

Feeding Turkey Poults with Starter Feed and Whole Wheat or Maize in Free Choice Feeding System: Its Effects on Their Performances

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ABSTRACT : This study was carried out to determine the effects of free choice feeding of starter feed and whole cereals on the growth of turkey poults. Two hundred-seventy poults (7-d old) were divided into 3 treatment groups each with 3 replications containing 15 males and 15 females. Control poults (C) were fed only on starter feed (280 g CP and 11.7 MJ ME/kg). Treatments for choice-fed turkey poults were offered a choice of a starter feed and wheat (120 g CP and 12.3 MJ ME/kg) for wheat selecting (WS) or maize (83 g CP and 13.9 MJ ME/kg) for maize selecting (MS) group in separate feeders. Final live weight (2,280.7 g for the C vs. 2,374.3 and 2,324.6 g for the WS and MS), daily gain (39.21 g vs. 40.87 and 39.99 g) and total feed intake (95.2 g vs. 103.2 and 97.9 g) in the WS poults were significantly higher ($p < 0.05$) than those of the C group, but feed conversion ratio was not significantly different between the treatments. The proportional intakes of cereals vs. total feed intake were 11% in both the WS and MS group. The amount of protein intake in the C group (280 g CP/kg diet) was significantly ($p < 0.05$) higher than that in WS and MS groups (263 and 259 g CP/kg diet, respectively) whilst the ME intake in the C group (11.7 MJ/kg diet) was significantly ($p < 0.05$) lower than that in MS group (11.9 MJ/kg diet). Our results showed that turkey poults fed starter feed and whole wheat in a free choice feeding system have a higher efficiency in terms of daily gain, final live weight, and an economic advantage may be obtained from free choice feeding due to a reduced protein intake and feed cost. (*Asian-Aust. J. Anim. Sci.* 2006. Vol 19, No. 1 : 86-90)

Key Words : Turkey Poults, Choice Feeding, Whole Cereals, Growth Performance

INTRODUCTION

The protein requirements of turkey poults are higher than those of broiler chicks at the same age (NRC, 1994). Since protein is a major cost of feed, there is a need to investigate the methods of reducing the feeding cost in turkeys. Any advancement in feeding systems for broiler chicken should be applied in the turkey industry.

Whole grain feeding has been used as an alternative feeding system allowing for protein saving due to significant reduction in protein intake and reduction in feed costs of poultry nutrition (Forbes and Covasa, 1995). The methods of whole grain feeding (split, choice, mixed etc.) have been reviewed by Forbes and Covasa (1995) and Rose (1996). Kutlu and Karakozak (1999) reported that the inclusion of whole wheat to the broiler diet or offering whole wheat as a choice can provide a considerable reduction (6.98%) in feed cost for body gain, while increasing fat deposition due to excess energy intake. Classen and Bennett (1996) reported that dilution of a diet with whole wheat starting from 5% (in starter diet) to 35% (in finisher diet) could be used in turkey nutrition without affecting growth performance. Although it has been reported that choice feeding is detrimental to growth and feed conversion ratio (Zulkifli et al., 2001) in commercial

broilers. Erener et al. (2003) reported that free choice of whole wheat can be used in broiler chickens. It is not obvious why results vary from experiment to experiment, since factors such as inclusion level or variation in quality and variety of whole grains, experimental periods and breeds or species have been consistent between experiments.

Choice feeding gives to domestic fowls the opportunity to select what they require in terms of energy and protein (Hughes, 1984; Cumming, 1994). Broilers, which have a choice between soybean meal and ground maize, gained the same rate as control chicks fed a commercial compound feed (Kaufman et al., 1978). Recently, Sahin et al. (2001) reported that choice-fed broilers chose a diet containing from 8% (8-13 d) to 55% (35-42 d) of whole wheat. However, there is little data available on free choice feeding in turkey poults. Therefore, this study was carried out to further test the hypothesis that free choice feeding system based on whole cereal wheat or maize affects the performances of turkey poults during growth period (7 to 63 d of age).

MATERIALS AND METHODS

A total of 270, 7-day-old American Bronze turkey poults were purchased from a local hatchery. On arrival, they were wing-banded, weighed and randomly housed in floor pens with wood shavings. The environmental conditions of the experimental unit such as ventilation and illumination were supplied both naturally and mechanically. The experimental temperature was 33°C declining by 3°C

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Table 1. The ingredient and chemical composition of the starter diet

Ingredients	g/kg
Maize (yellow)	200.0
Soybean meal (480 g CP/kg)	253.5
Sunflower meal (380 g CP/kg)	134.0
Wheat	200.0
Full-fat Soybean	150.0
Meat-bone meal (400 g CP/kg)	40.0
Fish meal (730 g CP/kg)	10.0
Dicalcium phosphate	3.0
Salt	2.5
Vitamin premix*	2.0
Mineral premix**	1.5
L-lysine HCl	0.6
DL-methionine	1.4
Enzyme	0.5
Cocciostat	1.0
Calculated chemical composition	
Crude protein	280.0
Crude fibre	60.0
Ether extract	62.7
Metabolisable energy (MJ/kg)	11.7
Calcium	10.4
Available phosphorus	5.5
Lysine	16.0
Methionine	6.0

* Provides per kg of diet: Mn, 80 mg; Zn, 60 mg; Fe, 60 mg; Cu, 5 mg; Co, 0.2 mg; I, 1 mg; Se, 0.15 mg; choline chloride, 200 mg.

** Provides per kg of diet: Vitamin A, 12,000 IU; vitamin D₃, 2,400 IU; vitamin E, 50 mg; vitamin K₃, 4 mg; vitamin B₁, 3 mg; vitamin B₂, 6 mg; niacin, 25 mg; calcium-D-pantothenate, 10 mg; vitamin B₆, 5 mg; vitamin B₁₂, 0.03 mg; D-biotin, 0.05 mg; folic acid, 1 mg.

weekly until 21°C; lighting was 23 h light+1 h dark. Wood shavings was used as bedding and changed weekly. Lighting program (fluorescent lighting) was began with a high light intensity at 20 lux (2 fc) and during the second or third week of age was reduced to 5 lux (0.5 fc) and hold at this reduced intensity for the remainder of the grow-out.

There were 3 dietary treatments, each consisting of 3 replicates. A replicate was a floor pen (2×2 m) with 15 female and 15 male birds. Each treatment had 90 birds. The control (C) group were fed commercial mash starter feed (Table 1), while wheat-selecting group (WS) was offered either starter feed or whole wheat (120 g CP and 12.3 MJ ME/kg) and maize-selecting group (MS) was offered either starter feed or whole maize (83 g CP and 13.9 MJ ME/kg). Energy values of whole grains were obtained from feedstuff tables published in our country.

All feed were supplied *ad libitum* in suspended cylindrical tube feeders (15 kg feeder), two per pen, one containing the whole grain and the other the starter feed until the end of the experiment at 63 d of age. Feeder space in each pen was 4 cm per bird. Water was available all day through experimental period by using one hanging drinkers per pen. Beak trimming procedure was not performed. The

body weights of poult were determined weekly. Daily gain and feed conversion ratio (FCR, g feed/g gain) were calculated weekly. The litter was sieved to determine the grain wastage. Mortality was recorded as it occurred.

Effect of treatment on body weight gain per bird, feed intake and diet selection per pen were analysed using the One-way ANOVA procedure using SPSS computer software 10.00 (SPSS Inc. Chicago, USA 1999). Significance of differences between treatment means were compared by using Duncan's multiple range test.

RESULTS

The feed intake, diet selection and growth performance (daily gain and feed conversion ratio) of treatments are given in Table 2. Free choice feeding for the WS group increased daily gain and final body weight significantly ($p<0.05$) in comparison with the C group without affecting feed conversion ratio. The protein intake in the C group was significantly higher than that in WS and MS groups whilst the ME intake in the C group was significantly lower than the MS group. Poults in the WS and MS groups consumed the same amount ($p>0.05$) of protein but the MS poult utilized protein more efficiently ($p<0.05$) than the WS poult.

For the entire experiment, birds in the WS group increased ($p<0.05$) their total feed intake by increasing cereal intake. The proportional consumption of cereal was similar for both WS and MS groups (Table 2). Whole-wheat consumption was higher than whole maize consumption during the period of 7-42 d, while whole maize consumption was higher than that of whole wheat during the period of 42-63 d (Figure 1). However, these changes did not affect the birds' growth in groups fed free choice.

DISCUSSION

In general, birds in wheat selecting group increased their total feed intake with increasing cereal intake. These changes did not affect birds' growth performance within free choice poult, but the WS group increased the final live weight compared to control. Although the proportional cereal consumptions in both WS and MS groups were similar, the higher total feed intake in WS group may be related to the fact that whole wheat is more palatable than whole maize. The other explanation for this discrepancy is that the size and hardness of maize grains might affect the consumption because gizzard of poult is undeveloped at early ages (Jin et al., 1998). On the other hand, beak trimmed birds are likely to have difficulty in feeding especially on free choice diets where particle sizes of the ingredients vary greatly (Glatz, 2000). Beak trimming

Table 2. Daily feed intakes, growth performances and feed cost per unit weight gain of turkey poults offered whole cereals and starter feed compared to control poults

	C	WS	MS	SEM
Feed intake				
Daily starter intake (g/bird)	95.20	91.92	87.53	1.20
Daily cereal intake (g/bird)	-	11.24	10.41	0.22
Daily feed intake (g/bird)	95.2 ^a	103.2 ^b	97.9 ^{ab}	1.41
Cereal intake/total feed intake	-	0.11	0.11	0.003
Daily protein intake (g)	26.7	27.1	25.4	0.33
Daily ME intake (MJ)	1.12	1.22	1.17	0.02
Protein intake (g/kg feed)	279 ^a	263 ^b	259 ^b	3.18
ME intake (MJ/kg feed)	11.7 ^a	11.8 ^{ab}	11.9 ^b	0.05
Growth performance				
Initial live weight (g per bird)	85.2	85.5	85.2	0.72
Daily gain (g)	39.21 ^a	40.87 ^b	39.99 ^{ab}	0.33
Final live weight (g)	2,280.7 ^a	2,374.3 ^b	2,324.6 ^{ab}	18.83
EE (MJ ME intake:g gain)	0.03	0.03	0.03	0.003
PE (g protein:g gain)	0.68 ^a	0.67 ^a	0.63 ^b	0.08
FCR (g feed:g gain)	2.43	2.52	2.45	0.06
Feed cost per unit weight gain				
Per kg feed cost (\$)	0.28	0.26	0.26	-
Total feed cost (\$)	1.47	1.53	1.45	-
Cost for per kg live weight	0.67	0.67	0.65	-

^{a, b} Means within rows with different superscript are significantly different ($p < 0.05$).

C: Control, WS: Wheat-selecting, MS: Maize-selecting, EE: Energy efficiency; PE: Protein efficiency; FCR: Feed conversion ratio.

SEM: Standard error of the mean.

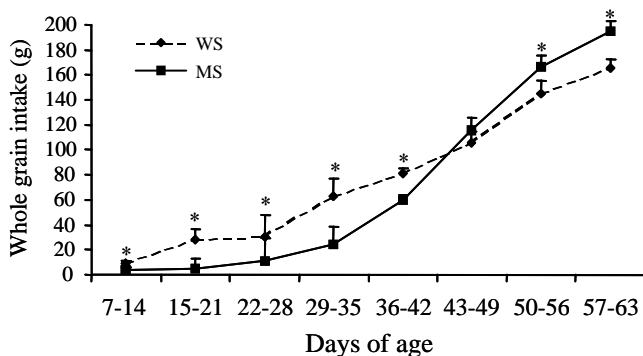


Figure 1. Weekly cereal intakes of turkey poults offered cereal and starter feed simultaneously. WS: Wheat-selecting, MS: Maize-selecting. Asterisks indicate the difference in wheat or maize intake ($p < 0.05$).

procedure was not performed in the present study in which medium-bodied turkey poults were used since Noble and Nestor (1997) reported that beak trimming reduces feed wastage of large-bodied turkeys but not that of medium-bodied birds. Therefore there is not the effect of beak trimming on intake of grains although wastage of whole maize was higher than whole wheat (data are not shown). The wheat intake in the present study was lower than that reported by Sahin et al. (2001) for broilers, despite the fact that turkeys have larger digestive systems than broilers at the same age.

The higher daily gain and final live weight in WS poults can be attributed to the higher feed consumption (Erener et

al., 2003) or may be related to the higher dietary energy (5-6%) content of whole wheat despite of variation in energy values of wheat (Cumming, 1987; Olver and Jonker, 1997; Bennett et al., 2002). Indeed, Kutlu and Karakozak (1999) and Erener et al. (2003) investigated the effects of the different choice feeding methods based on whole wheat on performance of broilers and observed that feed consumption and total live weight gain in choice group offered whole grain in a separate feeder with concentrate feed was higher than that of control group. Thus, feeding turkey poults with starter feed and whole cereals in a free choice feeding system may give a chance for poults to tune their energy to protein ratio balance by using, predominantly, either energy source for their energy requirement or protein source for their protein requirement (Sahin, 1999). Indeed, the study of Men et al. (2001) suggested that growing broiler ducks offered a combination of high and low protein feeds pair wise could eat excessive amounts of the high protein feed, thus resulting in protein intakes above requirements. In practice, such a preference between whole grains and compound feed may play a role in the intensive poultry industry to improve birds welfare (Miao et al., 2005).

It was calculated that the proportional intake of whole wheat against total feed intake by turkey poults ranged from 7% to 13%, but this were from 2% to 16% in MS group as they aged (Figure 1). Therefore, it might be suggested that whole wheat can be used for free choice at early age, but whole maize can be used after 35-d old. This discrepancy may be attributed to the enhanced digestive system of

poults and the increased energy requirements of poults with age or greater ability of birds to pick up the larger feed particles. The increased energy requirements of poults with age led them to select maize or wheat in free choice groups. This tendency was higher in MS group in comparison to WS, most likely because of the higher energy content of maize. Rose et al. (1986) and Olver and Jonker (1997) reported that broilers consumed diets with higher energy level and lower protein levels as they aged.

Protein intake in the present study showed that free choice turkey poults economised their intake by increasing their live weight gains in comparison to birds offered a single starter feed with fixed protein level. According to Shariatmadari and Forbes (1993), broiler growers (4 to 9 wk old) can match their protein intake closely to their requirements when given a pair of feeds that allows this; if both feeds are on the same side of the optimum, then, the one closest to that required is predominantly chosen. In the current experiment, protein value of the starter feed and cereals were different. However, the nutrient content of starter feed was the closest to the optimum requirement for turkey poults. That is why that turkey poults predominantly ate starter feed (nearly 89% of diet) so that their maximal growth was maintained.

Our results with respect to economical assessment of findings show that per kg feed cost and the feed cost of each kg weight gain on the MS group were more economical than that on starter feed group. Also the feed cost of each kg weight gain on the MS group was more economical than that on the WS group. Thus free choice feeding was more profitable than feeding complete mash diet. The choice fed turkey poults fed maize more profitable than their wheat fed counterparts in spite of the usually cheaper price of wheat in our country.

CONCLUSIONS

Our results showed that turkey poults fed starter feed and whole wheat in a free choice feeding system have a higher efficiency in terms of daily gain, final live weight, and economic advantage may be obtained from free choice feeding due to a reduced protein intake and feed cost. Further research is required to determine the effect of feeding with compound feed and different whole grains in free choice feeding system on the growth and fattening performances of turkeys.

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