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Performance and cost benefit of broiler finisher chickens fed diets containing soyabean residue supplemented with *Kingzyme* ®

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Abstract

This study was carried out to investigate the potentials of soya bean residue supplemented with exogenous enzyme (Kingzyme®) at finisher phase (4-8 weeks). A total of 360 day old Cobb 500 broiler chicks were randomly allocated to four dietary treatments containing 18% soya bean residue meal supplemented with Kingzyme® with different levels of supplementation designated as 0, 20, 25 and 30g. Each treatment were replicated thrice with 30 birds per replica in randomize complete block design. Data were generated for feed intake, live weight gain, feed conversion ratio, feed cost /kg gain (₦) and economic analysis. The results obtained for productive performance showed no significant (P>0.05) differences among all treatment groups. The control group (0g) and 30g Kingxyme ® supplementation levels recorded (1882.33 and 1803.67kg/bird) and (73.98 and 73.77 g/bird/day) values for final weight and daily feed intake, respectively. The higher price (₦1211.25) recorded for total cost of production and lower profit after sales (₦788.75) were observed at 0g level of supplementation. Hence, similar pattern was revealed in other treatment groups supplemented with enzymes. However, Kingzyme ® supplementation at 25g per 100kg diet gave lowest cost feed consumed + cost of enzyme (₦351.06) and best profit after sales (₦874.98) hence, chickens performed equally irrespective of the addition of Kingzyme ® supplementation on soya bean residue.

Keywords: Exogenous enzyme, soya bean, supplement

Performance et rentabilité des poulets à griller en finition nourris avec des régimes contenant des résidus de soja additionnés de Kingzyme ®

Résumé

Cette étude a été réalisée pour étudier les potentiels des résidus de soja supplémentés avec une enzyme exogène (Kingzyme®) à la phase de finition (4-8 semaines). Un total de poussins de 360 jours de chair Cobb poulets ont été répartis au hasard dans quatre traitements diététiques contenant 18 % de farine de résidus de soja additionnée de Kingzyme® avec différents niveaux de supplémentation désignés comme 0, 20, 25 et 30 g. Chaque traitement a été répété trois fois avec 30 oiseaux par réplique dans une conception en blocs complets randomisés. Des données ont été générées pour l'apport alimentaire, le gain de poids vif, le taux de conversion alimentaire, le coût de l'alimentation/kg de gain (₦) et l'analyse économique. Les résultats obtenus pour les performances productives n'ont montré aucune différence significative (P>0,05) entre tous les groupes de traitement. Les niveaux de supplémentation du groupe témoin (0g) et 30g Kingxyme ® ont enregistré (1882,33 et 1803,67kg/oiseau) et (73,98 et 73,77 g/oiseau/jour) des valeurs pour le poids final et l'apport alimentaire quotidien, respectivement. Le prix plus élevé (₦1211,25) enregistré pour le coût

total de production et la baisse du bénéfice après vente (₦788,75) ont été observés au niveau de supplémentation de 0 g. Par conséquent, un schéma similaire a été révélé dans d'autres groupes de traitement complétés par des enzymes. Cependant, la supplémentation en Kingzyme® à 25 g par 100 kg de régime a donné l'aliment consommé le moins cher + coût de l'enzyme (₦351,06) et le meilleur profit après-vente (₦874,98).

Mots-clés : Enzyme exogène, soja, supplément

Introduction

Livestock especially poultry production seem to be recognized as the fastest industry which can overcome the animal protein deficiency especially in third world countries due to the short generation interval, high turnover rate and economic efficiency (Inuwa *et al.,* 2020). Generally, broiler production is known to be capital demanding due to high cost of conventional feedingredients especially the energy and protein sources. Nonconventional feed resources from agro-industrial based are cheaply, easily and underutilized as feed (Tuleun *et al.*, 2005). These feed ingredients offer the best alternatives for reducing feed cost and therefore a reduction in the cost of meat thereby making animal protein available to the populace (Abdullahi *et al.,* 2021)**.** Development of the poultry industry has been described as the fastest way of ameliorating the animal protein deficiency in third world countries, due to the high turn-over rate associated with poultry production and economic efficiency (Dipeolu *et al.*, 2004). A number of feed additives such as antibiotics, vitamins, minerals and probiotics other growth promoters are being used to improve animal performance especially broiler chickens (Ndelekwute *et al*., 2015). Enzymes have been approved for use in poultry feed because they are natural products and pose no threat to the animal or consumer (Marte *et al*., 2021). Soya bean residue is another protein source available locally, with a CP content of around 27% (Lawan *et al.*, 2020). The product is both a source of energy and protein (Minh, 2000; Hong *et al.,* 2003). Soya bean residue is a low cost and nutritious feed for livestock which is widely available in several African and Asian countries. Competition between man and livestock for conventional feed ingredients leads to the search for alternative sources of feeds, thus, leading to assessment into soya bean residue as protein and energy source for broiler chickens.

Materials and methods

The study was conducted at the University of Maiduguri Teaching and Research Farm Maiduguri. Maiduguri is located between latitude 11^0 5 and 12^0 North and longitude $13^0$05 and 14^0 East at an altitude of 353 m above sea level (Inuwa*et al.*,2020)**,** the Borno state capital is located on latitude $11^0$51 N", longitude 13^0 09 E" and at altitude of 354m above sea level with mean relative humidity ranges from 30% to 45% (Marte*et al*., 2021).

Source and processing of soya bean residue

Soya bean residue were sourced within Maiduguri communities locally, a by-product from soya bean processing, *Dusar-awara* or *Wara,* is a left over when soya bean cheese (*awara*) is made from soya beans. The filtrate, which contains protein and fat, and is made from milled and boiled soya bean mash, called soya cheese (*awara* or *Wara*), while filtrate are the residue. Since Soya bean residue has water content of over 80% and high protein content, therefore the common method of storing is sun-drying and bagging.

Table 1: Ingredient composition of the experimental broiler finisher diets containing SBR withdifferent levels of *Kingzyme* supplementation (4 – 8 weeks)

Ingredients (%)	Level of *Kingzyme* supplementation/100kg			
	T_0 (0g)	T_1 (25g)	T_2 (30g)	T_3 (35g)
Maize	54.00	42.00	42.00	42.00
Soya bean meal	24.00	16.00	16.00	16.00
Soya bean residue	0.00	18.00	18.00	18.00
Groundnut cake	13.50	10.00	10.00	10.00
Wheat offal	2.00	5.50	5.50	5.50
Palm oil	2.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00
Min-Vit Premix*	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
NaCl	0.30	0.30	0.30	0.30
TOTAL	100.00	100.00	100.00	100.00
	Calculated Analysis			
ME (Kcal/kg)	3204.00	3203.00	3203.00	3203.00
Crude protein (%)	20.13	20.14	20.14	20.14
Ener. protein ratio	158.41	157.22	157.22	157.22
Ether extract (%)	9.02	9.77	9.77	9.77
Crude fibre (%)	3.37	6.11	6.11	6.11
Calcium (%)	1.10	1.11	1.11	1.11
Avai. Phos. (%)	0.45	0.44	0.44	0.44
Ca.: P. Ratio (%)	2.50	2.25	2.25	2.25
Lysine (%)	1.11	1.09	1.09	1.09
Meth + cys. (%)	0.79	0.71	0.71	0.71
Feed Cost/25kg(₦)	5700.50	6025.30	6025.30	6025.30

ME= Metabolizable energy

** = Bio Mix Broiler Finisher Premix supplying the following per Kg of feed: Vitamin A=3,400,000IU, VitaminD$_3$= 600,000IU, Vitamin E=4,000mg, Vitamin K$_3$ = 600mg, Vitamin B$_1$ = 640mg, Vitamin B$_2$ = 1600mg, Niacin = 8,000mg, Pantothenic=2000mg, Vitamin B$_6$ = 600mg, Vitamin B$_{12}$ = 4mg, Folic acid =200mg, BiotinH$_2$ = 300mg, Choline Chioride = 70,000mg, Cobalt = 80mg, Copper = 1200mg, Iodine = 400mg, Iron = 8,000 mg, Manganese =16,000mg, selenium=80mg, Zinc=12,000mg and Antioxidant=500mg.*

Experimental diets and management

A total of three hundred and sixty (360) *Cobb 500* broiler chickens were allocated to four (4) isocaloric and nitrogenous dietary treatments with different levels of *Kingzyme*® supplementation designated as T_0, T_1, T_2 and T_3 as presented in Table 1. Feed and water was *ad-libitum* from 4thto 8thweek.Feed intake were recorded daily while birds were weighed weekly,carcass quality was determined by measuring thelive weight of representative bird.Each treatment was replicated thrice containing 30 chicks per replicate in randomize complete block design.

Chemical evaluation

Chemical composition of SBR and experimental diets samples were carried out according to the procedure of AOAC.

Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) using randomize complete block design (Steel and Torrie, 1980). Significant differences among treatment means were compared using Duncan's Multiple Range Test (1955).SPSS version 9.0 was used for the computer analysis of the data.

Results and discussion

The results of main effects of performance showed significant (P<0.05) differences among final weight and feed intake while weight gain, feed conversion ratio, feed cost and mortality did not reveal significant (P>0.05) difference among all the treatment groups as presented in Table 2. supported by the interactions (Tables3). The control group (0g) and 30g *Kingxyme®* supplementation levels recorded similar values (1882.33 and 1803.67kg) and (73.98 and 73.77 g/bird) for final weight and daily feed intake, respectively which is justifiable by the interaction effect (Table 3). The values recorded were lower than values reported Marte*et al*. (2021) but positive (P<0.05) differences among final weight and feed intake revealed the effect of enzyme supplementation (Odukoya *et al.,* 2021). This result agrees with the report of Munassr (2011) who observed significant increase in performance of broiler chickens when their diets were supplemented with enzyme (Alu *et al.,* 2018). However, best feed conversion ratio (1.63) were recorded at 0 and 35g enzyme (*Kingxyme®*)supplementation were similar with values recorded by Agbai *et al*. (2021) while cost per kg gain (₦351.06) waslest recorded at 35g level of enzyme supplementation and contrary with starter phase where increase in enzyme supplementation leads to increase in cost per kg gain (Inuwa *et al*., 2020). The cost of feed was within the range reported for broiler chickens by Odoemelam *et al*. (2013), however, the feed cost per weight gain was higher in this study, higher than that reported forbroiler chickens by Odoemelam *et al*. (2013). Therefore, the in-significant (P<0.05) difference observed among the performance parameters could be attributed to *Kingzyme ®* supplementation in the diets.

Table 2: Performance of broiler finisher chickens fed diets containing soya bean residue (SBR) supplemented with enzyme (*Kingzyme*®) 4 – 8 weeks

Parameters	Level of *Kingzyme*® supplementation (g/100kg)				
	0	25	30	35	SEM
Initial weight (g/bird)	614.50	542.93	552.57	581.53	20.59^{NS}
Final weight (g/bird)	1882.33^{a}	1615.67^{ab}	1803.67^{ab}	1515.33^{b}	63.73*
Weight gain (g/bird)	1267.83	1072.74	1251.10	933.80	7.47^{NS}
Daily feed intake (g/bird/day)	73.98^{a}	67.76^{ab}	73.77^{b}	70.55^{b}	0.65*
Feed conversion ratio	1.63	1.70	2.20	1.63	0.16^{NS}
Feed cost /kg gain (₦)	380.40	406.66	452.00	351.06	15.97^{NS}
Mortality (%)	4.04	11.11	4.04	6.06	1.50

SEM = Standard Error of Means; a, b, = means within the same row bearing different superscripts differ significantly (P<0.05)

Table 3: Interaction effect between enzyme supplementation and levels on performance of broiler finisher chickens fed diets containing soya bean residue (SBR) 4 – 8 weeks

Parameters	Level of *Kingzyme*® supplementation (g/100kg)			
	0	25	30	35
Initial weight (g/bird)	552.38±20.75	610.16 ± 12.54	585.82 ± 33.10	552.61 ± 18.95
Final weight (g/bird)	1797.33±93.56	1653.00±164.45	1754.00±103.64	1217.41±87.06
Daily weight gain (g/bird)	1244.95±93.08	1042.83±52.09	1168.18±92.45	1217.4 ±87.06
Daily feed intake (g/bird)	30.66 ± 1.45	27.33 ± 0.66	29.00 ± 1.73	28.66 ± 0.88
Feed conversion ratio	1.63 ± 0.08	2.13 ± 0.28	1.73 ± 0.14	1.66 ± 0.12
Feed cost /kg gain (₦)	380.40±10.20	385.37 ± 42.65	401.27 ± 40.24	423.08 ± 13.98
Mortality (%)	4.04 ± 2.02	9.09 ± 1.74	6.06 ± 3.03	6.06 ± 1.74

The results of cost benefit analysis arepresented in Table 4. It was observed that final weight, total feed intake, feed cost/kg and Cost of feed consumed + cost of enzyme (₦) showed significant (P<0.05) difference among all treatment groups. The heaviest (1882.33g) final weight was recorded in 0g supplementation followed by 1803.67, 1615.67 and 1515.33g at 30, 25, and 35g levels of enzyme supplementation respectively. However, total feed intake of 0g and 30g levels were statistically (P<0.05) similar (2.21kg), while 2.03 and 2.11kg were recorded at 25g and 35g levels of enzyme supplementation respectively. Feed cost/kg (₦) and cost of feed consumed + cost of enzyme (₦) were both significantly (P<0.05) different among the treatment groups and also both were related because, the higher the cost/kg, the higher the cost of feed consumed + cost of enzyme, which shows positive relationship and the resultant effect is manifested in the total cost of production and selling per livebroiler. This means that, the higher price (₦1211.25) recorded for total cost of production and lower profit after sales (₦788.75) observed at 0g level of supplementation could therefore be attributed to the higher cost of feed/kg and cost of feed consumed + cost of enzyme, hence similar pattern was revealed in other treatment groups supplemented with enzymes, the highest production cost, the least profit margin,which is also directly linked to the higher prices of feed ingredients used during the study period. However, *Kingzyme*® supplementation at 25g per 100kg diet gave lowest cost feed consumed + cost of enzyme (₦375.02) and best profit after sales (₦874.98).

Table 4: C ost benefit analysis of broiler chickens fed diets containing soya bean residue (SBR) supplemented with enzyme (*Kingzyme®)*

Parameters	Levels of *Kingzyme*® supplementation (g/100kg)				
	0	25	30	35	SEM
(a) Initial weight (g)	614.50	542.93	552.57	581.53	20.59
(b) Final weight (g)	1882.33^{a}	1615.67^{ab}	1803.67^{ab}	1515.33^{b}	63.73
(c) Total feed intake (kg/bird)	2.21^{a}	2.03^{ab}	2.21^{b}	2.11^{b}	0.15
(d) Cost of enzyme (₦)	--	50	60	70	NTS
(e) Cost of chicks (₦)	700	700	700	700	NTS
(f) Cost of feed consumed (₦)	511.25	375.02	385.95	396.89	2.02
(g) Cost/kg weight gain (₦)	380.40	351.06	413.36	433.98	38.94
(h) Feed cost/kg (₦)	229.49^{a}	207.97^{b}	208.97^{b}	208.42^{b}	1.11
(i) Cost of feed consumed + cost of enzyme (₦)	506.59^{a}	425.02^{c}	445.94^{b}	466.89^{a}	1.03
(j) Total cost of production (e + I) (₦)	1211.25	1125.02	1145.94	1166.89	2.13
(k) Selling price (₦)	2000	2000	2000	2000	NTS
(l) Profit from sales (k – j) (₦)	788.75	874.98	854.06	833.11	2.29

SEM = Standard Error of Means, NTS = Not Tested Statistically, a, b, = means within the same row bearing different superscripts differ significantly (P<0.05)

Conclusion

The study showed that all birds performed equally irrespective of the addition of *Kingzyme* ® supplementation on soya bean residue. However, high production cost which resulted to low profit margin was directly linked to the higher prices of feed ingredients used. Hence, *Kingzyme* ® supplementation at 25g per 100kg diet gave lowest cost feed consumed + cost of enzyme (₦351.06) and best profit after sales (₦874.98).

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