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EFFECT OF FEEDING FULL FAT SAFFLOWER SEED WITH AND WITHOUT ENZYME ON THE PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKS

Daffa alla AA, Mukhtar Ahmed Mukhtar* and KA Mohamed

Department of Animal Production, College of Agricultural Studies -Sudan university of Science and Technology, Sudan.

ABSTRACT

This experiment was carried out to evaluate inclusion of various levels (o, 5, 10, 15 and 20 %) of full fat safflower seed (FFSS) with and without enzyme on the performance of broiler chicks. Total of one hundred and five, seven day –old unsexed broiler chicks were used. Five experimental diets (A, B, C, D and E) containing graded levels of FFSS (0.0, 5.0, 10.0, 15.0, and 20%) were formulated; the same diets were supplemented with xylam 500 enzyme to have ten experimental diets. Each treatment was subdivided into three replicates. The treatments were distributed in a complete Block randomize design (CRD).Results showed that FFSS can replace sorghum in the broiler diet as a source of energy without any adverse effects on the performance and carcass yield. The supplemental of commercial enzyme (xylam 500) to diets containing different levels of FFSS improved the broiler chick's performance, results also revealed that it is economical to use FFSS with and without enzyme as a source of energy in a broiler chicks diets.

Key words: Full fat safflower seed, Commercial enzyme, Broiler chicks.

INTRODUCTION

The poultry industry occupied a leading role among agricultural industries in many parts of the world. Intensive poultry production in Sudan goes back to 1972 as small scale around capital and other big cities. The provision of good protein in shortest period of time in form of meat and eggs is the major contributing role of poultry in human nutrition; Poultry feed cost about 65-70% of total variable cost (Smith 1996). The energy and protein sources materials were contributed by 65-70% and 28% in feed mixture respectively. Today the price of poultry diet ingredients mainly, the energy and protein sources continued to increase and this was attributed to decline in production and increasing demand with the rapidly expanding in poultry industry. Consequently there is an interest in searching for alternative sources of poultry feed of plant species (Mukhtar, 2007). Oilseeds are one of the best and common energy sources in poultry nutrition (Dajue and Mudel, 1996).

Full-fat Safflower seed is available on the market today, it contains about 15-19% crude protein, 28-35% ether extract, 15-19% crude fiber, 30-32% acid detergent fiber and 40-45% natural detergent fiber (Hill and Knowles, 1968; Weiss 1983), choline magnesium, lysine, pyridoxine, biotin, pathothenic acid (Oguz and Oguz, 2007).

Corresponding Author

Mukhtar Ahmed Mukhtar
Email: mukhtar18201169@gmail.com

MATERIALS AND METHODS

The experiment was carried out at experimental farm of Department of Animal Production, Collage of Agricultural Studies, Sudan University of Science and Technology, Khartoum North, Shambat during 25/05/2012 to 26/06/2012.Total of two hundred and ten, seven days old unsexed broiler chicks (cob 500) were purchased from a commercial company. All chicks were weighted with an average weight 41g /day old; chicks were adopted to premises and fed over 7 days before start of the experiment on basal diets.

After 7 days the chicks were weighted and distributed to ten experimental groups each group was further divided into three replicates, each with 7 chicks.

Chicks were vaccinated against Gumboro at 13 days age and repeated after a week, and vaccinated against Newcastle disease at 8 days and repeated after a week. Soluble multivitamin compound and antibiotic were given to the chick before and after vaccination in order to guard against stress. Mechanical ventilation system used to provide the required level of uniformity of air distribution over wide range of climatic condition. Two exhaust fans (fan diameter 1.29 with air 44500 m2 / h) were, sited in the middle of the west wall to maintain negative pressure in poultry house.

Experiments pens (1.5 * 1 m.) were prepared using wire mesh portioning then were clean washed and disinfected by formalin and white phenol solution. Chicks were kept in a semi closed house.

Each pen was provided by (5 kg) rounded feeder and (2.5 lit.) baby drinker which were adjusted to the progressive growth of chicks. The light program is 24 hours light from 1-3 days and 23 hours day for the rest period.

According to the approximate analysis of safflower seeds table (1) ten experimental diets were formulated containing full fat- safflower seeds (FFSS) at (0,5,10,15 and 20%) to be iso-Nitrogenous 22% and iso carloric (3100K/cal/Kg) with and without a commercial enzyme (xylam 500, 50 gm/100 Kg. ,to meet the requirement of broiler chicks according to NRC (1994).

Experimental diets were formulated as follow

Diet 1 as negative control (without FFSS and enzyme).Diet 2 as positive control, diets 3,4,5 and 6 formulated to contain graded levels (5,10,15 and 20%) of FFSS respectively, diets 7,8,9 and 10 were similar diets to 3,4,5 and 6 but they were supplemented with(50 g/Kg xylam 500 composed of Endo-1.4-B- xylanse 126 u/g and amylase 800 u/g, it is produced by Nutrex Company for feed enzyme Production Acherstemhoek 5,22275 Lille Belgium,) enzyme respectively. The calculated composition of the experiment diets was present in table (1).

The experimental continued for 42days and chicks were fed ad libitum .chicks of each replicate were weighted weekly intervals, feed intake was recorded at weighting, feed conversion ratio (FCR) and body weight gain were calculated weekly, mortality was recorded daily al-throughout the experiment period.

At the end of the experiment (42 days) the birds were fasted over night except from water, the birds were weighted and 3 birds were randomly selected from each group, then were weighted individually and slaughtered, after bleeding the slaughtered birds were scatted in hot water and feathers plucked manually, then washed, the skull, feet and shanks were removed at the hook joint and eviscerated for carcass characteristics , hot carcass, heart, head, Gizzard, abdominal fat and liver without gall bladder were measures.

The carcasses were divided into two halves each half was divided into commercial cuts (drumstick, thigh and breast) they were washed and deboned, meat of each cut was stored at refrigerate for analysis and panel taste. The commercial cuts were calculated as percentage of hot carcass, non carcass components (heart, head, legs, Gizzard and liver) abdominal fat were expressed as percentage of live weight, meat and of each cut were expressed as percentage of the weight of their cuts.

Pieces of meat were slightly seasoned wrapped individually in aluminum foil and toasted at 190° c for 70 minutes. Ten well trained taste panelists were used to score, color, flavor, tenderness and juiciness (Cross *et al* (1978) then samples were served to panelists with water to rinse their mouth after each sample.

The data obtained were subjected to analysis of variance following complete randomizes block design and comparison of means determined by Duncan's range test (Duncan, 1955).

RESULTS

The results of broiler chicks fed on diets containing graded levels of safflower seed with and without enzyme illustrated in table (2) results showed no significant ($p > 0.05$) difference between positive and negative control in body weight gain , chicks fed on diet supplemented with 5% and 10 % (SFS) recorded significant low ($p > 0.05$) values in body weight compared to all experiment chicks groups except group fed on 10 % SFS without enzyme supplementation of broiler chicks diets containing different levels of SFS with enzyme significantly ($p < 0.05$) improved body weight .

Result revealed that chicks fed on diet containing 5% without enzyme recorded significantly ($p > 0.05$) difference between other group with and without enzyme, although enzyme supplementation increased feed intake for all level of SFS.

Result also showed that chicks fed on diet containing 10 % S.F.S. supplemented with enzyme recorded significantly ($p < 0.05$) the best feed conversion ratio (FCR) while chicks fed on diet containing 5 % and 15 % S.F.S. with and without enzyme and 20 % with enzyme recorded similar value of (FCR) although both control group and 20 % without enzyme recorded significantly ($p > 0.05$) the lowest values. The mortality rate of experimental chicks showed no significant different all through the experimental period.

Results for the commercial cuts showed that chicks fed 10% of SFS with enzyme showed significantly ($p < 0.05$) the heaviest weight for breast while those on other experimental groups recorded similar value for the

breast (Table 6) .The same trend showed for breast meat and bone ratios, the treatment did not affect significantly (p > 0.05) on thigh and drumstick . Dressing and giblets results were showed no significant(p>0.05) difference for giblets (liver , heart , gizzard and abdominal fat), chicks fed on both negative and positive control recorded significantly (p >0.05) low value for liver but other tested groups recorded similar values ,also the same trend was recorded for heart values .

Chicks fed on both control groups 5, 15% and 20% SFS with enzyme recorded significantly the lowest (P> 0.05) values for gizzard ,however other experimental groups recorded the same values although the supplementation of diets containing SFS with enzyme decreased the weight of gizzard but not significant (P>0.05) table (3) .

Result showed that broiler chicks fed on diets containing SFS without enzyme recorded significantly (P>0.05) the heaviest abdominal pad fat compared to other tested groups while those fed on control diet 15 and 20%SFS supplemented with enzyme recorded significantly (P>0.05) the lowest value for abdominal pad fat .The average subjective meat quality score (Color, tenderness, juiciness and flavor) were not significant in all treatment groups and score given for all attributes were above moderate acceptability.

Economical study revealed that chicks fed on diet containing 10 %safflower seeds with enzyme recorded the highest profit (11.951) among the tested groups while the control group recorded the lowest value (7.558), also results showed increase in profitability ratio with supplementation of enzyme.

Table 1a. Composition of the experimental diets used in the experiment

Composition	0%	5%	10%	15%	20%
Dura (Feterita)	65.7	63.0	57.0	51.6	45.1
Groundnut Cake	13	12	12.0	11.0	11.14
Sesame Cake	13	13.6	12.9	13.7	14.0
Safflower Seed	-	5.0	10.0	15.0	20.0
Concentrate*	5.0	5.0	5.0	5.0	5.0
Oyster shells	1.0	0.53	0.5	0.4	0.27
Salt	0.25	0.25	0.25	0.25	0.25
Vitamins**(.)	0.2	0.2	0.2	0.2	0.2
Lysine	0.08	0.1	0.05	0.06	0.04
Methionine	0.17	0.1	0.05	0.06	0.04
Veg.oil	2.2	0.22	0.1	2.75	4.0
Wheat Bran	-	-	2.0	-	-
Total	100	100	100	100	100

Table 1b. Calculated compotation of experimental diets

ME./Kcal*	3106.87	3100.4	3100.4	3100.6	3100.4
Crude protein%	22	22.0	22	21.77	21.91
Lysine	1.2	1.2	1.2	1.2	1.2
Methionine	0.52	0.52	0.51	0.51	0.51
Calcium	1.0	1.0	1.0	1.01	1.0
Phos.	0.62	0.65	0.61	0.67	0.69
Crude fiber	4.22	4.64	5.26	6.02	6.75
Ether extract	4.38	5.69	6.92	8.44	9.83
Ash	4.52	4.39	4.24	4.39	4.42

Table 2. Effect of feeding full fat safflower on the performance of broiler chicks

Treatment/ Parameter	Enzyme	Control	% safflower seed				CV%	$Lsd_{0.05}$	SE±
			5	10	15	20			
Body weight gain(gm)	Without	1313.00^{c}	1223.00^{d}	1209.00^{d}	1291.00^{c}	1313.33^{c}	2.66%	61.87**	20.82
	With	1333.00^{c}	1322.00^{c}	1414.00^{b}	1422.00^{b}	1465.00^{b}			
Feed intake gm)	Without	2921.00^{ab}	2563.00^{b}	2688.00^{ab}	2788.00^{ab}	2896.00^{ab}	6.91%	336.9*	113.4
	With	3034.00^{a}	2843.00^{ab}	2749.00^{ab}	2968.00^{a}	2960.00^{a}			
Feed conversion ratio	Without	2.23^{a}	2.09^{ab}	2.22^{a}	2.16^{ab}	2.21^{a}	6.72%	0.2426	0.08165
	With	2.28^{a}	2.15^{ab}	1.94^{b}	2.09^{ab}	2.02^{ab}			

Means having different superscripts within a row are significantly different (P≥0.05).

Table 3. Liver, heart, gizzard and abdominal as a percentage of hot weight

Treatment/Parameter	Enzyme	Control	% safflower seed				CV%	$Lsd_{0.05}$	SE±
			5	10	15	20			
Liver	Without	2.52^{a}	2.21^{a}	2.33^{a}	2.09^{a}	1.96^{a}	12.69%	0.3836^{*}	0.1291
	With	0.20^{b}	2.30^{a}	2.32^{a}	2.12^{a}	1.89^{a}			
Heart	Without	0.36^{cd}	0.58^{ab}	0.57^{ab}	0.55^{ab}	0.51^{ab}	20.54%	0.1627^{*}	0.05477
	With	0.39^{bcd}	0.56^{ab}	0.56^{b}	0.36^{cd}	0.54^{ab}			
Gizzard	Without	1.66^{bc}	2.18^{b}	2.11^{ab}	2.26^{ab}	2.31^{a}	13.70%	0.4666^{*}	0.1571
	With	1.76^{ab}	2.12^{ab}	2.11^{ab}	1.82^{bc}	1.77^{bc}			
Abdominal	Without	1.33^{c}	1.46^{b}	1.47^{ab}	1.78^{b}	1.89^{ab}	28.4%	0.6622^{**}	0.2229
	With	0.93^{c}	1.32^{a}	1.30^{b}	0.78^{c}	0.82^{c}			
Dressing %	Without	63.83^{ab}	63.88^{ab}	65.19^{ab}	63.65^{ab}	65.78^{ab}	2.62%	2.912^{*}	0.98
	With	64.72^{ab}	63.58^{b}	66.49^{ab}	64.31^{a}	64.55^{ab}			

Means having different superscripts within a row are significantly different (P≥0.05).

Table 4. Breast, thigh, drumstick and wing

Treatment/ Parameter	Enzyme	% safflower seed					CV%	$Lsd_{0.05}$	SE±
		Control	5	10	15	20			
Breast	With	19.10^{ab}	16.58^{a}	21.51^{a}	17.19^{ab}	16.86^{ab}	15.60%	4.714^{*}	1.587
	Without	17.93^{ab}	19.56^{ab}	16.79^{ab}	16.17^{ab}	16.48^{ab}			
Thigh	With	3.82^{a}	4.41^{a}	4.28^{a}	4.46^{a}	4.18^{a}	13.25%	1.682^{ns}	0.5663
	Without	7.12^{a}	8.29^{a}	7.63^{a}	7.61^{a}	7.16^{a}			
Drumstick	With	9.68^{ab}	9.06^{ab}	9.51^{ab}	9.53^{ab}	9.58^{ab}	14.49%	2.369^{*}	0.7975
	Without	9.20^{ab}	9.48^{a}	8.86^{b}	8.35^{b}	10.06^{ab}			
Wing	With	4.60^{a}	4.37^{a}	4.32^{a}	4.62^{a}	4.91^{a}	13.97%	1.459^{ns}	04909
	Without	5.99^{ab}	8.14^{ab}	5.56^{ab}	5.51^{ab}	5.87^{ab}			

Means having different superscripts within a row are significantly different (P≥0.05).

DISCUSSION

Fats and oils are rich sources of energy, but they are more costly on a weight basis and may contain impurities (Blair and Potter, 1988). As alternative to fats and oils, full fat oils seeds (Mukhtar, 2011) such as Rosella seeds are used to replace supplement oils and fats in broiler diets. However, Rosella seed has ant nutritional factors which need further processing .So full fat safflower seed is available on the market and contains more ether extract ,and high ether extract content contributes to a high metabolic energy.

Safflower seed is a productive crop under semiarid or rain –fed condition, safflower seed contain 33 – 60 % hull and 40 -67 % kernel and due to their very high fiber content , safflower seeds un decorticated safflower meal are of low value in poultry (Kohler *et al*., 1965). However, the use of decorticated safflower is possible in poultry if energy level is adjusted with a special care to lysine and methionine supplementation. Hill and Knowles (1968) reported that the full fat safflower seed is sources of dietary mono unsaturated fatty acid (MUFA) and inclusion of it in monogastric diet can be particularly valuable to increase the degree of unsaturated of intramuscular fat, without negative effect lipid oxidation associated with dietary poly unsaturated fatty acid (PUUFA). Body weight gain of broiler chicks in the first experiment, fed on graded levels of safflower seed without enzyme revealed fluctuation in body weight gain value s, however groups fed on 15 % and 20 % safflower seed recorded significantly similar values and to those fed on 5 % safflower seed with enzyme. Chicks fed on 10 %, 15 % and 20 % safflower seed with enzyme recorded significantly the heaviest values.

Result showed no significant difference between chicks groups fed graded levels of dietary safflower seeds with or without enzyme except group fed on 5 %without enzyme which showed significantly the lowest feed intake compared to positive control, 15 % and 20 % with enzyme.

Feed conversion ratio improved but not significantly with the increase of safflower seed level and also with the enzyme supplementation. These results were in line with that recorded by Malakian *et al* (2011), who found that growth performance and carcass trial of broiler chicks were not affected significantly when fed on safflower seeds up to 20 % in diets where energy and protein were adjusted. Also Hossini (2008) who found no significant effect on the performance of laying hen fed different levels of full fat safflower, Oguz and Oguz (2007), Mahadi and Hassan (2010), Rodriquez *et al*. (2005) and Malakian and Hassan (2011) when they

include full fat safflower up to 20% in broiler diets. Also Tuzuki *et al*., (2003) found that sunflower seed inclusion up to 5.6% in laying hens diets had no effect on daily feed intake ,yolk color or Haugh unit scope Results were disagree with the findings of Daghir *et al*., (1980) who observed that feeding 15-25% full fat safflower seed to broiler depressed both body weight and feed intake and Rodriquez *et al*. (2005) who reported not significant differences in weight gain ,feed intake and utilization among chicken receiving control diet and those fed diets with increasing level of full fat safflower (from 5-25% of diet).Result were also in contrast to Arija *et al*. (1998), and Mohan *et al*., (1984) who reported that average body weight gain was significantly reduced in chicken fed diets contained different levels of safflower meal. The significant improvement of broiler chicks fed on experimental diets supplemented with xylanase enzyme might be to the fact that the exogenous enzyme improved dietary nutrient utilization and digestibility of energy, fat and protein. The result was in agreement with Park (1997), Ghaz *et al* (2003), Adeola and Bedford (2004), and Munassr (2011).

Result was also in contrast to Makkawi (2009) who found no effect on broiler chick's performance fed diet based on sorghum supplemented with xylanase enzyme and Bin baraik (2010) fed diet containing wheat bran supplemented with xylanase enzyme.

Results obtained showed that relative weights of breast yield, thigh, drumstick, subjective meat attributes, leg. Lung, neck, liver, heart and gizzard were not affected significantly (P>0.05) by dietary full fat safflower seed inclusion levels. These results were in agreement with con the findings of Malakine (2010), Malakian and Hassan (2011). In contrary Cheva, Isarakul and tangtaweepiofpat (1991) reported decreased in liver percentage by addition of full fat safflower seed in broiler diet. However, the supplementation of experimental diets with commercial xylanase 500 improved yield of drumstick, relative weights of heart, gizzard. Results were in agreement with findings of Munassr (2011). Although Makkawi (2009) reported no significant affect due to enzyme supplementation. Several studies reported that feeding poly unsaturated fatty acids to broiler chickens resulted in reduced abdominal and total carcass fat as compared to that in broiler fed saturated fatty acid sources (Sanz *et al*., 2000). Full fat safflower is rich in linoleic acid (75-78%) which plays an important role in reducing fat accumulation and promoting muscle growth. This effect is in accordance with the results obtained by Park *et al*. (1997) and Halmiski *et al*., (1991). Also the reduction of fat pad in chicks fed diets containing full fat safflower seed was associated with an increasing full fat safflower seed which was associated with an increase in lipid oxidation (Sanz *et al*. 2000).

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