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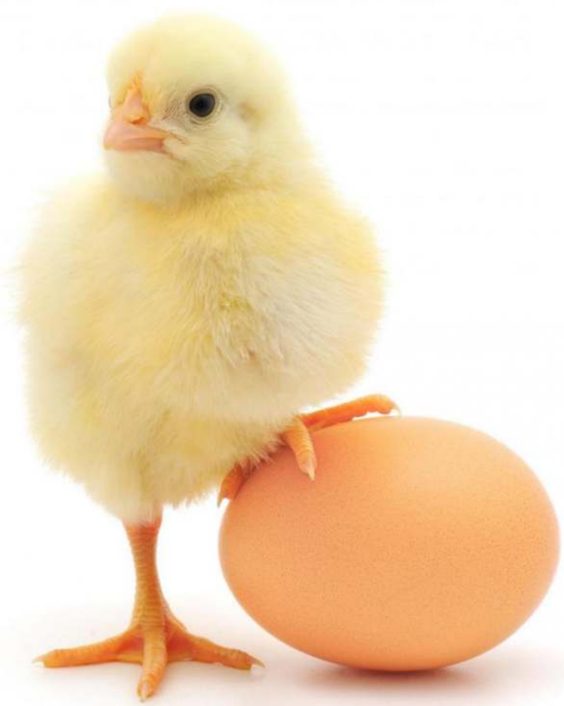

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Effect of Wheat and Barley Viscosity on Broiler Performance in Hamadan Province

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Abstract: Nutrient digestion and absorption could be inhibited by viscosity particularly in cereal diets on broiler feeding. This viscosity may be influenced by environmental condition and various cultivars in cereal. Experiment was conducted by complete random design (CRD). Four hundred and eighty Arian broiler chickens were used in two treatments includes, wheat and barely with 6 replicates and 40 chickens in each. Starter feeding recommended by NRC 1994 was used during the starter period (21 days of age). Experimental diets were arranged from 3 to 6 weeks of age. Similar condition such as temperature, moister, lighting, ventilation and drinking water were optimized for chicken. Feed intake (FI), feed conversion ratio (FCR) were recorded every week. Three chickens in each replicate were slaughtered as a random for consideration of gastrointestinal development in the end of experiment . No significantly differences were observed in FI, body weight (BW) and FCR, ($P > 0.05$). Although body weight was higher by wheat treatment compared with barley at 42 days of age. Where no response was appeared in gastrointestinal tract ($P>0.05$) in this particular case. The result of this study have shown that barley viscosity was higher than wheat but this was not significant.

Key words: Viscosity wheat, barley, Arian broiler

Introduction

Cereal is one of the best and common energy sources in poultry nutrition, particularly wheat and barley are the cheapest energy content in this category (Scott, *et al*., 1998). Wheat and especially barley by varieties energy sources and sticky fecal in broiler chicken may make limitation in consumption in poultry feeding (Esteve-Garcia *et al*., 1997). These problems are comes up by soluble non-starch polysaccharides particularly in barley cell wall β-glucans and arabinoxylan in cell wall of wheat (Ouhida *et al*., 2000). Chicken Performance and nutrient availability were declined in gastrointestinal tract by increased viscosity (Bedford, 2000; Annieson, 1991). Choct, 2001 and Annison, 1991, have reported that apparent metabolism energy (AME), nitrogen retention and FCR were reduced by wheat arabinoxylans and also digestibility of starch, protein and lipids were depressed by those ration which containing of 4% arabinoxyalans to 14.6, 18.7 and 25.8% respectively. In addition Hesselman and Aman, 1986 have shown that reduction in Ileum starch and protein digestibility in chicken which fed by barley ration rich in β-glucans content. Choct, 2001 has noted that decreasing in nutrient absorption was occurred by β-glucan with water absorptive in their jel molecules this could be link with glygolgalicas in the intestinal villi. Substrate distribution and enzyme activity in digestibility reflection were decreased by increasing of intestinal viscosity (Campbell *et al*., 1989).

Edwards *et al*., 1988, have stated that low efficiency of digestion and absorptive aspects which are related to undigested polysaccharides could be improved by organelles hyperplasia and hypertrophy (Marquardt, 2000). Annison, 1991 has found that the interaction effect between water soluble wheat arbinoxalanes and energetic response may be declined the metabolism energy rate, this point has been emphasized by (Rogel, *et al*., 1987). Chicken biological response in two different cultivars of barley in rich and poor β-Galogan content was different. Some evidences have demonstrated that wheat viscosity generally is lower than barley (Carre, 2002). Different content in non-starch-polysaccharides of wheat and barley leads to changing in poultry production in this case (Nathan Brid, 2000). Many of studies were focused to determine wheat and barley viscosity throughout of the world, but different condition such as environmental aspects, classification of soil, cereal cultivars could have the different effect on viscosity since this study has been arranged to clarify some unknown aspects in this respects. Poultry performance and changing in gastrointestinal tract also were examined in this investigation.

Materials and Methods

Experiment was modulated by 480 one day old Arian chickens in CRD by two treatments (wheat and barley ration) and six replications with 40 chickens in each. Chickens were weighted and organized in the similar weight for both treatments before the starting of experiment. In the first three weeks chicken was fed based on NRC 1994 recommended as is observed in Table 2, Testing ration with 15% barley and wheat in ingredient were continued until six week of age. Chemical composition of wheat and barley were presented in the Table 1. Starter and grower ration details and their chemical composition were shown in Table 2. Rearing condition such as temperature, lighting regime, moisture, litter status were optimized in the similar range. FI, BW, FCR and mortality were measured daily and calculated in 22, 28.35 and 42 day of age. In the end of experiment three chickens in each replicate were slaughtered as a random to examine the intestinal viscosity. Organelles weight, consist on full and empty (gizzard, proventriculus, Intestine and Ceca) and liver weight were tested. In addition length of (intestine, Duodenum, jejunum, Ileum and Ceca) were measured. Digesta of small intestine was removed and kept in -20°C for both treatments in barley and wheat. Viscosity was examined by Stowald methods (Habibi, 1999) and data was analyzed by SAS (1996) package.

Table 1: Chemical composition of wheat and barley (%)

Feed	Nutrient			
	DM	CP	CF	EE
Wheat	90.46	10.40	2.72	1.27
Barley	92.39	11.24	8.87	1.70

DM, dry matter; CP, crude protein; CF, crude fiber; EE, eater extra

Table 2: Feed formulation and composition in starter and grower wheat and barley ration

Feed	Starter %	Grower %	
		Wheat	Barley
Corn	50.0	50.65	50.65
Soya bean	30.0	25.0	25.0
Wheat	10.0	15.0	-
Barley	-	-	15.0
Fish meal	6.0	6.0	6.0
Oil	1.30	-	-
Bone meal	1.50	2.0	2.0
Salt	0.2	0.3	0.3
Lys.	0.2	0.2	0.2
Met.	0.35	0.35	0.35
Mineral	0.25	0.25	0.25
Vitamin	0.20	0.25	0.25
Energy	2948	2837	2870
Protein	22.20	20.41	20.53
Dry matter	91.65	93.72	93.39
Crude fiber	3.50	3.34	3.71
Lys.	1.44	1.39	1.41
Met.	0.75	0.74	0.74
Ca	0.87	0.97	0.97
Avil. P	0.59	0.65	0.68

Lys. Lysine; Met. Methionine; Avil. P, Available phosphorous

Results

No significant differences were found in FI and FCR in 28, 35 and 42 days of age (P>0.05) Table 3. In contrast in grower diet in exception of 28 day old chicken FCR was improved in wheat compared with barley. There is no any significantly different in body weight (BW) in 28, 35 and 42 days of age (P>0.05) as observed in table 4 although, higher BW was found in wheat treatment compared with barley treatment in 42 days of age (P_{prob}> T = 0.07). No significant changing were shown in all organelles weight (P>0.05) as illustrated in Table 5, but liver weight was greater in wheat ration than barley (P_{prob}> T= 0.11) The similar trends were appeared regarding different sections of gastrointestinal length (P>0.05) but duodenum was longer in those bird which fed by wheat in comparison to barley ration (P_{prob}> T= 0.11). No significant changing was not achieved between wheat and barley viscosity (P>0.05), although, barley viscosity was higher than wheat diet (P_{prob}> T= 0.73).

Table 3: Feed intake and feed conversion ratio in starter and grower ration

FCR	Feed intake (g)	Treatment	Period (day)	Ration
1.27	726		1 -21	Starter
1.70	1311.30	Wheat	1 -28	
1.27	1256.60	Barley		Grower
1.70	2246.00	Wheat	1 -35	
1.27	2269.70	barley		
1.7	3299.80	Wheat	1 -42	
1.27	3329.80	barley		

Table 4: Body weight in starter and grower ration (g)

	Starter		
1 to 21 day	566.70±12.83		
	Grower		
	Barley	wheat	Prob>|T| P
1 to 28 day	893.40±18.55	897.30±19.17	0.60
1 to 35 day	1283.80±19.56	1318.40±28.13	0.29
1 to 42 day	1816.50±32.46	1902.80±34.45	0.07

Discussion

The nutritive value of wheat and barley could be influenced by NSPs quantity and quality and these may play a major role in poultry performance and out put of poultry industry. In addition wheat and barley intestinal viscosity also has the vital effective on poultry production. This viscosity may be concern to amount of wheat and barley seed in poultry ration (Bedfor, 2000). Some recognition aspects in this study have shown that wheat FCR was improving to compared with barley this point has been supported by Esteve-Garcia *et al.* (1997). Otherwise Bedford, 2000 has reported that there is high positive correlation between FCR and intestinal viscosity since increasing viscosity could depress FCR as well as poultry production. Decreasing growth rate and FCR could be appeared by high intestinal viscosity (Almiral *et al.*, 1995; Wiseman, 2000). The results of this study have demonstrated that although no significantly differ was found in body weigh regarding wheat and barley diet, but body weight in wheat treatment was higher than barley this was agree by (Almiral *et al.,* 1995). Several studies

Table 5: Organelle weight in response to wheat and barley in 42 of age

	Weight (g)		
	Barley	Wheat	Prob>|T| P
Full Intestinal	106.12±8.26	117.74±6.19	0.29
Empty Intestinal	78.50±1.97	70.37±.74	0.10
Full Gizzard	61.44±9.12	72.68±5.47	0.32
Empty Gizzard	49.60±4.47	51.19±3.06	0.78
Full Proventricuius	9.89±.37	10.84±.65	0.24
Empty Proventriculus	9.68±.42	9.87±.57	0.80
Full Ceca	11.56±.89	12.57±1.06	0.48
mpty Ceca	7.77±.44	6.96±.62	0.31
Liver weight	45.83±2.74	54.30±3.91	0.11

Table 6: Intestinal length in response to wheat and barley

	Length (cm)		
	Barley	Wheat	Prob>|T| P
Intestinal Length	168.50±4.48	173.50±5.26	0.50
Gejunum Length	144.17±4.62	142.67±4.96	0.83
Duodenum Length	27.67±1.80	30.83±54.00	0.13
Ceca Length	16.75±1.12	16.75±.31.00	01.0

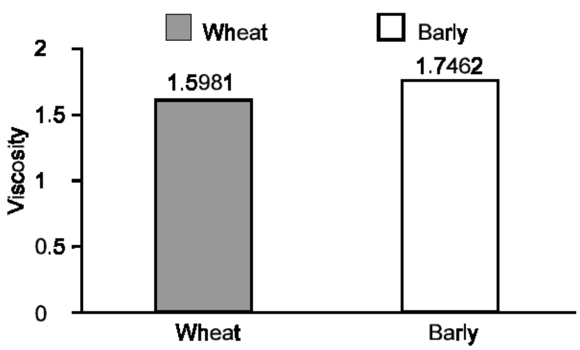

Fig. 1: Intestinal viscosity in wheat and barley diet

have emphasized that increasing intestinal viscosity which is corresponding by reduction physical potential of mixing diet in gut and low distribution of feed in gastrointestinal tract may effect on endogenous enzyme activity, changing microfelora population and also renewal intestinal cells (Almiral and *et al.*, 1995 and van *et al.*, 1993). Choct *et al.*, 1999 and Bedford, 2000 have noted that predominant interaction between intestinal meciroflora and viscosity may increase microflora with high viscosity this could increased unsuitable fermentation in jejunum and ileum and likely leads to unavailable of nutrient for bird confirmation of this finding has been observed by Waldense *et al.*, (2000). On the other hands NSPs could reduced enzyme activity such as amylase and lipase by effecting on pancreas and small intestine which were emphasized by Almiral *et al.*, 1995. They reported that protein and lipids digestibility in different levels could be depressed by barley with high viscosity this may reduced starch digestibility but starch has been digested in ileum and Ceca and then will excreted as a useless materials. Based on this idea decreasing of FI, FCR and BW in response to barley compared to wheat are approached in this case of study. Although no significant differences have occurred in body weight and different segments of intestinal length but observed dramatically increased in empty intestinal weight by barley, seems to be a big reaction in this respect. In the fact of this view, reducing of intestinal size and weight may decrease digestibility rate (Marquardt, 2000; Maisonner *et al.*, 2001; Nicol, *et al.*, 1993).

Conclusion: Although in this study no significantly different was found between of wheat and barley viscosity but barley viscosity was greater than wheat. These finding predominantly dependant to cultivars of seed, soil fertilizations, harvesting time, storage condition and environmental situation which were confirmed in different parts of the world.

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