

GROWTH PERFORMANCE OF GROWER RABBITS FED GRADED LEVELS OF JATROPHA SEED MEAL AS A REPLACEMENT FOR SOYA BEAN MEAL

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ABSTRACT

This study evaluated the utilization of fermented jatropha seed meal (FJSM) by grower rabbits. Thirty (30) grower rabbits of mixed breeds and sex were purchased and used for the study. The rabbits were assigned to five dietary treatments. Each treatment was replicated three times with two rabbits per replicate in a completely randomized design. Data collected during the experiments were growth parameters and were subjected to analysis of variance. The results from the growth performance showed that final body weights and total weight gain decreased progressively ($P < 0.001$) as FJSM increased in the diets. Final body weight of rabbits fed T1 (2561.20g) recorded significantly higher ($P < 0.001$) weight compared to those on jatropha seed meals. However, among Jatropha seed meal-based diets rabbit, fed T2 recorded significant higher ($P < 0.05$) final body weight 2021.50g. Feed conversion ratio also differed significantly ($P < 0.001$) across the treatments. It was observed that the superior feed conversion was recorded T1 (2.19) followed by T2 (4.42). Rabbit fed T5 had significant ($P < 0.001$) higher mortality (50.00%). It was observed from the study that rabbits fed T3, T4 and T5 diets recorded lower feed intake. It was therefore, concluded that fermented Jatropha seed meal can be incorporated in grower rabbit diet up to 25% without adverse effect on the growth performance of rabbit.

Keywords: Fermentation, Growth, Jatropha, Rabbits, Performance

INTRODUCTION

The use of non-convention plant protein especially from tropical legumes as an alternative to conventional sources have been advocated by animal nutritionist in recent past (Aslani *et al.* (2007). However, the utilization of these tropical seeds in livestock feeds is subject to some inherent constraints; of particular importance are problems associated with anti-nutritional factors. Processing methods such as cooking, toasting, fermentation and soaking have been reported to reduce the anti-nutritional factor in seed (Antevy *et al.*, 2017). One of the non-conventional feedstuffs focused in this study is *Jatropha curcas* seed. The seed has been reported to contain 16-18% crude protein and anti-nutrients such as lectin, trypsin inhibitor, saponin, phytate, and phorbol esters (Antevy *et al.*, 2017). A study conducted by Antevy *et al.* (2017) to evaluate the performance of broiler chickens fed differently processed *Jatropha curcas* seed meal showed that broiler chickens fed fermented *Jatropha curcas* seed meal recorded higher feed intake, final body weight gain and superior feed conversion ratio. The study adopted fermentation as a method of processing. Fermentation is one of the oldest forms of feed processing and preservation and also has the capacity to improve nutritional and functional properties of the feed stuff (Frias *et al.* 2008). This study therefore examined utilization of fermented jatropha seed meal (FJSM) by grower rabbits

MATERIALS AND METHODS

The study was conducted at the Rabbit Unit of the Department of Animal Science and Range Management, Modibbo Adama University of Technology, Yola. *Jatropha curcas* fruits were purchased from Yola market. The fruits were cracked mechanically to remove the seeds. The seeds were then cleaned of dirt by washing and packed in a jute sack cooked for 48 hours, drained and put in an air tight container for 72 hours to allow natural fermentation. Thirty (30) grower rabbits of mixed breeds and sex were purchased from rabbit farmers within Yola metropolis, Adamawa State, Nigeria. The rabbits were assigned to five dietary treatments. Each treatment was replicated three times with two rabbits per replicate in a completely randomized design. Each rabbit was housed in a fitted with aluminium feeder and drinker. The experimental animals were given prophylactic treatment against endo and ecto-parasites. Five diets were compounded using FJSM to replace

soyabean meal at 0, 25, 50, 75 and 100% designated as treatment 1, 2, 3, 4 and 5 respectively as shown in Table 1.

Table 1 Ingredient and Percentage Composition of Experimental Diets

Ingredients	Replacement levels of fermented <i>Jatropha</i> seed meal				
	T1 (0 %)	T2 (25%)	T3 (50 %)	T4 (75%)	T5 (100 %)
Maize	52.00	52.00	52.00	52.00	52.00
Soyabean meal	18.00	13.50	9.00	4.50	0.00
FJSM	0.00	4.50	9.00	13.50	18.00
Groundnut haulms	10.00	10.00	10.00	10.00	10.00
Maize offal	13.00	13.00	13.00	13.00	13.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated analysis					
Crude protein	16.83	16.64	16.73	16.65	16.70
Crude fibre	8.84	8.76	8.70	8.63	8.69
ME Kcal/kg	2978.14	2998.13	2990.14	2992.88	2991.34

*Vitamin-mineral premix provider per kg the following: Vit. A 1500 IU; Vit.D3 3000 IU; Vit.E 30 IU; Vit.K 2.5mg; Thiamine B1 3mg; Riboflavin B2 6 mg; Pyridoxine B6 4 mg; Niacin 40 mg; Vit. B12 0.0 mg; Pantothenic acid 10 mg; Folic acid 1mg; Biotin 0.08 mg; Chloride 0.125mg; Mn 0.0956 g; Antioxidant 0.125 g; Fe 0.024 g; Cu 0.006 g; Se 0.24 g; Co 0.24. SBM *= Soyabean meal

Data were collected for 12 weeks. Rabbits were weighed at the beginning of the experiment and weekly, subsequently. Weight gain was calculated as final body weight minus initial body weight. Feed intake was obtained as the difference between the quantity offered and quantity not consumed. Feed conversion ratio (FCR) was calculated as feed intake divided by weight gain and recorded as they occurred. Data collected were subjected to one-way analysis of variance means were separated using Duncan's Multiple Range Test using SAS (2003).

RESULTS AND DISCUSSION

The proximate compositions of the raw and fermented *jatropha* seed meal are presented in Table 2. The results showed higher values of crude Protein (CP) 43.67%, ash (9.13%) and lower values of crude fibre (2.41%), ether extracts (20.18%), nitrogen free extracts (NFE) (14.52%) and metabolizable energy (3765.83%) for the fermented *Jatropha* seed meal. The higher crude protein (CP) content observed in fermented *Jatropha* seed meal could possibly be due to the modification effect of the fermentation process that leads to crude protein improvement. The CP values of both raw and fermented *Jatropha* seed meal were within the range of 35-50% crude protein reported by Aslani *et al.* (2007). The ash content of the fermented *Jatropha* seed meal in this study is higher than that of soybean meal (6.40%). This indicates that fermented *Jatropha* seed meal may be comparable to soybean meal in its usefulness in rabbit diets. The crude fibre (CF) content of the raw and fermented *Jatropha* seed meal is lower than 9.10% reported by Sumaiti *et al.* (2012). The variation in the crude fibre composition when compared to other studies could be attributed to the differences in agronomic practices, laboratory analysis and edaphic factors (Taiwo *et al.*, 2005).

Anti-nutritional composition of raw and fermented *Jatropha* seed meal

The result of the anti-nutritional factors (ANFs) composition (Table 3) shows that raw *Jatropha* seed contained 3.32mg phorbol ester, 20.45mg trypsin inhibitors, 191.56mg saponin, 278.67mg tannin, 94.67mg oxalates and 234.56mg phytates. It results showed decrease in antinutrients as a result of fermentation. The presences of anti-nutrients in the raw *jatropha* seed meal confirm the earlier report of Makkar and Becker, (1999) that *jatropha* seed meal contained high concentration of anti-nutritional factors. The use of fermentation as a method of detoxification however, reduced the concentration of

ANFs and increased the nutrient composition of Jatropha seed meal, but did not completely remove the ANFs in the seed.

Table 2 Proximate Composition of Raw and Fermented Jatropha Seed Meal

Parameter	Raw	Fermented
Dry matter	91.11	89.91
Crude Protein	30.11	43.67
Ether extracts	32.13	20.18
Crude fibre	4.06	2.41
Ash	7.13	9.13
NFE	17.68	14.52
Metabolizable Energy	4344.24	3765.83

Metabolizable Energy = ME (kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE. Calculated according to the formula of Ponzenga, (1985)

Table 3 Anti-nutritional composition of raw and fermented Jatropha seed meal (mg/100g)

Parameter	Raw	Fermented
Phorbol esters	3.32	2.11
Trypsin inhibitors	20.45	8.67
Saponin	191.56	78.98
Tannins	278.67	87.89
Oxalates	94.67	56.45
Phytates	234.56	58.11

Growth Performance of rabbits fed fermented Jatropha seed meal

Table 4, showed the growth performance of rabbits fed fermented Jatropha seed meal. The final body weights and total weight gain were highly ($P<0.001$) influenced by the replacement levels of fermented Jatropha seed meal. Final body weight of rabbits fed T1 (2561.20g) recorded significantly higher ($P<0.001$) weight compared to those on jatropha seed meals among Jatropha seed meal based diets rabbit fed T2 recorded significant higher ($P<0.05$) final body weight 2021.50g. Total body weight gain and total feed intake varied from 203.00g/day in T5 to 1361.10g/day in T1 and 1212.40g/day in T1 to 4351.10g/day in T1 respectively. Feed conversion ratio also differed significantly ($P<0.001$) across the treatments. It was observed that the superior feed conversion was recorded T1 (2.19) followed by T2 (4.42) and the inferior value in T3 (5.25), T4 (5.06) and T5 (5.97) respectively. Rabbit fed T5 had significant ($P<0.001$) higher mortality (50.00%). It was observed from the study that rabbits fed T3, T4 and T5 diets recorded lower feed intake. This could be attributed to the residual effect of anti-nutritional factors in the fermented Jatropha seed meal which resulted to low palatability of diets. Ogbu *et al.* (2015) reported that anti-nutritional factors such as tannins and saponins decrease feed intake due to its astringent properties. Phytate also has been reported to reduce the bioavailability of divalent cations due to insoluble complexes formation during digestion and absorption of minerals (Weaver and Kanna, 2002). This showed that rabbits fed T3 (50%), T4(75%) and T5 (100%) inclusion levels of Jatropha seed meal could not efficiently absorb the dietary nutrients in the gastro-intestinal tract as a result of high concentration of antinutritional factors. Esonu *et al.* (2001) also reported that high trypsin inhibitors in the diet reduce protein digestibility resulting in poor utilization of available nutrients. The finding from this study confirmed the result of Abdel-Shafy *et al.* (2011) who reported significant reduction in feed intake and growth rate of more than 30% as a result of residual phorbol esters in jatropha seed meal. Rabbit fed T5 diets recorded high percentage of mortality percentage this could be attributed to residual content of phorbol ester. Agboola and Adenuga, (2015) reported high percentage of mortality of birds fed 10% inclusion of Jatropha seed meal

Table 5: Growth performance of rabbit fed graded levels of fermented *Jatropha curcas* seed meal

Parameter	Replacement levels of fermented <i>Jatropha</i> seed meal					SEM
	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)	
Initial body weight (g)	1200.10	1190.10	1180.02	1200.2	1198.30	27.09 ^{ns}
Final body weight (g)	2561.20 ^a	2021.50 ^b	1681.10 ^c	1500.10 ^d	1401.30 ^e	73.86 ^{***}
Total weight gain (g)	1361.10 ^a	831.40 ^b	501.10 ^c	300.00 ^d	203.00 ^e	12.59 ^{***}
Total feed intake (g)	4351.10 ^a	3676.20 ^b	2631.20 ^c	1520.20 ^d	1212.40 ^e	54.22 ^{***}
Feed conversion ratio	3.19 ^d	4.42 ^c	5.25 ^b	5.06 ^b	5.97 ^a	0.07 ^{***}
Mortality (%)	0.00	3.00	10.0 ^b	24.00	50.00	-

Means in the same row bearing different superscripts differ significantly ($P < 0.001$), ns= not significant ($P > 0.05$), SEM = Standard error mean

CONCLUSION

The study showed that fermented jatropha seed meal can replace soyabean up to 25% FJSM as a source of plant protein in formulating rabbit diets. It is therefore recommended that 25% fermented *Jatropha* seed meal can be used in compounding rabbit diet.

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