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Effects of Varying Processing Methods of Soya Bean on Performance of Broiler Chickens

Anthony, A. A. Waba, Y. E. Bandawa, G. J.
Department of Animal Health and Production, Federal polytechnic Bali Taraba State, Nigeria.

Abstract:- This experiment was conducted to examine the impact of different soya bean processing methods and the effect of processed soybean on broiler performance. For this purpose, a 56-day research was conducted on 400 ROSS 308 broiler chickens, which are raised under good intensive system of management in Federal Polytechnic Bali teaching and research farm. In achieving this, birds were assigned to five (5) treatment and sample size of six (6) per pen was used with eight replications. Performance data was collected weekly and carcass analysis was done on the trial day (56). Data were analyzed using ANOVA in SPSS, Confidence and significance level at 95% and P <0.05 respectively was used. The research findings showed that no significant difference p>0.05 was observed in all the parameters tested. However, high performance observed in this research trial was recorded in a treatment A, D and E respectively. This proved that hydro-thermal treatment of soybean as the best method that preserved nutrients, reduced anti-nutritional factors and enhance performance in broiler chickens. Similarly, the significant increase seen on the length and weight of the small intestine indicates increased surface area for nutrient absorption. On the other hand, poor performance was recorded on treatment B and C. This reveals that thermal processing methods (toasting and extrusion) were not suitable for optimum performance as shown in this research trial. The comparative trial on evaluation of different methods of soybean processing shows that the hydro-thermal and the control treatment was the overall best in the preservation of nutrient, removal of anti-nutritional factors and performance improvement in broilers chickens unlike the thermal processing methods. The tools used in arriving at this decision provides a farmers with a better decision on the best processing method that will improve optimal performance.

Keywords:- *Processing Methods, Soya Bean, Performance and Broilers.*

I. INTRODUCTION

Soya beans (*Glycine max*) is not only known as human source of quality edible oil but a primary source of protein in poultry diet known and widely used (Waldroup, 1982). It is important to process soya bean in order to remove the anti-nutritional factors, which are trypsin inhibitors and lectin which naturally occur in soyabean (Liener and Kakade 1980).

Different methods are used in processing soya bean for its different protein products. Anti-nutritional factors are eliminated or reduced by using different processing methods to improve the nutritional value for animal feed (Araba, 1990). Processing methods have impact on the quality of the products, but it all depends on the method used (Araba, 1990). Heating process has been identified as the only method that affects the protein quality of soybean. Anti-nutritive factors (trypsin inhibitors and lectins) can be rendered inactive when heating conditions such as moisture content, heating temperature and heating time are properly used (Araba, 1990). Using high heating temperature leads to denaturing of the amino acid and protein content of the soya bean (Hurell, 1990; parsons et al., 1992). The aim of this study was to examine the effects of different soya bean processing methods on broiler performance.

II. METHODOLOGY

Experimental Birds/ Design

Total number of 400 ROSS 308 broiler chicks were ordered from Olam hatchery, which is one of the reputable poultry farms in Jos Plateau state. The experiment was conducted at the Federal Polytechnic Bali teaching and Research poultry farm. In achieving this, Five (5) treatment and sample size of six (6) per pen was used with eight replications.

Methods of processing / Treatment structure

Treatment A. (Control (Ultima poultry feed)
Treatment B. (Toasted method)
Treatment C. Extruded soya bean)
Treatment D. (Boiling method)
Treatment E. (Steam cooking method)

Source and processing of Soya beans

Soya bean was purchased at the Bali village market. Full fat soya beans was subjected to four different processing methods (Toasted, Extruded, Boiling and steam cooking).

Toasted soya bean mean:

Dried soya bean was toasted using a metal pot and fire wood as heat source. The soya bean was stirred consistently with a stir rod to have uniform toast and prevents burning. The toasting was continuous till the color changed to golden brown. The soybean was spread out on concrete floor to cool, then milled and incorporated in the diet.

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Soybean extrusion

The extrusion process of grains involve the use of extruding machine set on a high temperature. Grains such as maize, soybean, sorghum and millet are processed into different textures. It is more environmentally friendly and energy efficient when compared with cooking methods. The extrusion process used in this research was the modification of FEFAC, 2007. Using extrusion machine.

Cooked method:

Dried soya bean was cooked using a metal pot and water. Firewood was set to supply heat, a metal pot was placed on top of heat and water was poured in to the metal pot until a boiling point was reached and the soya bean changed colour to golden brown. It was allowed to cool before incorporation in the feed.

Steam soya bean meal:

Dried soya bean was steamed using force bottom power technology. Firewood was set to supply heat, a metal pot was placed on top of heat and water was poured in to the metal pot, a triple stand in shape of the metal pot was fixed inside the pot so as to prevent the milled beans from contacting water. The triple stand was covered with net and the evaporating and the steaming lasted till the milled soya bean change colour to golden brown. It was allowed to cool before incorporation.

Diet Specification:

Diets was formulated at the polytechnic poultry research farm by using maize as a source of energy. The diet formulations for each phase are shown in table 2. The five treatment diets were included in the starter diets, grower and as well as finisher diets were the same for all birds.

Table 1. Diet composition for starter, grower and finisher phases.

0Ingredient	d0-14	d15-28	d28 +
Maize	61.00%	63.00%	66.46%
Soybean	33.43%	30.13%	26.29%
Soya oil	1.57%	2.93%	3.89%
Salt	0.39%	0.51%	0.38%
Limestone	0.16%	0.38%	0.11%
Dicalcium Phos. 18% P	2.18%	1.92%	1.73%
Lysine HCl	0.27%	0.21%	0.24%
DL-Methionine	0.33%	0.28%	0.25%
Threonine	0.16%	0.12%	0.13%
Vitamin & Mineral premix	0.51%	0.51%	0.51%

Feeding techniques

Diet was weighed into individually labelled bags containing 4kg (one bags for each pen) to allow feed intake to be measured during the starter phase. Initially two bags of 4kg were weighed for each pen for grower stage and two bags of 6kg were weighed for the finisher phase. A formulated bag labelled for each pen and leftover feed was tipped back into the respective bag, and the bags were reweighed to measure feed intake on a weekly basis

Procedure

On arrival of the birds, glucose were added to their water to ease the long distance stress. Feed and water were provided ad *libitum* from feed troughs and drinker within each pen. Vitamin and mineral supplements were also added to the water from day 0-3 using a commercial supplement at the recommended rate.

The experimental diets were fed to the birds up to day 56, with different treatments fed from day 0 -14(starter), 15-28 (grower) and 28-56 days (finisher).

Pen weight and feed intake was determined on arrival (day 0) and again on day 7, 10, 14, 21, 28, 35, 42 and 56.These weight and feed intake was divided by the number of birds in the pen to determine approximate individual bird weight gain, feed intake and FCR.

Statistical analysis

Data collected for, performance, were subjected to analyses using ANOVA in SPSS (IBM SPSS Statistics V.23) statistical package, in order to identify if there was any significant difference between the five different diets used, confidence and significant level were set at 95% ($p < 0.05$) respectively. Duncan's Multiple Range Test (DMRT, 1999) was used in mean separation.

Ethics

All procedures that were used in this research trial were based on animal health and welfare guidelines

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III. RESULTS AND DISCUSSION

Table 2: Performance of experimental birds on different processing method at starter phase

Performance	Treatments				
	A	B	C	D	E
IBW	40.33	40.22	40.33	40.33	40.67
ABW (g)	740	649	635	735	706.60
FI (g)	720.00	670.00	619.00	674.00	683.00
ABWG (g)	360.00	235.00	205.00	254.00	245
FCR	2.00	2.38	2.38	2.21	2.74
Survl. (%)	97.00	95.00	95.00	96.00	97
P –Value	0.598	0.739	0.722	0.672	0.599

Table 3: Performance of experimental birds on different processing method at Finisher phase

Performance	Treatments				
	A	B	C	D	E
IBW	740	649	635	735.20	706.00
FI(g)	1441.00	1305.00	1304	1367.00	1325.00
ABWG (g)	660.00	389.00	420.00	430.20	429.00
FCR	2.18	2.83	320.00	2.87	3.40
SURV (%)	96.20	95.00	96.00	97.00	96.50
P- Value	0.075	0.451	0.764	0.099	0.545

The result in the study showed no significance difference ($p>0.05$) on Body weight of chickens in all the treatments as shown in the Table 2 and 3. However, higher body weight of (740g and 735g) was found in treatment A and E respectively compared to chickens on heat treatment (B and C) with ABW of 649g and 635g respectively at the starter phase. Similarly, the initial body weight and average body weight gain of birds in treatment A, D and E (740g, 735.20, 706. And 600.00g, 430.20 429.00g) were also higher compared to other treatments in this study at the finisher phase. No significant difference ($p>0.05$) were found on feed intake of broiler on all the treatment in the starter and the finishing stage during the research trial. Although a significant increase in feed intake of 720.00g, 674.00g and 683.00g in the starter phase and 1441.00, 1367.00 and1325.00 in the finisher phase has been observed on broiler chickens found in treatment A.D and E respectively. At the starter and finishing stage, no significance difference ($p>0.05$) was found throughout the experimental period. However, a relatively fair feed conversion ratio of 2.0 and 2.18 in the control treatment was found in starter and finishing phase compared to other treatment in the research as shown in table 2 and 3 respectively.

From the results observed on the current study, there is an increased growth performance and feed efficiency on broiler chickens fed with control and hydro-thermal processed diet(cooking and steam cooking) compared to broiler chickens on heat treatment (extrusion and toasting processing method) in both starter and finishing phase. This could be due to the availability of higher nutrients in control and hydro-thermal treatment than other treatments, the findings of this research are in line with other authors who reported similar findings that cooking, steam cooking improves growth performance compared to extrusion and toasting ((Chohan et al., 1993). However, a detrimental effects which led to reduced performance has been seen in a research using toasted feed on broiler chickens has been reported on both starting and finishing stage (Leeson et al., 1987). A report of Chohan et al., 1993, revealed poor performance when unprocessed soya bean was used on broiler chickens. This could be due to the heat used when processing may not be sufficient to destroy the trypsin inhibitors which consequently affect the growth performance of the chickens. Similarly, in line with the findings of this trial, Ari et al (2012) attributed that steaming method was superior compared to toasting and extrusion.

IV. CONCLUSION

A significant variation has been observed on the performance of broilers subjected to different soya bean processing methods. The research findings shows that treatment A, D and E respectively recorded the best performance compared to other treatment treatments .This proved that hydro-thermal treatment method of soybean is the best method that will preserve nutrients, reduce anti-nutritional factors and enhance performance in broiler chickens. Similarly, the significant increase seen on the measurement of small intestines indicates increased surface area for nutrient absorption. On the other hand, poor performance has been recorded on treatment B and C. This reveals that thermal processing methods (toasting and extrusion) were not suitable for optimum performance as shown in this research trial. This could be as a result of decreased feed intake. It is therefore recommended that further research need to be conducted on difference processing time of each method. However, the tools used in arriving at this decision provides a famer with a better decision on the best processing method that will improve optimum performance.

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