is a better processing method than soaking and also does not have any adverse effect on the health status of the rabbits.

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