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Effect of Dietary Wheat Screening Diet on Broiler Performance, Intestinal Viscosity and Ileal Protein Digestibility

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Abstract: Much more effort has been made to find out a new source of feed for domestic animal particularly in monogastric and in specific animal such as poultry for their competition by human. Wheat screening (W. S.) is one of best occasion in this respect. The experiment was conducted by 320 day old unsexed Ross 308 chicken, Four rations were used as a four treatments includes (0, 10, 20 and 30%) of wheat screening in broiler diets. Four replicates with 20 birds were arranged in each. Isoenergeytic and netrogenic have modulated in all rations. The experiment was started from 21 days of age to the slaughter weight. Experiment statistical was in complete random design (CRD), data analysed by SAS programme and means were examined by Dancan multiple test. No significant differences were found in body weight (BW), feed intake (FI) and feed conversion ratio (FCR) in 28, 35, 42 and 46 day old chicken by different levels of wheat screening. The similar trend were observed in organelles weight with exception in intestinal and gastrointestinal empty weight and intestinal length which were significantly higher ($p<0.05$) in 30% of wheat screening (48.09, 266.28 g and 199.12 cm) respectively compared with the control and 10% W.S. ration. In addition Ileal protein and fat digestibility significantly reduced ($P<0.05$) by 30% wheat screening (78.79 and 68.94%) respectively compared to other treatments. In contrast intestinal viscosity was in the highest significant rate ($P<0.05$) 1.61 Centipoise (cP) by 30% wheat screening compared with other treatments (1.51, 1.52 and 1.53 cP). The results of this study have shown that there is no any adversely effect of wheat screening on broiler performance. It would suggested that 20% of wheat screening in broiler ration could leads to decrease the ration price and approach more benefits for poultry industry.

Key words: Wheat screening, ross chicken, viscosity, Ileal protein digestibility

Introduction

Cereal seed particularly wheat as human food source should be alternated by other seed in poultry feeding. Because it could, not only reduction in the ration price but produce cheaper meat and egg for human consumption and save the human resources food such as wheat and other cereal with high advantages. In addition some of these alternatives are by-product such as wheat screening and need to be recycled to meat and egg production. Limited work has been carried out regarding wheat screening in broiler nutrition. Balyey *et al*., 1968 have noted that pellet wheat screening with manipulated enzyme could improve the growth rate (GR) and feed conversation ratio (FCR). The similar results have reported in pill of wheat screening by (Saunders *et al*., 1969; Cave *et al*., 1965). Stapleton *et al*., 1980 have found that there are no any significantly ($P<0.05$) adverse effect of 60% wheat screening in 6 week broiler age on growth rate and feed conversation ratio compared by wheat seed this also supported by (Vanderkils *et al*., 1993). Mathlouthi *et al*., 2001 have reported that wheat screening arabenose is lower than wheat, triticale, oats, wheat bran and the other wheat by-product but higher than barley, corn, soybean meal and rice barn. In overall the viscosity of wheat screening is lower than above cereal seed (Mathlouthi *et al*., 2001). There is no much attention to determination of wheat screening intestinal viscosity and organelles response but the physical content of this feed has shown that there are lots of wheat, barley, oats and rey in this ingredient. Regarding these cereals much more study was carried out to find out what happen to intestinal viscosity in this particular case. High intestinal viscosity content was recognition by wheat, barley, oats and rye in poultry feeding (Choct *et al*., 1996; Mathlouthi *et al*., 2001; Vanderkils *et al*., 1993). Decreasing feed overflow, declining ca and p absorption (Vanderkils *et al*., 1993) and depressing protein and fat digestibility by these cereal and increasing intestinal viscosity have confirmed by Choct *et al*., 1996. Limited research has focused to determine of these items exactly in wheat screening particularly in our condition in broiler diet. Since, this study has been optimized to consider the effect of wheat screening on intestinal viscosity, Ileal protein digestibility and broiler performance based on our condition (Iran).

Materials and Methods

Three hundred and twenty unsexed day old chicken Ross 308 were placed as a group and fed by the commercial diet until 21 day old. Experimental diets have been modulated in four treatments (0, 10, 20 and 30 %) of wheat screening as presented in Tables (1 and

Table 1: Ingredient in four experimental diets (Kg)

Ingredient	control	10% W.S.[1]	20% W.S.	30% W.S.
Corn	620	525.2	428.7	332.7
Soy bean meal	271.2	262.5	255	247
Concentre[2]	75	75	75	75
Wheat screening	-	100	200	300
Oyster shell	12.7	12.7	12.30	12
Corn oil	17	21	25	29
DL-methionine	1.5	1.5	1.7	2
L-Lysine	0.3	0.2	0.2	0.2
Antioxidan	0.15	0.15	0.15	0.15
Vitamins	1.45	1.20	1.40	1.40
Salt	0.7	0.55	0.55	0.55

1,W, Wheat screening; 2, Concentre Includes: Corn gluten, 0.49; Soya, 43.14; Fish meal, 4.9; methionine, 4.51; Lysine, 1.57; grindazim GP15000, 0.26; Colin Clorid, 0.52; Betaien, 0.66; DCP 35.30; Salt, 5.49; Vit. Permix, 1.18; Mine. Permix, 0.59; Antioxidant, 1.39%; ME, 2000 kcak/kg and Crude protein, 35%

Table 2: Nutrient in four experimental diets (%)

Nutrient	control	10% W.S.[1]	20% W.S.	30% W.S.
Crude protein	19	19	19	19
Calcium	0.85	0.85	0.85	0.85
Available phosphorous	0.42	0.42	0.42	0.42
sodium	0.16	0.16	0.16	0.16
cholera	0.216	0.211	0.207	0.205
Methionine	0.46	0.46	0.46	0.46
Lysine	1.0	1.0	1.0	1.0
Crude fibre	4.55	4.55	4.68	4.61
ME (kcal/kg)	2999.88	3000.41	2999.55	2999.46

1, W.S, Wheat screening; 2, ME, Metabolizable energy

2). Four replicates with 20 birds in each were used in treatments. All ration have optimized in isoenergetic and netrogenic. Statistical status was in complete random design (CRD), data was analyzed by SAS programme and means were examined by Dancan multiple test. Body weight (BW), feed intake (FI) feed conversion ratio (FCR), were tested in 28, 35, 42 and 46 days of age. In the end of experiment 2 chickens in each replicate were authonised as a random. Their intestine were removed quickly and Intestinal and Ilieum digesta were removed and then kept in -20°C for measuring viscosity by Estowald method (Habbi, 1999; AOAC, 1990). Protein and fat Ileal digestibility determined by Fuller method (Fuller, 1993) and Ca and P excretion were measured by atomic absorption. The experiment was proved in animal care committee of Bu-Ali Sina University in Iran.

Results

As a present in Table 3 and 4 no significant differences ($P>0.05$) were found in FI, BW and FCR in 28 and 46 day of age regarding different levels of wheat screening effects. In contrast, high significantly different ($P<0.05$) were observed in BW at 35 and 42 days of age by 30% of wheat screening compared with control group (1178.59 and 1754.66 g) respectively. Although no significant change were recognised between different levels of wheat screening in body weight but this factor shows more effectives and very lower in 30% wheat screening compared with other levels. As indicated in Table 5, High significant decreasing ($P<0.05$) were appeard in Ileal protein and fat digestibility in 30% wheat screening compared with other treatments. Where greater significant increasing ($P<0.05$) were shown in excreting calcium, phosphorous as well as intestinal socity in response to 30% of wheat screening compared with other treatments. No significant reaction was indicated in organelles weight related to different levels of wheat screening diet (Table 6). Gastrointestinal tract and intestine weight significantly induced ($P<0.05$) by 30% of wheat screening compared with 10% and control group, but no response was recognized in 20% wheat screening with other treatments .Otherwise no changed were achieved in the others factors (Table 7). In final results, dramatically greater significant reaction ($P<0.05$) were approached in Intestinal and (jejunum +Ileum) length in 30% of wheat screening in comparison to other treatments and 10% W. S. and control respectively (Table 8).

Discussion

Wheat screening is one of the most useful by-products which are produced in throughout the world as well as in

Table 3: Feed intake, body weight and feed conversion ration in 28 and 35 days of age (g)

Treatments	28 days of age			35 days of age		
	FI	BW	FCR	FI	BW	FCR
Control	1302.25[a]	825[a]	1.58[a]	2154.75[a]	1239.39[a]	1.72[a]
10% wheat screening	1298.50[a]	504[a]	1.61[a]	2092.75[a]	1210.03[a b]	1.75[a]
20% wheat screening	1297.25[a]	795[a]	1.63[a]	2090.75[a]	1197.33[ab]	1.76[a]
30% wheat screening	1290.00[a]	791[a]	1.63[a]	2083.00[a]	1178.59[b]	1.77a

FI, Feed intake; BW, Body weight; FCR, Feed conversation ratio; Means in the same column with no common superscript are different significantly (P<0.05).

Table 4: Feed intake, body weight and feed conversion ration in 42 and 46 days of age (g)

Treatments	42 days of age			46 days of age		
	FI	BW	FCR	FI	BW	FCR
Control	3475.50[a]	1832.09[a]	1.89[a]	4256.25[a]	2085.24[a]	2.03[a]
10 %wheat screening	3385.00[a]	1778.13[ab]	1.91[a]	4208.75[a]	2062.12[a]	2.04[a]
20% wheat screening	3379.25[a]	1771.58[ab]	1.92[a]	4196.75[a]	2035.79[a]	2.06[a]
30% wheat screening	3370.00[a]	1754.66[b]	1.62[a]	4178.75[a]	2022.09[a]	2.07[a]

FI, Feed intake; BW, Body weight; FCR, Feed conversation ratio; Means in the same column with no common superscript are different significantly (P<0.05).

Table 5: Intestinal viscosity, Ileal protein and fat digestibility and Ca, P execration (%)

Treatments	Crude protein	fat	Calcium	Phosphorous	Viscosity[1]
Control	82.24[a]	73.27[a]	35.12[b]	44.56[b]	1.51[b]
10 %wheat screening	81.96[a]	72.19[a]	35.74[b]	44.91[b]	1.52[b]
20% wheat screening	81.83[a]	71.78[a]	35.99[b]	45.00[b]	1.53[b]
30% wheat screening	79.78[b]	68.94[b]	39.27[a]	47.02[a]	1.61[a]

[1]Viscosity is based on Centipoise (cP)., Means in the same column with no common superscript are different significantly (P<0.05).

Table 6: Organelles weight in response to different levels of wheat screening (g)

Treatments	liver	Pancreas	F. Gizzard	E. Gizzard	F. PRC	E. PRC
Control	48.77[a]	4.71[a]	56.72[a]	37.51[a]	8.71[a]	7.52[a]
10 %wheat screening	46.78[a]	4.73[a]	58.53[a]	37.65[a]	8.31[a]	7.57[a]
20% wheat screening	46.12[a]	4.96[a]	57.14[a]	40.19[a]	7.99[a]	7.06[a]
30% wheat screening	51.23[a]	5.17[a]	61.29[a]	40.24[a]	8.02[a]	6.91[a]

F, Full; E, Empty; PRC, Proventriculus; Means in the same column with no common superscript are different significantly (P<0.05)

Iran. Since the wheat as a main cereal food was used in along time ago in human nutrition. Therefore the wheat by-product (Wheat screening) is more available in the most part of country, particularly in location that current experiment was carried out. In related to this availability an experiment was set up. Table 3 and 4 were presented that there are no any significant differences (P>0.05) in FI, BW and FCR in response to different levels of wheat screening in the end of experiment, this was agree by other researchers (Audren *et al*., 2002; Bragg and Biely, 1977; Wold-Tsadick and Bragg, 1980), in contrast the out put of some works were not corresponding with results of this study (Choct and Annison, 1990; Choct *et al*., 1996; Edwards *et al*., 1988; Mohanna, and Carre, 1998), it could be related to different environmental condition, wheat cultivar, harvesting situation, experimental environment and grading wheat screening.

Increasing viscosity by cereal seed as a general and wheat screening as well as has been emphasised by most scientific works (Brenes *et al*., 1993; Esteve Garcia *et al*., 1997; Marpuardt, 2000; Mathlouthi *et al*., 2001; Preston *et al*., 2000), since the most part of wheat screening consist of cereal seeds such as wheat, barley, oats and rye (Rajabzadeh, 2001; Golian and Parsaie, 1996). This increasing was supported by current study in 30% wheat screening. Depressing ILeal protein and fat digestibility as well as increasing calcium and phosphorous excreting by receiving much more arabinoxyalane and ß-glocan in 30% wheat screening, were matched by other achievements (Edwards *et al*., 1988; Mohanna and Carre, 1998; Vanderkils *et al*., 1993). This may related to sorunding nutrients by macro-molecules such as arbinoxylane and ß-glocan in wheat screening and increasing microbial population and caused more Ca and p excreting from gastrointestinal

Table 7: Intestinal weight in response to different levels of wheat screening (g)

Treatments	F. Intestine	E. Intestine	F. Ceca	F. G I T
Control	84.98[a]	38.40[b]	14.49[a]	234.36[b]
10 %wheat screening	88.70[a]	38.81[b]	14.83[a]	299.10[b]
20% wheat screening	89.51[a]	43.16[ab]	14.97[a]	248.34[ab]
30% wheat screening	96.38[a]	48.09[a]	15.20[a]	266.28[a]

F, Full; E, Empty; GIT, Gastrointestinal tract. Means in the same column with no common superscript are different significantly (P<0.05)

Table 8: Intestinal length in response to different levels of wheat screening (cm)

Treatments	D. L.	I & J L.	Intestine L.	Ceca L.
Control	29.37[a]	137.65[b]	167.52[b]	22.12[a]
10 %wheat screening	27.38[a]	148.00[b]	175.37[b]	22.44[a]
20% wheat screening	27.00[a]	151.87[ab]	177.75[b]	22.38[a]
30% wheat screening	28.25[a]	171.00[a]	199.12[a]	22.75[a]

D, Duodenum; L, Length; I & J, (Ileum + jejunum); Means in the same column with no common superscript are different significantly (P<0.05)

tract. Liver, pancreas, Full and empty gizzard and proventriculus weight didn't show any reaction to different levels of wheat screening this was also noted by (Preston *et al*., 2000) Intestinal weight and length was effected by 30% wheat screening, Particular case in this category was related to full gastrointestinal and empty intestine weight with high significantly ($p<0.05$) increasing in 30 and 20% of wheat screening compared with other treatments. In addition intestinal length in 30% of wheat screening and (jejunum+ ILeum length) at 20 and 30% of W. S. were high dramatically increased P<0.05) in comparison to other treatments. These finding may effect in digestibility as well as nutrient absorption which also examined by (Choct and Annison, 1990; Esteve Garcia *et al*., 1997; Marpuardt, 2000).

Conclusion: Wheat screening as a by-product with low price could use at least in 20% of broiler ration. Since the results of this study have shown that, there is no any adversely effect even from 30% of wheat screening on broiler performance. In contrast by attention to depressing protein digestibility and increasing viscosity by 30% of wheat screening, 20% of this by- product could be a more desirable amount in broiler ration.

High attention should be made to find out the suitable condition of this ingredient in feeding of layers hens, breeder, and to other birds, there is no doubt this useful by-product (co-product) may impress production in poultry industry.

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References

Association of official analytical chemists, 1990. Officical method of analysis. Vol. 2 (5) 3rd edition, pp: 69-88.

Audren, G.P., H.L. Calssen, K.V. Schwean and V. Raca, 2002. Nutrional value of wheat screening of broiler chickens. J. Anim. Sci., 82: 393-398.

Balyey, H.S., J.D. Summer and S.J. Slinger, 1968. The fluency of steam pelleting condition on the nutritional value of chicken diets. Poult. Sci., 47: 931-939.

Bragg, D.B. and J. Biely, 1977. Nutritive value feed of wheat screening in broiler diets. Poult. Sci., 56, 1697 (Abstract).

Brenes, A., M. Smith, W. Guenter and R.R. Marquardt, 1993. Effect of enzyme supplementation on the performance and digestive tract size of broiler chickens fed wheat and barley-based diets. Poult. Sci., 72: 1731-1739.

Cave, N.A.G., S.J. Slinger, J.D. Summers and G.C. Ashton, 1965. The nutritional value of wheat milling by-products for the growing chicken. 1. Availability of energy. Cereal Chemistry, 42: 523-532.

Choct, M. and G. Annison, 1990. Anti nutritive activity of wheat pentosans in broiler diets. Br. Poult. Sci., 31: 811-812.

Choct, M., R.J. Hughes, J. Wang, M.R. Bedford, A.J. Morg and G. Annison, 1996. Increased small intestinal fermentation is partly responsible for the antinutritive activity of non-starch polysaccharides in chicken. Br. Poult. Sci., 37: 609-621.

Golian, A. and S. Parsaie, 1996. Utilization of wheat screening in laying hen nutrition. J. Agri. Sci., Karaj, Iran, 27: 105-114.

Edwards, C.A., I.T. Johnson and N.W. Read, 1988. Do Viscous polysaccharides slow absorption by inhibiting diffusion or convection? Eur. J. Clin. Nutr., 42: 306-312.

Esteve Garcia, E., J. Brufau, A. Prraz Vendrell, A. Mionel and N. Duren, 1997. Bioefficiency of enzyme preparation containing ß-glutamate and xylanase activities broiler diet based barley and wheat in combination with flavomycin. Poult. Sci., 79: 1778-1738.

Fuller, M.F., 1993. In-vitro digestion for pigs and poultry, Second edition, C. A. B. International, P: 209.

Habibi, Z., 1999. Practical methods of chemistry lab. Publishing in Sohrab, pp: 403-407.

Marpuardt, R.R., 2000. Enzyme enhancement of nutritional value of cereal: role of viscosity water soluble non-starch polysaccharides in chicken performance in enzymes in poultry and swine nutrition. Edited by Ronald R. Marpuardt and Zhengxang han. IDRC. CRDI publishing.

Mathlouthi, N., L. Saulnier, B. Quemener and M. Larbier, 2001. Comparison of the effect of two enzyme preparations on feedstuff viscosity. Nutr., 65: 553-554.

Mohanna, C. and B. Carre, Y. Nys, 1998. Incidence of dietary viscosity on growth performance and zinc manganese bioavailability in broiler. Anim. Feed Sci. Tec., 77: 225-226.

Preston, C.M., K.J. McCracken and A. McAllister, 2000. Effect of diet form and enzyme supplementation on growth efficiency and energy utilization of wheat based diets for broiler. Br. Poult. Sci., 41: 324-331.

Rajabzadeh, N., 2001. Advance technique in cereal, university of Tehran, pp: 150-290.

Saunders, R.M., H.G. Walker, Jr. and G.O. Kohler, 1969. Aleurone cell and the digestibility of wheat mill feeds. Poult. Sci., 84: 1497-1503.

Stapleton, P., D.B. Bragg and J. Blely, 1980. The botanical and chemical composition and nutritive value of wheat feed screenings. Poult. Sci., 59: 333-340.

Vanderkils, J.D., M.W.A. Verstegen and A. Vanvoorst, 1993. Effect of soluble polysaccharide (Carboxyl methyl cellulose) on the absorption minerals from the gastrointestinal tract of broiler. Br. Poult. Sci., 34: 985-997.

Wold-Tsadick, M.S. and D.B. Bragg, 1980. Utilization of wheat screening in the broiler diet as a major source of energy. Poult. Sci., 56: 1674 (Abstract).