BAP -11

Effect of Toasted Castor Seed Meal (TCSM) on Serum Biochemistry of Grower Rabbits Supplemented with or without Quantum Blue® Enzyme

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Abstract
An experiment was conducted to evaluate effect of toasted castor seed meal (TCSM) on serum biochemistry of grower rabbits supplemented with or without Quantum blue® enzyme.Twenty weaner rabbits of average live weight of 660.45±12.05 were utilized and allotted to 4 diets namely T1, T2, T3 and T4 which were compounded to be isonitrogenous (15% crude protein) and isocaloric (2850kcal/kg, ME) with two levels (0 and 30%) of TCSM. Treatments T1 and T2 contained 0% TCSM with 0 and 100ppm of enzyme, respectively. Treatments T3 and T4 contained 30% TCSM with 0 and 100ppm of enzyme, respectively; the experimental design was 2X2 factorial arrangement. At the end of the feeding trial which lasted for 42 days, blood samples were collected from the ears veins of 4 rabbits per treatment using 5mls sterile disposable syringes and emptied into sample bottles without anti-coagulant to allow clotting of the blood and used to evaluate serum biochemical constituents. The result obtained showed that all the parameters evaluated due to TCSM did not show significant variation ($p>0.05$). However, enzyme supplementation significantly ($p<0.05$) improved albumin from 22.83 to 28.00mmol/L but reduced phosphorus (5.30 to 4.43 mmol/L). Similarly, the interactive effects of enzyme supplementation and TCSM improved ($p<0.05$) albumin (20.00 vs. 25.67 vs. 30.67 and 25.33 g/L), calcium (2.50 vs. 2.03 vs. 2.33 and 3.00mmol/L) and albumin (20.00 vs. 25.67 vs. 30.67 and 25.33 *g/L*). In conclusion, inclusion of 30% TCSM and supplementation of Quantum blue®enzyme at 100 ppm alleviates the presence of ricin and improves acceptance, absorption and utilization of feed by grower rabbits.

Key words: Castor seeds,Quantum blue® enzyme, blood serum, grower rabbits, toasting,ricin

Introduction

Castor (*Ricinus communis*) seeds have remained the most important non-edible oilseed crop of the arid and semi-arid regions (Soetan and Oyewole, 2007). Reports on feeding of castor seed meal to livestock showed that it has huge potential as a tropical feed resource because of its high nutrient profile (Akande and Odunsi, 2012). The vast quantities of defatted meal generated from oil processing industries particularly in Asia and Africa are capable of reducing cost of feeding farm animals. However, its use as animal feed has been largely restricted because of inherent toxins (Nagalakshmi and Dhanalakshmi, 2015).

The use of exogenous enzymes as a means of alleviating the effect of these toxins as well as effective utilization of the inherent nutrients in the feedstuff has been advocated. Some of the functions of exogenous enzyme include degrading the phytate found in plant- based ingredient, releasing phosphorus, increasing feed efficiency, unraveling intrinsic thermo stability and it releasing of calcium and other mineral ions that would typically chelate and be bound to the phytate by making it unavailable for absorption (Alu, 2012). The mechanisms of Quantum blue enzyme is that it breaks down the phytate faster and gets to the site of action intact. This revolutionary product survives the rigors of feed processing trial conducted in commercial feed mills and has shown excellent recovering of Quantum blue because the product is intrinsically thermo stable, which ensures that the enzyme is able to get to work quickly (Bio-ingredient Ltd, 2004).

The aim of this study is therefore, to evaluate the effect of utilization of toasted castor seed meal supplemented with or without blue enzyme on serum biochemistry of grower rabbits.

Materials and Methods

The experiment was carried out at the Teaching and Research Farm of the Faculty of Agriculture, Nasarawa State University. The farm is located in Shabu, Lafia, in Nasarawa State, in the Guinea Savanna zone of North Central Nigeria. It is located on latitude 08^0 35´ N and longitude 08^0 33´E;the mean monthly maximum and minimum temperatures are 35. 06 and 20.16^0C, respectively while the mean monthly relative humidity is 74 %. Annual rainfall is about 168. 90mm (NIMET, 2008).

Quantum blue® was purchased from Bio-ingredients Ltd, Abuja. It is manufactured by Nutrex/NV (Belgium) and packaged in 1kg sachets. It is a powdery multi-enzyme compound containing β-glucanase, xylanase, phytase and arabinoxylanase. Twenty weaner rabbit were purchase from a commercial farm and reared in an open-side wire mesh rabbit hutches. Light was provided at night using electric bulb throughout the period of the experiment to enable rabbits eat both day and night. The rabbits were fed with weighed amount of the experimental diets and drinking water was provided *ad-libitum* and other routine management practices were adopted as outlined by Alu *et al.* (2009).

Four diets were compounded to be isonitrogenous (15% crude protein) and isocaloric (2850kcal/kg ME) with two levels (0 and 30%) of toasted castor seeds meal (TCSM). Treatments T1 and T2 contained 0%TCSM with 0 and 100ppm of

enzyme, respectively. Treatments T3 and T4 contained 30%TCSM with 0 and 100ppm of enzyme, respectively; the experimental design was 2X2 factorial fitted into ANOVA. In all, the nutrients were balanced to meet the nutrient requirements of the rabbits for that particular class (Table 1).At the end of the feeding trial, blood samples were collected from four (4) rabbits per treatment using 5mls sterile disposable syringes. The blood were collected from theears veins of the rabbits and emptied into sample bottles without anti-coagulant to allow clotting of the blood and used to evaluate serum biochemical constituents. Total protein and urea were analyzed using sigma kits. Glucose was analyzed according to Feteris (1965) and cholesterol according to Roschlan *et al.* (1974).

Data obtained were subjected to factorial designed and where significant differences ($p>0.05$) were observed, means were separated using Duncan's Multiple Range Test (Duncan, 1955) as described by Steel and Torries (1980).

Table 1. Percent gross composition of experimental diets for grower rabbits

Feedstuffs	Diets			
	T1-	T2+	T3-	T4+
Maize	51.95 00	51.95	40.00	40.00
Soybeans(Fullfat)	15.00	15.00	17.00	17.00
Groundnut cake	12.00	12.00	6.00	6.00
Castor seed toasted	-	-	30.00	30.00
Bone meal	0.70	0.70	0.70	0.70
Fishmeal	5.00	5.00	4.00	4.00
Palm oil	5.00	5.00	0.55	0.55
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	9.60	9.60	1.00	1.00
Premix	0.25	0.25	0.25	0.25
Enzyme (ppm)	-	100	-	100
Total	100:00	100.00	100.00	100.00
Calculated nutrients and energy composition				
Energy (kcal/kg, ME)	2851.52	2851.52	2851.30	2851.30
Crude protein (%)	15.72	15.72	15.00	15.00
Crude fibre (%)	2.61	2.61	3.57	3.57
Calcium (%)	1.87	1.87	0.11	0.11
Phosphorus (%)	1.15	1.15	0.40	0.40

The vitamin – mineral premix supplied the following per 100kg of diet: Vitamin A 15,000 I.U, Vitamin D_3 300,000 I.U., Vitamin E 3,000 I.U., Vitamin K 2.50mg, Thiamin, (B_1) 200mg, Riboflavin (B_2) 600mg, Pyridoxine (B_6) 600mg, Niacin 40.0mg, Vitamin B_{12} 2mg, Pantothenic acid 10.0mg, Folic acid, 100mg, Biotin 8mg, Choline chloride 50g, Anti-oxidant 12.5g, Manganese 96g, Zinc 6g, Iron 24g, Copper 0.6g, Iodine 0.14g, Selenium 24mg, Cobalt 214mg.

Results and Discussion

Table 2 summarizes the effect of TCSM on serum biochemical constituents of grower rabbits. All the parameters evaluated did not show significant variation ($p>0.05$) with or without TCSM. The non-significant variation is an indication of acceptance, absorption and utilization of the test ingredient by the animals as well as the effectiveness of the processing method on the chief anti-nutritional factor, *ricin*. The results of the present findings are in consonance with the earlier report of Nagalakshmi and Dhanalakshmi (2015) who reported no adverse effect of feeding CSC as sole protein supplement in diet on body weights, DM intake and nutrient efficiency in lambs.

The result of the effect of Quantum blue® enzyme supplementation on serum biochemical constituents of grower rabbits fed toasted castor seed TCSM (Table 2) shows that enzyme supplementation significantly ($p<0.05$) improved serum albumin, 22.83 to 28.00mmol/L but reduced phosphorus (5.30 to 4.43 mmol/L). However, there was no variation ($p>0.05$) in the Na (148.00 – 145.83mmol/L), Ca (2.27 – 2.67mmol/L), Cl (99.17 – 97.33 mmol/L), urea (3.92 – 3.95 mmol/L), creatinine (67.00 – 66.67 mmol/L) and total protein (61.67 – 62.33 g/L). These results support the earlier findings of Alu (2012) when he fed sugarcane scrapping meal-based diets supplemented with exogenous enzyme to quails and observed significant improvement in some of the serum biochemical constituents. Table 3 shows the results of the interactive effects of Quantum blue® enzyme supplementation and TCSM on serum biochemistry of grower rabbits. Serum calcium and creatinine were improved (3.00 mmol/L and 82.67 mg/L) significantly ($p<0.05$) with high TCSM and enzyme supplementation, respectively. Similarly, albumin concentration was improved (25.67 vs. 30.67 and 25.33 g/L) significantly ($p<0.05$).Literatures (Alu, 2012) have shown that the interactive effects of enzyme and other ingredients do not differ significantly. This is because the exogenous enzyme levels the

performance of the animals as against the either anti-nutritional factors or arabinoxylanases in the feed. The values recorded in the present study of rabbits fell within the normal range for healthy and matured rabbits as reported by Adedeji *et al.* (2006).

Table 2. Effect of Quantum blue® enzyme supplementation or TCSM on serum biochemistry of grower rabbits

	TCSM Treatment Means				Enzyme Treatment Means			
Parameters	0% CSM	30% CSM	SEM	LOS	0ppm Enzyme	100ppm Enzyme	SEM	LOS
Na (*mmol/L*)	148.00	146.33	1.90	NS	148.5	145.83	1.90	NS
Calcium (*mmol/L*)	2.42	2.52	0.18	NS	2.27	2.67	0.18	NS
Phosphorus (*mmol/L*)	5.20	4.53	0.25	NS	5.30[a]	4.43[b]	0.25	*
Chloride (*mmol/L*)	100.17	96.33	1.67	NS	99.17	97.33	1.67	NS
Urea (*mmol/L*)	4.18	3.68	0.50	NS	3.92	3.95	0.50	NS
Creatinine (*mmol/L*)	66.67	67.00	6.48	NS	67.00	66.67	6.48	NS
Protein (*g/L*)	60.83	63.17	1.98	NS	61.67	62.33	1.98	NS
Albumin (*g/L*)	25.33	25.50	1.24	NS	22.83[b]	28.00[a]	1.24	*

SEM-Standard error of means, LOS-Level of significance, NS-Not significant (p>0.05), *= Significant variation (p<0.05),CSM-Castor seed meal, a,b = Means on the same row carrying different superscript differ significantly

Table 3. Interactive effects of Quantum blue® enzyme supplementation on serum biochemistry of grower rabbits fed castor seeds meal-based diets

Parameters	0%CSM +0ppmE	0%CSM +100ppmE	30%CSM +0ppmE	30%CSM +100ppmE	SEM	LOS
Na (mmol/L)	151.00	146.00	145.00	146.67	2.68	NS
Calcium (mmol/L)	2.50[b]	2.03[b]	2.33[b]	3.00[a]	0.25	*
Phosphorus (mmol/L)	5.53	5.07	4.87	4.00	0.35	NS
Chloride (mmol/L)	100.67	97.67	99.67	95.00	2.36	NS
Urea (mmol/L)	4.07	3.77	4.30	3.60	0.71	NS
Creatinine (mmol/L)	82.67[a]	51.33[b]	50.67[b]	82.67[a]	9.17	*
Protein (g/L)	61.00	62.33	60.67	64.00	2.79	NS
Albumin (g/L)	20.00[b]	25.67[a]	30.67[a]	25.33[a]	1.76	*

SEM-Standard error of means, LOS-Level of significance, *-Significant (p<0.05), a,b-means carrying different superscript differ significantly (p<0.05), NS-Not significant (p>0.05), CSM-Castor seed meal

Conclusion

Inclusion of 30% toasted castor seeds and supplementation of Quantum blue® enzyme at 100 ppm alleviates the presence of ricin and improves acceptance, absorption and utilization of feed by grower rabbits.

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