

UTILIZATION OF PROSOPIS PODS WITH AND WITHOUT ENZYME IN BROILER DIETS

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Received: 25/11/2012

Accepted: 26/12/2012

ABSTRACT: *Prosopis juliflora pods (pp), as unconventional feed ingredients was incorporated in broiler diets by replacing sesame cake at 0, 5, 10 and 15 per cent with or without enzyme. An experiment with 7 day-old commercial Ross 308 broiler chicks were randomly distributed in 8 treatment groups of 21 chicks in each with three replicates. Chicks fed on diet containing 5%Prosopis pod (PP) replacing sesame meal supplemented with enzyme recorded significant ($P < 0.05$) heavy body weight, body weight gain, more feed intake, and the best value of feed conversion ratio. No significant differences were noticed in percent values of eviscerated carcasses and selected commercial cuts (breast, drumstick and thigh) due to dietary inclusion of (pp) with or without enzyme supplementation. Also there were no significant differences ($P > 0.05$) were recorded for physical and chemical composition of broiler meat, feces chemistry and constituents of blood plasma. Enzyme supplementation apparently improves the general performance of broiler chicks in all dietary treatments. Economically Prosopis pods may be safely included in broiler diets replacing sesame meal up to 15% with or without enzyme without any adverse effect.*

INTRODUCTION

Poultry feed costs about 65-70% of the total variable cost. In broiler diets, the plant protein constitute about 28%, and attributed mainly from sesame and groundnut cakes. Today, the price of sesame cake, which is the major source of plant protein in Sudan, has continued to increase, and this was attributed to declining production and increasing demand by the rapidly expanding poultry industry. Consequently there is an interest in the search for new alternative (Jurgen *et al.*, 1988 and Mukhtar, 2007). Previously attempts have been made at using the grinded Prosopis pods as a mixture for human and livestock feed. Mesquite local name of Prosopis, now occupies many hectares and distributed widely in Sudan,

many methods of controlling and or eliminating mesquite growth were tried.

The whole pods of Prosopis species contain 9-17% protein (Meyer *et al.*, 1982); 13-31% sucrose (Becker, 1982) and 17-31% crude fiber (Meyer *et al.*, 1982). Using of Prosopis pod in higher amount in poultry diet is not suitable, because it contains some anti nutritional factors such as phytate antitrypsin, non-starch polysaccharides which decrease feed consumption, growth rate and feed utilization by increasing gut viscosity and thus reducing the availability of nutrients for digestion and absorption (Choct and Annism, 1992).

Enzymes are natural products of fermentation, their use has predominantly been related to the hydrolysis of fiber or non – starch polysaccharides (NSP)

fractions. So, the addition of enzyme (xylanase) improved body weight, body weight gain, feed intake and feed conversion ratio, by enhancing the overall digestibility of energy and protein (Pourreza et al., 2007).

The objective of this study was to verify the nutritional value of *Prosopis juliflora* pods as plant protein source and energy supplement replacing sesame cake with or without enzyme(xylam500) and to evaluate the effect of enzyme addition in the broiler diet high in fiber content.

Materials and Methods

This experiment was conducted at poultry production farm, College of Agricultural Studies, Sudan University of Science and Technology, during the period from 8th April to 23th May 2010, in an ambient temperature ranged between 27.6 and 35.3c.

Pods of *Prosopis* were harvested and stretched in a well-ventilated opened building till they were dried, cleaned, and milled in an electric mill to pass through a forty mesh sieve. Milled pods then subjected to a process of drying for overnight, a sample was taken for analysis, then sealed in plastic bags and stored.

According to the results of approximate analysis, four experimental diets (A,B,C and D),were formulated, to meet the nutrient requirements of broiler chicks according to NRC (1994). Diet A as a negative control (NC) (without prosopis pod, xylam), diet A2 (positive control, PC), Diets B₁, C₁ and D₁, were formulated to contain graded levels (5, 10 and 15%) of *Prosopis* pods flour replacing sesame cake respectively.

Diets B₂, C₂ and D₂ were similar to diets B₁, C₁ and D₁ but they were supplemented with 50g/ kg xylam 500. The ingredients inclusion percent and calculated composition of the experimental diets were presented in Table (1).

One hundred and sixty eight, 7-days old unsexed broiler chicks (Ross 308) were

used after a week of adaptation period. Chicks were randomly distributed to eight treatment groups with three replicates of 7 chicks per each replicate, in an open wire mesh-side poultry house. Feed and water were provided freely. Light was provided 24 hours, in a form of natural light during the day and artificial during night.

Chicks of each replicate were group weighed at weekly intervals and feed consumption was recorded at the time of weighing- then conversion ratio (FCR) and body weight gain were calculated weekly, mortality was recorded daily throughout the experimental period.

At the end of the experiment, the birds were fasted overnight except from water. Birds were weighed and 3 birds were randomly selected from each group, weighed individually and slaughtered. Jugular blood samples from each bird were collected into clean dry bottles and allowed to clot and stored to analysis, the slaughtered chicks were scaled in hot water, feather plucked manually then washed, and eviscerated for carcass characteristics. Hot carcass, heart, gizzard, abdominal fat and liver without gall bladder were measured. The carcasses were chilled at 4% for 24 hours for carcass characteristics and meat yield.

The chilled carcasses were weighed (cold weight) after 24 hours, and then they were sawed into two halves. The left side then divided into the commercial cuts (breast, drumstick, and thigh). Each cut was weighed individually then deboned to determine the weight of meat of each cut. The meat was frozen for analysis.

Stored meat samples were cut into small pieces, minced twice and duplicate samples were analyzed for proteins, fat, ash and moisture contents according to the AOAC, (1975). Also stored feces samples were analyzed to determine the effect of different levels of *Prosopis* pods and enzyme supplementation in feces chemical composition. The separated serums from the collected juglar blood samples were

also analyzed. The data obtained were subjected to analysis of variance following complete randomized block design, and the comparison of means determined by using Duncan's multiple range tests (Duncan's, 1955).

Results and Discussion

Results obtained showed no differences between negative control (NC) and positive control (PC) in the performance of broiler chicks. But there was a numerical improvement with the addition of enzyme in the performance of chicks. That might be explained due to low level of PPF dietary supplementation. This result did not agree with the report of Al Betawi *et al.*, (2010). Who found significant ($P < 0.05$) increase in body weight, body weight gain and FCR.

Supplementation of the diets with enzyme (xylam 500) improved the chicks performance compared to other tested groups.

Chicks fed on diet contained 5% Prosopis pods flour supplemented with enzyme recorded significantly ($P < 0.05$) heavy body weight, more feed consumption, high body weight gain and best FCR. This might be due to that the enzyme improve significantly ($P < 0.05$) the nutrient and digestibility availability. The result was in agreement - with the report of (Mathouthi *et al.*, 2002 and Pourreze *et al.*, 2007), but in disagreement with that obtained by Makkawi (2009). Also the significant increase in feed consumption of this group might refer to the decrease of energy availability in the diet which leads to feed intake increased as a compensatory mechanism of the birds or the positive effects of the enzyme on the digestive system. This result was in agreement with the reports of (Arija *et al.*, 1998; Soliman *et al.*, 1996).

Feed conversion ratio showed no significant ($P > 0.05$) between treatments up to 10% PPF in the diets with and without enzyme. However the chicks fed on diets

containing 15% PPF with and without enzyme recorded significantly ($P > 0.05$) the lowest value for feed conversion ratio.

Compared to other tested groups. The result was in agreement with the report of Makkawi (2009), who related the negative response of FCR to the destruction of lysine and methionine, also might be due to the importunate increase in the body weight gain to the feed intake at higher levels of PPF in the diets or due to inadequacy of the enzyme in proportion to the amount of non starch polysaccharides. This result was in conformity with the findings of Mutetwa and Rukuni (1998) and Rehman *et al.*, (2002).

The level of Prosopis pods flour or the enzyme supplementation had no significant effect on the mortality rate of the tested chicks, although the chicks fed on diet containing 5% Prosopis pods flour without enzyme recorded the highest percentage of mortality.

The effect of feeding on body components were expressed as a percentage of hot eviscerated body weight (Table 3) and percentage of commercial cuts (breast, drumstick and thigh) on the weight of selected cuts. No significant ($P > 0.05$) differences were observed due to Prosopis pod flour level / or supplementation with enzyme in percentages of dressing and commercial cuts yield (Table 3), meat chemical composition and blood plasma constituents and chemical composition of broiler feces (Table 4) These results were in agreement with the report of Makkawi (2009), and Al Betawi *et al.*, (2010).

Based on the results it can be concluded that Roselle seed can be incorporated in broiler diets up to 15% with enzyme without any adverse effects. The supplementation of enzyme apparently improved the performance of chicks. The inclusion of RS with and without enzyme did not affect on the percentages of non carcass component, carcass characteristics and meat objective and subjective values, while it resulted in significant reduction on

serum cholesterol and level of AST enzyme activity compared to control diet. Inclusion of RS up to 15% with enzyme recorded

economically more profit and profitability ratio compared to all tested diets.

Table (1): Diet Composition

Ingredients	0% PP(A₁)	5% PP(B₁)	10% PP(C₁)	15 % PP(D₁)
Sorghum Grain	65.00	61.0	54.1	49.00
Ground nut cake	13.0	19.4	20.0	21.86
Sesame cake	15.0	7.0	7.0	5.1
Prosopis pod	-	5.0	10.0	15.0
Super concentrate*	5.0	5.0	5.0	5.0
Oyster shell	1.0	0.755	0.73	0.7
Salt	0.25	0.25	0.25	0.25
Methionine	0.09	0.122	0.1	0.1
Lysine	0.66	0.541	0.6	-
Vegetable oil	-	0.732	2.02	2.79
Vitamin**	-	0.2	0.2	0.2
Total	100	100	100	100

Calculated chemical composition of experimental Ingredients (%)

ME (kcal/kg)	3103.33	3102.29	3103.76	3104.765
Crude protein	22.0	22.0	22.0	22.0
Lysine	2.12	2.0	2.1	2.12
Methionine	0.55	0.54	0.54	0.54
Calcium	1.18	1.0	1.02	1.0
Phosphorus (Av.)	0.65	0.6	0.69	0.58
ASH	6.4	7.4	6.95	6.9
Crude Fiber	4.1	5.2	6.3	7.5
Ether Extract	4.56	4.1	4.1	3.98
NFE	37.06	38.7	39.35	40.38

ME=Metabolizable energy, NFE= nitrogen free extract

Broiler concentrate: Crude protein 40%, crude fat 3%, crude fiber 1-5% Lysine 13-5%, Methionine 5-9%. Methioni+necystein 60.25%, calcium 6.8% Phosphorus

Prosopis pod, unconventional feed, enzyme supplementation

Table (2): Performance of broiler chicks fed graded levels of Prosopis pods flour with or without enzyme for 6weeks

Treatments	Initial wt (g/b)	FBW (g/b)	Feed intake (g/b)	BWG (g/b)	FCR	Mortality %
Control	199.83	1769.8 ^a	3307.15 ^a	1571.13 ^a	2.11 ^a	0.6
Control+E	198.33	1824.29 ^a	3386.57 ^a	1625.0 ^a	2.09 ^a	0.0
5%PP	197.14	1827.62 ^a	3437.95 ^{ab}	1630.62 ^a	2.11 ^a	1.19
5%PP+E	208.33	2080.43 ^b	3639.82 ^b	1872.09 ^b	1.94 ^a	0.0
10%PP	201.67	1786.19 ^a	3333.8 ^a	1584.69 ^a	2.1 ^a	0.6
10%PP+E	202.95	1833.57 ^a	3505.33 ^b	1650.62 ^a	2.11 ^b	0.0
15%PP	196.42	1775.0 ^a	3607.92	1578.24 ^a	2.25 ^b	0.0
15%PP+E	209.28	1897.12 ^a	3699.57 ^{ab}	1685.11 ^a	2.19 ^b	0.6
SEM+	-	45.03	72.9	44.91	0.7	-

Values are means of 9 chicks per dietary treatment. , PP=Prosopis pod. E=enzyme. , SEM ±Standard error of means. **BWG= body weight gain. FBW=final body weight**
a,b,c= Means with the same letters on the same column are not significantly differences (P>0.05).

Table (3): Effect of feeding broiler chicks on experimental diets on hot carcass weight and yield of commercial cuts.

Items	Control	Control +E	5% PP	5% PP+E	10% PP	10% PP+E	15% PP	15% PP+E
Hot carcass wt (g/b)	1838.33	2041.67	1921.67	2010.0 ^a	1810.0 ^s	1890.0 ^b	1695.0 ^b	1973.33 ^b
Breast *	21.21	24.24	22.72	23.13	22.83	22.83	22.28	22.52
Drumstick *	7.04	7.10	7.03	7.17	6.35	7.14	6.19	6.84
Thigh*	5.17	5.88	5.18	5.22	5.18	5.19	4.72	5.32
Wing *	4.35	5.04	4.68	4.73	5.02	4.14	4.15	4.81
Liver **	2.04	1.83	2.14	2.04	2.14	2.18	2.41	1.93
Abdominal fat **	1.47	1.03	0.84	1.44	1.23	1.49	0.43	1.04
Heart **	0.42	0.67	0.36	0.36	0.38	0.46	0.36	0.45

*As (%) of hot carcass **as (%) of final body weight.

E=enzyme ,PP= Prosopis pods

Table 4: Chemical Composition of carcass meat and feces of broiler chicks fed on experimental diets

Items	Control	Control +E	5% PP	5% PP+E	10% PP	10% PP+E	15% PP	15% PP+E
DM	37.25	36.15	32.75	32.5	36.9	34.1	34.85	35.1
CP	16.7	17.0	17.5	17.85	17.25	17.35	17.35	17.5
Ash	1.1	1.3	1.35	1.35	1.25	1.25	1.25	1.25
EE	2.75	2.95	3.1	3.15	3.05	2.95	3.0	3.1

Chemical composition of broiler Chicks feces:

DM	94.25	96.25	93.25	95.25	94.7	95.25	93.25	95.85
CP	6.3	6.57	5.89	5.55	5.45	5.3	5.3	5.4
Ash	14.8	15.2	11.6	12.9	13.1	13.15	13.15	11.95
EE	2.75	2.65	2.45	2.35	2.3	2.2	2.35	2.35

DM=dry matter, CP=crude protein, EE=ether extract

E=enzyme. PP= prosopis pod

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الملخص العربي

استخدام ثمار المسكيت مع او بدون الانزيم في تغذية الدجاج اللحم

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تم استخدام ثمار المسكيت كمكون علفي غير تقليدي في علايق الدجاج اللحم بالنسب الاتية: 0, 5, 10 و 15% مع او بدون انزيم الزيلاينيز (الزيلام 500). تم اجراء التجربة باستخدام 168 كتكوت لآخم غير مجنس من سلالة (روص 308) في عمر اسبوع. وزعت عشوائيا الي 8 مجموعات بكل مجموعة 21 كتكوت, قسمت كل مجموعة الي ثلاثة مكررات متساوية.

سجلت الكتاكيت التي تغدت على العليقة 5% ثمار المسكيت مع اضافة الانزيم فروقات معنوية في كل من الوزن النهائي, الوزن المكتسب والكفاءة التحويلية. بينما سجلت الكتاكيت المغداة على 15% ثمار المسكيت بدون انزيم وجميع الكتاكيت والتي تغدت على المستويات المختلفة من ثمار المسكيت مع اضافة الانزيم فروقات معنوية للعليقة المستهلكة.

اوضحت النتائج عدم وجود فروقات معنوية للمعاملات مختلفة في نسب التصافي, الوزن الحار, القطع التجارية, التركيب الكيميائي للحم, الاختبارات الحسية للقطع التجارية المختارة (الفخد, الصدر, الساق) وقياسات الدم. اظهرت النتائج ان اضافة الانزيم في علائق الدجاج اللحم تحسن الاداء العام في كل المعاملات اقتصادية انه يمكن اضافة ثمار المسكيت في علائق الدجاج اللحم حتى 5% مع اضافة الانزيم دون اي تاثيرات سالبة.