

Effects of allzyme ssf® supplementation of differently processed pigeon pea (*Cajanus cajan*) seeds on performance and carcass characteristics of broiler chickens.

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Target audience: Poultry farmers, Feed millers and agro allied industries

Abstract

*This study was conducted to investigate the effects of Allzyme SSF® supplementation of differently processed pigeon pea (*Cajanus cajan*) seeds on growth performance and carcass characteristics of broiler chickens. Two hundred and seventy (270) day old broiler chicks of Abor-Acre strain were fed six dietary treatments in which the control diet (T1) had no pigeon pea seed meal while other diets supplemented with Allzyme SSF® contained 30% of pigeon pea seed meal processed by different methods. The enzyme was applied at 200g/tonne of feed as recommended by the manufacturer. The birds were randomly assigned to six dietary treatments and were further replicated three times with 15 birds per replicate in a complete randomized design. They were fed six experimental diets containing 23% crude protein (CP) during the starter and 20% CP during the finisher phase. The results obtained showed that birds fed the control diet had significantly ($P < 0.05$) better performance than those fed dietary treatments containing Allzyme SSF® supplemented differently processed pigeon pea seed meal in the starter phase. However, daily feed intake was not significantly ($P > 0.05$) higher for birds fed fermented pigeon pea seeds than other dietary treatments. In the finisher phase, no significant differences ($P > 0.05$) were observed among the birds fed the control diet and those fed Allzyme SSF® supplemented PPSM based dietary treatments for all the performance parameters measured except feed intake. No significant differences ($P > 0.05$) were also observed in the carcass characteristics of birds across all the dietary treatments. It was observed that 30% dietary level of inclusion of pigeon pea seeds processed by soaking + fermentation methods were better than all the other pigeon pea seeds based dietary treatments. Thus, it can be concluded that at 30% dietary level of inclusion PPSM processed by soaking and fermentation with Allzyme SSF® supplementation will enhance better feed utilization and performance with no adverse effects on carcass characteristics of broilers*

Keywords: Pigeon pea seed meal, Allzyme SSF®, supplementation, performance, broiler chicks, carcass characteristics.

Description of Problem

The ever increasing cost of livestock feeds with the attendant increase in the

cost of animal products such as meat, eggs and milk has motivated animal nutritionists to explore the non-

conventional feed ingredients as an alternative means of improving livestock production (1). One of such non-conventional protein sources is pigeon pea (*Cajanus cajan*), a perennial shrub which grows well in dry conditions and produces peas for more than one year. Pigeon pea ranked fifth among the edible grain legumes of the world in terms of importance. It is a staple crop in Puerto Rico, Bahamas and is widely grown in Asia. In Nigeria, pigeon pea is mostly found in Bendel, Plateau, Benue and Ondo. It is a multipurpose crop and is mainly grown for its mature, dry seeds. It could satisfy needs for food, animal feed, wood, agriculture and medicine. Pigeon pea contains 18-30% crude protein (2). Apata and Ologbobo (3), worked on the proximate composition of some raw Nigerian legumes seeds and reported crude protein values of 20.6 – 27.7 % for pigeon peas.

Pigeon pea seeds like most tropical legume seeds contain anti-nutritional substances which affect their utilization in poultry feeding, especially the raw seeds. Some of these anti-nutritional factors (ANFs) include protease inhibitors (trypsin and chymotrypsin inhibitors), lectins, tannins and non-starch polysaccharides (NSP) (4, 5, 6). The presence of some of these toxic factors is associated with growth depression and pancreatic hypertrophy in monogastric species (7). It has been well established that processing is required before legume seed such as pigeon pea can be incorporated into animal diets as processing improves the utilization of

protein and energy contained in legumes (8, 9). Some of these processing methods include soaking and germination, fermentation, cooking, roasting, dehulling, chemical treatment etc, Ologbobo (10) reported that soaking in water for 96 hours and germination are the most effective method of reducing phytic acid and oxalic acid in soybeans. Furthermore, soaking followed by germination considerably reduces the activity of trypsin inhibitor in pigeon pea. The report of (11) also established that soaking in water and cooking can also improve the nutritional status of grain legumes. According to Faris and Sign (12), the nutritive value of legume based fermented foods were higher than their raw components.

In the past few decades, the use of exogenous enzyme in diets for monogastric animals has been increasingly investigated and was found to exert significant beneficial effect on the nutrient digestibility and utilization. The response to the use of enzymes is greatest on the poorest quality raw materials (13). The use of enzyme enables the feed compounder to minimize feed costs through reduced usage of expensive ingredients (14). Some of these enzymes include cellulase (B-glucanases, xylanases and associated enzymes, phytases, proteases, lipases and galactosidases. Some of these enzymes have been blended together to form commercial brand. Examples are Allzyme[®], SSF[®], Maxigrain[®], Nutrasexyla[®], Rovabio[®] and, RozazymeG2G[®].

Allzyme SSF[®] is an enzyme complex that enhances the digestibility of feed thus improving the growth and economic efficiency. Major enzymes in Allzyme SSF[®] include amylase, cellulase, phytase, xylanase, beta glucanase, pectinase and protease. The objective of this study was therefore to evaluate the effects of Allzyme SSF[®] supplementation of differently processed pigeon pea (*Cajanuscajan*) seeds on the growth performance and carcass characteristics of broiler chickens.

Materials and Methods

Source of seeds and processing.

The study was conducted at the Poultry Unit, Teaching and Research Farm Department of Animal Science, Ahmadu Bello University, Samaru - Zaria, located at (11° 11'S and 38° E) in the Northern Guinea Savannah zone of Nigeria. The pigeon pea seeds used in this study were the brown variety type obtained from Samaru Kataf in Kaduna state. The seeds were divided into five batches. The first batch of 30kg was soaked in seventy five (75) litres of cold water for 24 hours under room temperature after which the water was drained and there after the seeds were sundried for 4 days, milled and included in the diets. The second batch of seeds (30 kg) was also soaked in seventy five (75) litres of cold water for 24 hours at room temperature. The water was drained, and the seeds bagged in a polythene bag to present an air tight condition for 4 days to enhance microbial degradation (fermentation). The seeds

were sundried after 72 hours for 4 days on a concrete floor before being milled and included in the diets. The next batches of 30 kg of seeds each were poured into a pot of boiling water (100⁰C) stirred at interval to allow the seeds to be uniformly cooked and allowed to boil for 35 minutes and 50 minutes, respectively. They were then removed and dried to a constant weight for 3 days before being milled and included in the diets. The last batch of seeds of 30 kg was processed by roasting. The seeds were poured into a large locally made frying pan set over burning firewood and constantly stirred for 25 minutes until a brown to darker brown colour was achieved. It was then crushed and included in the diet.

Experimental diets

Six experimental diets were formulated for both starter and finisher phases, such that the dietary treatments contained 30% pigeon pea seeds. The control diet contained no pigeon pea seed meal. The ingredient compositions of the diets are shown in Tables 2 and 3.

Experimental birds and design

Two hundred and seventy (270) day old Abor-Acre broiler chicks were used for the experiments. The birds were weighed and divided into six groups of forty-five birds each. Each group of 45 birds was sub-divided into three replicates of 15 birds per pen and was randomly assigned to the six dietary treatments in a complete randomized design (CRD).

Table 1: Proximate Composition of Raw Pigeon Pea

Parameters %	
Dry matter	90.13
Crude protein	23.50
Crude fibre	8.37
Ether extract	2.73
Ash	4.78
Nitrogen-free Extract	60.64

Table 2: Percentage Composition of Broiler Starter Diets (1-5 weeks)

Ingredients	Treatments					
	1	2	3	4	5	6
	Control	Soaked (24hrs) + Allyzme	Soaked (24hrs)+ (fermented 72hrs) + Allzyme SSF®	Boiled (35mins) + Allyzme	Boiled (50mins) + Allyzme	Roasted (25mins) + Allyzme
Maize	55.12	37.43	37.43	37.43	37.43	37.43
Soya beans	10.00	10.00	10.00	10.00	10.00	10.00
Groundnut cake	27.98	15.67	15.67	15.67	15.67	15.67
Pigeon pea	0.00	30.00	30.00	30.00	30.00	30.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	3.50	3.50	3.50	3.50	3.50	3.50
Lime stone	0.50	0.50	0.50	0.50	0.50	0.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.15	0.15	0.15	0.15	0.15	0.15
Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00
Allzyme SSF®	0.00	0.02	0.02	0.02	0.02	0.02
Calculated analysis						
Metabolizable Energy(Kcal/ kg)	2,987	2,839	2,839	2,839	2,839	2,839
Crude protein (%)	23.00	23.00	23.00	23.00	23.00	23.00
Ether extract (%)	6.70	5.00	5.00	5.00	5.00	5.00
Crude fibre (%)	3.09	4.40	4.40	4.40	4.40	4.40
Calcium (%)	1.60	1.60	1.60	1.60	1.60	1.60
Available Ph (%)	0.76	0.74	0.74	0.74	0.74	0.74
Lysine (%)	1.10	1.35	1.35	1.35	1.35	1.35
Methionine (%)	0.55	0.55	0.55	0.55	0.55	0.55
Cysteine (%)	0.36	0.33	0.33	0.33	0.33	0.33
Cost ₦/ kg of diet	56.91	54.03	54.03	54.23	55.03	55.03

*Biomix premix provided per kg of diet: Vit A. 13,340 i.u, Vit D₃ 2,680 i.u, Vit E 10 i.u; Vit K 2.68mg; Calcium Pantothenate, 10.68mg; Vit B₁ 20.022mg; Folic acid 0.668mg; Choline chloride, 400mg, Chlortetracycline, 26.68mg; Manganese 133.34 mg; Iron, 66.68mg; Zinc, 55.34mg, Copper 3.2mg; Iodine 1.86; Cobalt 0.268mg. Selenium 0.108mg.

SBSM = Soyabean seed meal

Wood shavings were used as the litter material. Heat and light were provided for the first 14 days with stoves, and electric bulbs. Feed and fresh water were provided *ad libitum*. The experiment lasted for 9 Weeks. Routine vaccines and drugs were administered as at when due.

Data collection

The initial body weight, weekly body weight and feed intake of the birds as well as mortality throughout the experiment were recorded. At the end of the experiment, performance parameters such as final weight, feed intake, weight gain, feed to gain, feed cost per kg gain and mortality were calculated.

Carcass analysis

At the end of the feeding trial, three birds per treatment (one bird per replicate representing the average weight of the replicate group) were selected for carcass evaluation. Before slaughter, the birds were fasted overnight to clear the guts after which they were weighed and slaughtered by the neck slit and allowed to bleed properly. After slaughtering and bleeding, the carcasses were deeped in warm water at (65°C) bath for 5 minutes before defeathering. The defeathered chickens were later eviscerated. The carcasses were weighed and cut into different parts i.e head, neck, breast, back, wing, thigh and shank and the internal organs (intestines, gizzard, kidney and liver) were separately weighed. Live weight, dressing percentage and weight of cut parts and internal organs were recorded. Weights

of cut parts relative to dressed weight were expressed as percentages.

Data analysis

All empirical data generated were subjected to analysis of variance (ANOVA) using the general linear model (15) and significant difference between treatment means were separated using the Duncan's Multiple Range Test (16).

Results and Discussion

The results of the effect of Allzyme SSF[®] supplementation on the performance of broiler chickens fed differently processed pigeon pea (*Cajanus Cajan*) seeds for starter phase are presented in Table 4. Significant differences ($P < 0.05$) were observed in final weight, average daily gain, feed to gain ratio, feed cost per kg gain and mortality due to supplementation of the dietary treatments. However, feed intake was not significantly ($P > 0.05$) affected by enzyme supplementation. The final body weight of birds fed the control diet (1160g) were significantly higher ($P < 0.05$) than those fed other dietary treatments. Birds fed pigeon pea seeds soaked for 24 hours had significantly ($P < 0.05$) higher final weight (841g) than those on other PPSM based diets. However, the birds fed diet 5 containing pigeon pea seeds boiled for 50 minutes had the least value (594.10g). The same trend was observed for daily weight gain with the birds on the control and those on diet 2 having 32.03g and 22.8g, respectively, and were significantly ($P < 0.05$) better than those on other PPSM based diets.

Table 3: Percentage Composition of Broiler Finisher Diets (6-9 Weeks)

Ingredients	Treatments					
	1 Control	2 Soaked (24hours) + Allzyme	3 Soaked + (fermented 72 hrs) + Allzyme	4 Boiled (50mins) + Allzyme	5 Boiled (50mins) + Allzyme	6 Roasted (25mins) + (Allzyme)
Maize	63.95	46.24	46.24	46.24	46.24	46.24
Soyabeans	10.00	10.00	10.00	10.00	10.00	10.00
Groundnut cake	19.50	7.21	7.21	7.21	7.21	7.21
Pigeon pea	0.00	30.00	30.00	30.00	30.00	30.00
Fish meal	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00
Limestone	0.50	0.50	0.50	0.50	0.50	0.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00
Allzyme SSF	0.00	0.02	0.02	0.02	0.02	0.02
Calculated Analysis						
Metabolizable	3,081	2,928	2,928	2,928	2,928	2,928
Energy (Kca/kg)						
Crude protein %	20.00	20.00	20.00	20.00	20.00	20.00
Ether extract%	6.30	4.80	4.80	4.80	4.80	4.80
Crude fibre %	3.00	4.00	4.00	4.00	4.00	4.00
Calcium %	1.70	1.70	1.70	1.70	1.70	1.70
Available Ph %	0.70	0.70	0.70	0.70	0.70	0.70
Lysine %	1.20	1.25	1.25	1.25	1.25	1.25
Methionine %	0.56	0.58	0.58	0.58	0.58	0.58
Cysteine %	0.32	0.30	0.30	0.30	0.30	0.30
Cost N/kg of diet	57.14	55.80	55.80	56.00	56.80	56.80

*Bio-mix premix provided per kg of diet: Vit A, 13,340 i.u., Vit D₃ 2,680 i.u., Vit E 10 i.u., Vit K 2.68 mg; Calcium pantothenate, 10.68 mg; Vit B₁ 20.022mg; Folic acid 0.668mg; Choline chloride 400mg, Chlortetracycline, 26.68; Manganese 133.34mg; Iron, 66.68mg; Zinc, 55.34mg, Copper 3.2mg; Iodine 1.86; Cobalt 0.268mg; Selenium 0.108mg SBSM = Soyabean seed meal

The significantly higher final weight and daily weight gain exhibited by birds fed the control diet could be due to high nutrient profiles of soybean and

groundnut resulting in efficient utilization of the protein supplied. Performance of birds fed PPS soaked for 24 hours could be attributed to the reduction of some

anti-nutritional factors that might have enhanced palatability of the diet coupled with Allzyme SSF[®] supplementation to bring about improved nutrient digestion, absorption and utilization. This result agreed with the findings of (17) who reported that soaking and cooking can eliminate or reduce the phytic acid content present in pigeon pea and mung beans. The report of (18) also established that enzyme supplementation significantly improved the performance of broiler chicken. No significant ($P>0.05$) differences were observed in average daily feed intake of birds across the dietary treatments. However, the higher feed intake observed in birds fed diet 3 could be attributed to the palatability of the diet. The result of the feed to gain ratio showed that birds on the control diet and diet 2 with 1.23 and 1.47, respectively were most efficient ($P<0.05$) compared to those on other PPSM based diets. This result could be linked to efficient conversion of protein in the feed ingredients for tissue deposition by birds on diets 1 and 2. The same trend was observed for cost per kg gain with birds on Diet 1 and 2 having the least cost per gain (N70.00 vs N79.42) compared to birds fed diets 3, 4, 5 and 6. Birds fed PPSM boiled for 50 minutes based diet had the highest feed cost per kg gain compared to birds fed other dietary treatments. It appears soaking pigeon pea seeds for 24 hours were more cost effective than other processing methods. This could be as a

result of the reduced cost per kg of the diets and corroborated the findings of (19). The percentage mortality varied from zero to 2.94% and could not be linked to the the dietary treatments. This suggests that inclusion of processed Pigeon pea seeds in broiler diets posed no threat to the health of the animals. The performance of finisher broilers fed differently processed PPSM supplemented with Allzyme SSF[®] are presented in Table 5. There were no significant differences ($P>0.05$) observed across the dietary treatments except feed intake. birds on control diet had non significant ($P>0.05$) better final body weight, average daily gain, feed to gain ratio, feed cost per kg gain and mortality than those on PPSM based dietary treatments. However, birds fed diet 3 containing pigeon pea seed soaked + fermented had non significantly ($P>0.05$) higher values when compared with those on other PPSM based diets. The improved final weight (1980g) observed for the control group compared to birds fed PPSM based diets could be due to the relatively high nutrient profiles of soybean and groundnut cake than pigeon pea. It also implies that more energy must have been made available and utilized by the birds for improved weight gain.

Table 4: Performance of Broiler Starter (1-5 Weeks) Fed Differently Processed Pigeon Pea Seeds Based Diet with Allzyme Supplementation

Parameters	Treatments						SEM	LOS
	1 Control	2 Soaked (24 hrs) + Allzyme SSF®	3 Soaked (24 hrs) + Fermented (72 hrs) + Allzyme SSF®	4 Boiled (35 mins) + Allzyme SSF®	5 Boiled (50 mins) + Allzyme SSF®	6 Roasted (25 mins) + Allzyme SSF®		
Initial weight (g)	40.00	40.00	40.00	40.00	40.00	40.00	0.00	NS
Final weight (g)	160 ^a	41.10 ^b	33.10 ^{cd}	38.39 ^{cd}	94.10 ^d	17.60 ^c	1.47	
Average daily feed intake (g)	39.65	33.57	43.44	42.13	42.24	43.01	6.85	NS
Average daily gain (g)	32.03 ^a	22.88 ^b	16.95 ^{cd}	17.09 ^{cd}	15.83 ^d	19.36 ^c	1.18	*
Feed: Gain ratio	1.23 ^a	1.47 ^a	2.56 ^b	2.46 ^b	2.67 ^b	2.22 ^b	0.55	*
Feed cost/kg gain (₦)	70.00 ^a	79.42 ^b	138.32 ^{cd}	133.40 ^{cd}	146.93 ^d	122.17 ^c	17.47	*
Mortality (%)	2.94 ^a	0.00 ^b	0.00 ^b	0.42 ^b	1.26 ^{ab}	0.84 ^b	0.35	*

Means on the same row with different superscripts differ significantly ($P < 0.05$) NS: Not significant ($P > 0.05$). SEM: Standard error of means. LOS: Level of significance. *= $P < 0.05$

Table 5: Performance of Broiler Finisher (6 – 9 Weeks) Fed Differently Processed Pigeon Pea Seeds Based Diets with Allzyme SSF® Supplementation

Parameters	Treatments						SEM	LOS
	1 Control	2 Soaked (24hrs) + AllzymeSSF®	3 Soaked (24 hrs) + Fermented + Allzyme SSF®	4 Boiled (35 mins) + Allzyme SSF®	5 Boiled (50 mins) + Allzyme SSF®	6 Roasted (25 mins) + Allzyme SSF®		
Initial weight (g)	780.00	780.00	780.00	780.00	780.00	780.00	0.00	NS
Final weight (g)	1980.00	1602.00	1866.00	1582.20	1662.00	1740.60	227.00	NS
ADFI	72.72 ^b	58.46 ^c	86.75 ^{ab}	80.64 ^{ab}	89.63 ^a	88.00 ^{ab}	6.74	*
ADG	42.86	29.36	38.79	28.65	31.50	34.30	8.12	NS
Feed:Gain Ratio	1.69	1.99	2.23	2.81	2.85	2.57	0.78	NS
Feedcost/kg gain (₦)	96.57	111.04	124.43	157.36	161.88	145.98	49.49	NS
Mortality (%)	4.20	5.46	6.72	5.04	5.88	5.13	1.67	NS

abc: Means on the same row with different superscripts differ significantly ($P < 0.05$) NS: Not significant ($p > 0.05$) SEM: Standard error of means. LOS: Level of significance ADFI=Average daily feed intake (g) ADG Average daily gain (g)

Birds on the control diet had the least feed to gain ratio (1.69) and cost per kg gain (₦96.57) followed by those on diet 2 containing PPSM soaked for 24 hours with 1.99 and ₦111.04 respectively. However, the feed to gain and the cost per kg gain were not significantly ($P>0.05$) different across the dietary treatments. This trend of result could be linked to improved feed utilization and tissue deposition by birds across all the dietary treatments. This supported the report of (20) and (21) that variation in bird performance is reduced when enzymes are added to the feed.

The results of carcass characteristics and relative organ weights of broiler birds fed the experimental diets are shown in Table 6. All carcass parameters measured were

not significantly ($P>0.05$) affected across the treatment groups. This supported the reports of (20) that variation in birds' carcass characteristics is reduced when enzymes are added to their diet. However, the relatively higher values in live weight and dressed weight showed by birds fed diet 1 (control), 3 (soaked + fermented pigeon pea with Allzyme SSF®) and 6 (roasted pigeon pea with Allzyme SSF®) could be attributed to good nutrient utilization. This agreed with (8, 9) who reported that processing improves the utilization of proteins and energy contained in legumes for growth. Generally, organ weights of birds fed pigeon pea seed meal diets were relatively higher ($P<0.05$) than those fed the control diet.

Table 6: Carcass Characteristics of Broiler Chickens Fed Allzyme SSF® Supplemented Differently Processed Pigeon Pea Seeds Based Diets (Expressed as percentage of live weight).

Parameters	Treatments						SEM	LOS
	1 Control	2 Soaked (24 hrs) + Allzyme SSF®	3 Soaked (24 hrs) + Fermented + Allzyme SSF®	4 Boiled (35 mins) + Allzyme SSF®	5 Boiled (50 mins) + Allzyme SSF®	6 Roasted (25 mins) + Allzyme SSF®		
Live weight (g)	1980.00	1602.00	1866.00	1582.20	1662.00	1740.60	227.37	NS
DWt (g)	1576.70	1178.70	1486.30	1345.00	1323.75	1430.00	224.28	NS
Dressing (%)	79.63	73.58	79.65	85.00	79.65	82.16	8.75	NS
Heart (%)	0.48	0.57	0.50	0.56	0.47	0.68	2.73	NS
Liver (%)	2.73	3.11	2.87	3.28	2.96	4.62	15.27	NS
Gizzard(%)	2.89	2.96	3.27	3.67	3.06	3.22	29.90	NS
Kidney (%)	0.54	0.57	0.45	0.55	0.69	0.74	5.26	NS
Spleen (%)	0.11	0.16	0.15	0.16	0.18	0.17	6.65	NS
Lungs (%)	0.53	0.56	0.68	0.69	0.55	0.92	4.86	NS
Breast (%)	13.45	11.58	10.69	15.17	14.53	13.11	42.63	NS
Head (%)	3.08	3.60	3.24	3.27	3.36	3.76	7.10	NS
Back (%)	12.62	11.46	14.39	15.42	12.84	13.55	38.49	NS
Wings (%)	8.79	8.47	8.62	10.25	9.28	9.80	31.77	NS
Thigh (%)	19.07	16.50	16.50	21.51	19.23	20.44	59.28	NS
Leg (%)	4.87	5.14	5.21	4.08	4.67	6.06	19.56	NS
Neck (%)	4.80	4.33	4.59	4.17	5.03	4.71	16.84	NS
Length of SI (cm)	219.99	222.00	257.01	228.99	219.99	233.01	66.81	NS

abc: Means on the same row with different superscripts within the same row differ significantly (P<0.05) NS: Not significant (P>0.05), * Significant (p<0.05); LOS: Level of significance, SEM: Standard error of means
SI: Small DWt Dressed weight (g) intestine

Conclusion and Application

1. Allzyme SSF® supplementation significantly improved the utilization of pigeon pea seeds processed by soaking in broiler starter diets at 30% dietary level of inclusion.
2. Allzyme SSF® supplementation significantly improved the utilization of pigeon pea seeds processed by soaking + fermentation in broiler finisher diets at 30% dietary level of inclusion.

3. Allzyme supplementation of differently processed pigeon pea seeds had no negative effect on the performance and carcass characteristics of broiler chickens.
4. For effective and desirable results Allzyme SSF® supplementation of pigeon pea seeds processed by soaking and fermentation at 30% inclusion level in broiler diets is recommended.

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