The effect of using different levels of fish meal in Broiler diets on the growth performance and carcass traits

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Abstract

Fish meals have been regarded as good supplemental nutrient for poultry, especially due to the high quantity and quality of the protein it supplies. This study was carried out to evaluate the effect of fish meal on broiler growth performance and on carcass traits. 10 chicks, 7 days old Hubbard (unsexed) were assigned to each of 3 replicates of 4 treatments (T1, T2, T3, T4) containing 0, 2, 4 and 6 % fish meal respectively, having approx. 21 % Starter and 18% Grower crude protein. Chick final live weights, weight gain, feed intake and feed conversion ratio (FCR) were determined on a weekly basis for 35 days, and at 36 days of age 3 chicks per treatment were killed and carcass and organs were weighed. The results showed no significant differences between the birds getting fish meal in diet and the birds of the control diet without fish meal, regarding the investigated parameters of growth and carcass performance. In this experiment it was found that birds with a high proportion of fish meal in the diet (4 and 6% / kg) over the whole experimental period proved significantly (P<0.05) higher final live weight, weight gain, feed intake and carcass weight (g/bird) compared to birds with a lower proportion of fish meal in the diet (2%).

Keywords: Broiler, Broiler performance, Carcass traits, Fish meal

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أثر استخدام مستويات مختلفة من مسحوق السمك على صفات أداء النمو والذبيحة في الدجاج اللاحم

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الملخص

نفذت تجربة تسمين على 4 معاملات من الدجاج اللاحم من سلالة الهابرد من عمر 7 - 35 يوم، وكونت كل معاملة من 3 مكررات وكل مكرر من 10 طيور بمجموع 120 طير في حظيرة التجارب التابعة لكلية الزراعة والطب البيطري في جامعة ذمار بهدف معرفة أثر استخدام مستويات مختلفة من مسحوق السمك على صفات أداء النمو و الذبيحة في الدجاج اللاحم و قسمت التجربة الى المعاملة الأولى والتي استخدمت فيها كسبة فول الصويا بدون مسحوق السمك والمعاملة الثانية و تم استخدام 2% من مسحوق السمك والثالثة تم استخدام 4% من مسحوق السمك و المعاملة الرابعة وفيها تم استخدام 6% من مسحوق السمك الى جانب كسبة فول الصويا في علائق البادي (7 -21 يوم) والنامي (21 - 35 يوم). بينت نتائج هذه التجربة عدم وجود فروق معنوية لمسحوق السمك على صفات النمو في الفترة الاولى (7 - 21 يوم) والثانية (21 – 35 يوم) بين طيور جميع معاملات التجربة. في هذه التجربة بينت النتائج خلال الفترة الكلية للتجربة (7 - 35 يوم) ان استخدام مسحوق السمك بنسة 4% و6% في عليقة طيور المعاملات الثالثة والرابعة على التوالي قد ادي الى زيادة معنوية في الوزن الحي النهائي والزيادة الوزنية الكلية وكمية العلف المستهلكة (جم/طير) مقارنة بطيور المعاملة الثانية و لتي تغذت على عليقة فيها 2% من مسحوق السمك، كذلك اظهرت طيور المعاملة الثالثة والرابعة وزن ذبيحة اعلى معنويا مقارنة بطيور المعاملة الثانية

كلمات مفتاحيه: دجاج اللحم، إنتاجية الدجاج، مسحوق السمك، صفات الذبيحة

Introduction

Fish meal is recognized in animal nutrition as a good source of protein, energy, minerals and vitamin (Heuser and Norris, 1951; Menge et al., 1952; Branion and Hill, 1953; Rosenburg et al., 1955; Rasmussen et al., 1957; Rand et al., 1958; Hinners and Scott, 1960; Harms et al., 1961; Smith and Scott, 1964), with high biological values (Sure and Easterling 1952) and contains omega -3 and –6 fatty acid that protect health of animals and reduce their dependence on antimicrobial additives or other drugs (Miles and Chapman 2006; Wiesenfeld et al. 2005).

The inclusion of fish meal is usually limited due to the high cost, undesirable off-flavoured meat and growth depression effects caused by a high level of fish meal in broiler diets. Available fish meals are made from different species of using various production systems and different fish meals have varying feeding values. Earlier studies examined the influences of the use of fish meal on poultry production and had shown different results. Waldroup et al. (1965) reported that there were no significant differences found in body weight or feed utilization when 25 and 50% of the soybean meal was replaced by fish meal and the replacement of 75% of the soybean protein significantly reduced the body weight at 8 weeks of age. Also Anderson et al. (1968), Rojas et al. (1969, 1971), Damron et al. (1971), Avila and Balloun (1974) showed similar results relating to performance, body weight and feed efficiency. In contrast, Schumair and McGinnis (1969) reported that the utilization of different levels of fish meal improved growth of chicks up to 30% and was not reduced when 34% protein from fish meal was fed. Other studies indicated that growth of chicks receiving fish meal in diets was significantly greater (Griffith and Schexnailder 1971) and the feed intake was lower with higher feed efficiency (Ojewola et al. 2005) than that of chicks fed basal diet without fish meal. Ponce and Gernat (2002) showed that chicks fed 10 or 20% protein from Tilapia by-product meal as replacement for protein of soybean meal had higher body weight and feed consumption and improved

feed conversions from 14 to 28 d of age compared to other treatments (without fish meal or with higher fish meal proportion in diet). On other hand, Hess et al. (2009) reported that broiler chicks given 7,5% catfish meal in the diet showed the highest body weight at 21 day of age compared to broiler chicks fed poultry-by product meal or control birds group fed only on corn-soybean meal and after 21 d of age no significant differences were recorded in this study.

Poultry sector in Yemen has developed quickly during the last three decades and is depending mainly on the use of high performance birds and high quality feed, especially sources of protein such as soybean meal. As known the feed cost of chicks farm forms about 65 -75% of the total production cost. Soybean meal has been wide used as major component in the chicks feed and it is relatively expensive. Hence its use in chicks feed in Yemen leads to an increase of the cost of the chicks. The search for alternative protein sources of feed ingredients as a partial substitute to scarce and expensive conventional feedstuffs towards reducing the feed costs has not been widely investigated in Yemen. The aim of the present study was to determine the effect of replacement Soybean meal by local produced fish meal on growth performance and carcass traits in broilers chicks.

Materials and Methods

One hundred twenty one day old unsexes Hubbard broiler chicks were obtained from a commercial hatchery. All chicks were fed starter diet for 7 days pre-experimental period, after which the birds were individually weighed and randomly divided into 4 treatments, 3 replicates in treatment with 10 birds each. The chicks reared on the floor pens of identical size (95×90 cm^2) in a deep litter system. Wood shavings were used as the litter material layer. The room was heated by gas brooder and each pen was provided with hand waterer and feeders. The climatic conditions and lighting program were uniform and followed by the commercial recommendations.

The formulated treatment diets consisted of substituting 0 (control), 2, 4 and 6% of the soybean meal by fish meal which was produced by local fish manufactory (Hadramout, Yemen). The diets were given as starter from 7 – 21 days and grower from 21 -35 days. The composition of treatment diets is shown in Tab. 1. All the diets contained similar crud protein and metabilizable energy (ME). Each experimental diet and water was provided *ad libitum* to the birds for a period of 28 days and all diets were provided in mash form. Data on live body weight and feed consumption were recorded at weekly intervals and mortality was recorded at occurrence. From the above mentioned data, body weight gain and feed conversion ratio (FCR) were calculated. On the day 36, three chicken whose body weight were closest to mean for each replicate were selected, weighed after being starved overnight (12 hrs) and killed by cervical dislocation. The feather, head and shanks were removed and the carcass and breast and thigh were eviscerated. The edible offal of birds was also weighed. All data were analysed using the ANOVA procedure of SPSS Program. Significant differences among treatments were identified at 5 % level by LSD Test.

Table 1 compositions of experimental diets containing 2 to 6% fish meal.

Ingredients and analysis	Starter (7 - 21 days)				Grower (21 - 35 days)			
	T1	T2	T3	T4	T1	T2	T3	T4
Ground corn %	66	66	66	66	72	72	72	72
Conc.starter*%	10	10	10	10	8	8	8	8
Soybean meal (46%) %	24	22	20	18	20	18	16	14
Fish meal %	0	2	4	6	0	2	4	6
Calculated Analyses								
Crud Protein%	20.66	21.1	21	21.8	18.7	19.1	19.6	20.6
ME kcal/kg	3099	3108.2	3117.4	3123.6	3159.6	3168.8	3178	3223.2
Lysine g	11.3	11.8	12.3	12.8	9.8	10.3	10.8	11.3
Methionen g	5.3	5.5	5.7	6.0	4.6	4.8	5.1	5.4
Calcium g	8.9	9.7	10.6	11.5	7.7	8.0	8.9	9.8
Phosphorus g	6.5	6.9	7.3	7.6	5.9	6.3	7.7	7.1

(*) Protein concentrate contained per kg: 30% protein, 1800 kcal ME, 7,8 % Ca, 2,7% P, 2,5% Lysin, 2,5 Methionin.

Results and Discussion

The effect of experimental treatments on growth performance and carcass traits of broiler chicks are given in Table 2 and 3. In this experiment, during the starter period (7 - 21d) or the grower period (21 - 35 d), the mean live body weight (21 d), body gain, feed consumption and feed conversion ratio were not significantly ($P>0.05$) influenced by fish meal inclusion of 2%, 4% and 6% to the experimental diets in comparison to control diet without fish meal or among fish meal groups. The final live body weight (35 d), total weight gain and the total feed consumption (7 – 35 d) were significantly ($P<0.05$) affected by fish meal level 4% and 6% in the diet. The groups of birds fed on diets 4% and 6% fish meal showed higher final live body weight, weight gain and feed consumption (g/bird) compared to the group fed 2% fish meal in the diet. The lower live body weight (35 d) of birds getting 2% fish meal in the diet was due to the lower feed intake (2520g/bird). Over the whole experimental period (7 – 35 d), there were no significant differences observed between the fish meal dietary experimental groups and the control group relating to growth performance (body weight, weight gain, feed consumption and feed conversion ratio). The lowest final body weight was recorded from the diet with 2% fish meal level and the highest from 4%. These results of this experiment are in agreement with previous finding from Waldroup et al. (1965), Rojas et al. (1969), Damron et al. (1971) and Wu and Kellems (1984) who reported that the replacement of soybean meal with fish meal at several levels resulted in no significant differences in live body weight, weight gain and feed efficiency. Also, Harms et al. (1961) reported that 3% fish meal in practical broiler diets had no significant effect on the production parameters measured and it does not agree with the results from Ponce and Gernat (2002), Karimi (2006) and Negessa and Tera (2009) who stated significant improvement in production parameters by fish meal supplementation to diets at different age of the birds. All carcass traits showed no significant differences among all groups, except the carcass weight was

significantly with the groups of birds fed 4% and 6% fish meal diets compared to group of bird fed 2% fish meal diet. These results are in agreement with Hess et al. (2009) who reported that carcass traits were not significantly affected by feeding either of animal protein products. On the other hand, reported Negessa and Tera (2009) in their study, that chicks fed 0 % fish meal diet had significantly ($p \leq 0.001$) lower slaughter weight than the rest of the groups feeding different fish meal in diet. The mortality of broiler chicks was during the experimental period less than 2%.

In conclusion, the results of this experiment showed that the use of 4% and 6% of fish meal in broiler rations influences of the growth performance positively.

Table 2 the effect of different fish meal on growth parameter by Broiler chicks

	Treatments			
Parameter	T1	T2	T3	T4
Live weight (g/bird)				
21 d	646.4	641	659.8	697
35 d	1499.2^{ab}	1418.6^{a}	1582.3^{b}	1571.4^{b}
Weight gain (g/bird)				
07 -21 d	555.4	549.4	568.1	604.6
21 -35 d	852.8	777.2	922.5	874.4
07 -35 d	1408.2^{ab}	1326.2^{a}	1490.6^{b}	1479.1^{b}
Feed intake (g/bird)				
07 -21 d	841	745	799	825
21 -35 d	1859	1776	1986	1819
07 -35 d	2700^{ab}	2521^{a}	2785^{b}	2644.1^{b}
FCR (feed/weight gain)				
07 -21 d	1.52	1.35	1.40	1.37
21 -35 d	2.18	2.29	2.15	2.08
07 -35 d	1.92	1.90	1.87	1.79

$^{a-b}$ Means in rows with different superscript differ significantly (P <0.05).

Table 3 the effect of fish meal on carcass weight and carcass parts

Parameter	Treatments			
	T1	T2	T3	T4
Carcass weight g	1031[ab]	956[a]	1112[b]	1123[b]
Dressing %	68.8	67.5	70.3	69.3
Breast %	30	34.8	30.9	32.7
Thigh %	34.4	33.4	32.3	33.4
Edible offal g				
Heart	8.4	7.3	8	7.6
Liver	35.2	32.3	38.3	28
Gizzard	31.3	38.3	40	37

[a -b] Means in rows with different superscript differ significantly (P <0.05).

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