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A Study On Wheat Middling's Usage On Turkey's Performances

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Abstract: Two trials were conducted to determination of chemical composition and nutritive value of grade 1 wheat middlings wastes and its suitable levels in turkey diets were investigated.Experiment 1 evaluated the chemical composition, and energy and protein content. The experiment 2 was conducted by 160 day old unsexed white wide breast turkeys. Four rations were used as a four treatments includes (0, 10, 20,30%) of wheat middlings in turkeys diets. Four replicates with 10 birds were arranged in each.All of diets were Isoenergetic and isonetrogenous. The experiment was started from 30 days of age to the 120 days of old. Experiment statistical was in complete random design (CRD), data analysed by SAS program and means were examined by Duncan multiple test. The metabolizable energy and protein content were 3220 kcal/ kg and 14.2% respectively. No significant differences were found in body weight (BW), feed conversion ratio (FCR) and body weight gain and cost of 1kg meat production in the turkey feeding trial and in by different levels of wheat middlings($p>0.05$). There were no significant variables in breast and thigh and abdominal fat and viscera percent of slaughtered turkeys too ($p>0.05$). However, in this study, these variations did not significantly affect the performance of turkeys. It would suggested that 30% of wheat middlings in turkey's ration could leads to decrease the ration price and approach more benefits for turkey industry

Key words: Turkey, Wheat midddlings

INTRODUCTION

Wheat midddlings (Wm) are a by-product of the wheat milling industry and do not compete with humans as a source of food. As such these by-products have the potential to reduce Poultry and livestock feeding costs. During the wheat milling process, about 70 to 75% of the grain becomes flour, and the remaining 25 to 30% is available as wheat byproducts largely destined for livestock consumption. These by-products commonly are referred to as millfeed (MF),wheat mill run (WMR), or Wm with little regard for the various mill streams and proportions that are combined and ultimately constitute the by-product's final composition. From a human nutrition standpoint, it is a paradox that wheat milling methods to produce white flour eliminate those portions of the wheat kernel (bran, germ, shorts,and red dog mill streams) that are richest in proteins, vitamins, lipids and minerals. Forexample, highly refined (patent) flour may contain only 10 to 12% of the total thiamine and niacin, 20% of the phosphorus, and 50% of the calcium of the parent grain (K. State University, 1998). Wm are available in two types as grade 1 and grad 2. Grade 1 includes 80% of Wm. Hole and broken grains are the magor parts of grade 1 Wm and in grade 2 in addition flour and other cereal grains and straw and dust are available(K. State University, 1998). Many factors are important on protein digestibility and on content of metabolisable energy of Wm such as amount of non starsh polysaccharides(NSP) and environmental factors . High water soluble NSP for example pentosans in diet can cause increase of viscosity of digestives and decrease digestibility of nutrients of feed and increase of water consumption and loss of performance and do management problems(Classen, H.L., 1996). Stapelton and *et al* (1980) after determination of Wm composition reported that Wm includes: broken and shrunken grains 77%,wild buckwheat 17.3%,wild oat 1.29%,rape-seed 1.13%,cow cockle 0.76%, lady's thumb 0.92% and dust is 1.6% (Stapelton, P., 1980). In k.state univ report amount of broken grains and weed seeds is reported about 2%-3% (K. State University, 1998). Previous research has suggested that Wm can be used successfully in poultry feeding. Amino acid content of Wm is

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higher than wheat grains and its use in broiler diets have not undesirable effects on broiler performance(Stapelton, P., 1980). Stapleton et al. studied five different commercial samples of wheat screenings containing from 67 to 84% wheat, 12.2 to 14.6% protein, 4 to 12% wild buckwheat and 5 to 11% rapeseed, in feeding studies with broiler chickens to 4 wk of age. No significant effect of wheat screenings was seen on body weight and feed efficiency(Stapelton, P., 1980). Gheisari and et al studied grade 1 and grad 2 wheat screening and macaroni wastes as energy resources on broiler diets. They reported it is possible to use macaroni wastes and grade 1 wheat feed screening at 45% and 30% levels in the diet of broiler chicks ,respectively, without any undesirable effects on their performance(Gheisari, A., 2003). Saki and Alipana studied on metabolizable energy and protein digestibility of wheat screening diet on growth rate of broiler. They show that metabolizable energy of grade 1 of wheat screening is significantly higher than grade 2 wheat screening($p<0.05$). No significantly differences were found in daily feed intake, daily growth rate, uniformity, and production index in concern to different levels of wheat screening in broiler diet(Saki, A.A. and A.A. Ali Pana, 2005).

The above data indicate a high degree of potential for the use of wheat screenings in poultry diets. By the way there is no data about Wm usage and its effects on turkey's performance. Therefore, the following study was designed to study the nutritive value and use of Wmf in turkey diets.

MATERIAL AND METHODS

Experiment 1:

Botanical and chemical composition and nutritive value of grade 1 Wm was determinated. Three Wm samples were measured. Samples obtained with the only stipulation being that the samples were grade 1 Wm appropriate for monogastric species. Amount of contents of grade 1 Wm was measured by grain screening machine (Table 2). The samples were chemically analyzed for key nutritional characteristics, moisture [Association of Official Analytical Chemists (AOAC) 1990], protein (AOAC 1995) ether extract (AOAC 1990), (Table 3). The samples were used in a sibbald method for determination of metabolizable energy(Stapelton, P., 1980).

A total of 24 adult male leghorn roosters were placed in battery cages and used to determine the true metabolizable energy (TME) of the Wm. First 24 hours were all hungry roosters to be emptying the contents of the viscera samples.

Then they divide to two groups of control and trial group by 3 replication with 4 rooster in each replicant. In control group no feed were had for 24 hours. In trial group 30 gr of grade 1 Wm was force feeded to rooster by use of a special funnel. After 24 hours excreta of each group were collected and TME calculated (Stapelton, P., 1980), (Table 3).

Experiment 2:

A total of 160 turkeys(white wide breast) were housed in straw litter pens. Each dietary treatment had 4 replications (10 birds each) for a total of 40 birds per treatment. The same Wm samples used in exp. 1 replaced, 0%, 10%, 20%, 30% of the diet for the experimental period from 30 day old to 120 day old. Diets were formulated to be isoenirgetic and isonitrogenous (Table 1,Table2). Up to 30 days of age, chicks fed with same diet. Trial period started from 30 to 120 days(from week of 4 to 16th week). Diets formulated using software UFFDA. Experiment statistical was in complete random design (CRD), data analysed by SAS program and means were examined by Duncan multiple test(Saki, A.A. and A.A. Ali Pana, 2005).
Statistical design mathematical model above is as follows.

$$X_{ij}= \mu +a_i+ e_{ij}$$

In the above model:
X_{ij} : numeric value of each view
μ : population mean
a_i : effect of each treatment
e_{ij} : is the effect of experimental error.

Weekly body weight gain, were measured weekly and reported as monthly reports. Final weight, feed conversion ratio and cost of one kilo meat per feed consumped were measured in end of experiment. Carcass characteristics of turkeys include % of breast, thighs,abdominal fat content,viscera were measured after slaughter.

Table 1: Composition of diets for turkeys

Ingredients %	Month2				Month3				Month 4			
	0%	10%	20%	30%	0%	10%	20%	30%	0%	10%	20%	30%
Corn	38.57	49.45	38.02	21.75	52.5	44.25	34.75	34.5	56.5	48	39.05	29
SBM	37	38	5.1	34.2	38.21	36.8	35.05	35.75	33.35	32.01	30.75	30.35
Protein concentrate 1*	6	6	20	6	1	1	2	1.765	1	1	1.77	2.2775
Wheat Middlings	0	10	0	30	0	10	20	30	0	10	20	30
Wheat Bran	0.05	0	3.5	0	---	---	---	---	---	---	---	---
Oil	3.5	3.94	2	4.655	4.7	4.2478	4.79625	4.83	4.91	4.9043	5.35535	4.9666
Oyster shell	2.13	2.04	0.45	2.04	2.42	2.4322	2.5	2.33	2.45	2.43	2.06465	2.33
DCP	0.4	0.6	0.12	0.4	0.85	0.4	0.38	0.05	0.87	0.60	0.39	0.3059
NaCl	0.12	0.12	0.56	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Enzymite **	0.1	1.48	0.25	0.315	0.1	0.5	0.3375	0.5	0.55	0.6857	0.125	0.40
Min+vit premix	0.25	0.25	----	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Calculated values	----	----	3029.9	----	---	----	----	----	---	---	---	----
TME kcal\kg	3030	3030.2	23.72	3030.2	3092	3090	3090	3090.18	3152.797	3153.546	3152.822	3152.697
CP%	23.46	23.70	1.18	23.45	20.224	20.2512	20.240	20.221	18.74	18.74	18.74	18.74
Ca %	1.24	1.25	0.462	1.19	1.24	1.28	1.261	1.144	1.24	1.27	1.24	1.20
P a %	0.464	0.495	38.02	0.473	0.41	0.39	0.39	0.36	0.43	0.40	0.40	0.39

1.Protein concentrate provided per kilogram of diet ME 1960 kcal/kg, Crude Protein 25, Calcium 16.5%, Available Phosphorus 7.2%, Na 3 5, Cl 3.3%, Lysine 4%, Methionine 3.3 %, Met+Cystine 3.5%

2. Poultry Premix provided per kilogram of diet Mn, 88 mg; Cu, 6.6 mg;Fe, 8.5 mg; Zn, 88 mg; Se, 0.30 mg; vitamin A, 8,800 IU; cholecalciferol,3,300 IU; vitamin E, 6.6 IU; vitamin K, 5.0 mg; riboflavin, 4.4 mg;pantothenic acid, 5.5 mg; niacin, 25 mg, choline, 150 mg; vitamin B12,8.8 mg; ethoxyquin, 1.1 mg/kg.

3. Enzymite chemical analyze : Sio2 66.5%, AL2o3 11.81%, Tio2 0.21%, Fe2o3 1.3%, Cao 3.11%, Mgo 0.72%, K2o 3.12%, Na2o 2.01% Mno 0.04%, P2 o5 0.01%

Results:

Experiment 1:

Wm botanical composition shows in table 2.

Table 2: Botanical composition of wm samples

Whole wheat grain %	34.2
Broken wheat grain %	61.8
Weed seed %	3.4

In table 3 chemical composition a nd nutritive value of wm is showed.

Table 3: Chemical composition and nutritive value of wm

TME(kcal\kg)	3220
Moisture 5	10.4
Crude protein %	14.2
Ether extrate %	3.7
Crude fiber %	4.5
Calcium %	0.134
Available phosphorus %	1.05
Sodium %	0.36

Experiment 2:

- Weekly Weight Gain and Final Weight:

Wm levels did not affect broiler average weekly body weight gain for the periods of month 3 or month 4 ($p>0.05$). There were significant differences between treatments in month 2($p<0.05$). There were no significant variables in final weight ($p<0.05$).

- Feed Conversion Ratio:

No significant differences were found in feed conversion ratio (FCR) by different levels of Wm($p>0.05$) (Table 4).

Table 4: Effect of wheat screenings on growth, feed efficiency, and performance of turkeys.

Treatment	0%	10%	20%	30%	SEM	Probability
Avg wg month 2	844.2 a	825.3 b	815.5 c	821.1 bc	2.323	*
Avg wg month 3	1303	1257	1297	1240	4.160	NS
Avg wg month 4	1194	1239	1209	1161	5.027	NS
Final w kg	15.32	15.18	15.07	14.60	0.036	NS
FCR	2.510	2.483	2.520	2.460	0.029	NS
Cost rial	12955	13218	12765	12270	3.481	NS

Avg gain – average gain. Gr/week *there were significant differences ($p<0.05$)
FCR – Feed Convertion Rate
Each dollar equals with 10000 rials.

Table 5: Effect of wheat screenings on carcass traits

	Treatment					
% of carcass	0%	10%	20%	30%	SEM	Probability
Breast	28.89	28.53	28.85	28.42	0.038	NS
Thigh	23.97	23.93	23.49	23.37	0.030	NS
Abdominal Fat	1.05	0.69	0.81	1.29	0.042	NS
Viscera	5.65	5.64	5.48	5.27	0.036	NS

z1, control, no wheat screenings; 2, 25% wheat screening 1; 3, 50% wheat screenings 1; 4, Total wheat replacement by wheat screenings 1; 5, 25% wheat screenings 2; 6, 50% wheat screenings 2.
yAvg gain – average gain. xAvg FI – average feed intake

- Cost of 1 Kg Meat Production:

No significant differences were found in index of production and cost of one kg of meat($p> 0.05$). (Table 4). Alghogh the best results and less cost is belongs to treatments with using Wm(Table 4).

- Carcass Traits:

On carcass traits, including carcass parts (percent of the breast, thighs percent, the percentage of abdominal fat, percentage of viscera) no significant differences between different treatments were found($p>0.05$) (Table5).

Discussion:

As is clear the protein amount of grade 1 Wm better than wheat grain . According to some reports, the amount of weed seeds increases protein content of Wm and cause a better profile of amino acids in Wm even compared to hole wheat grain (K. State University, 1998). The metabolizable energy also is high. In the report of K. State University, the amount of starch is about 25.75 percent and has been reported that could cause the increase of energy (K. State University, 1998). Gheisari and et al reported that the amount of metabolizable energy is 3270 kcal/kg. Moisture level was 7.8%, crude protein 12%, crude fat 2.2%,and crude fiber 3.5% percent has been reported that is similary with our project (Gheisari, A., 2003). These performance results are in accordance with the findings. Stapelton and et al after determining the chemical composition of Wm reported that the amount of amino acids is higher than of wheat grain (Stapelton, P., 1980). Similar results reported about better profile of amino acids in Wm compaired with wheat grain, reports of Wold. Tsadick , Audren ans et al, Bennet determined the chemical composition and metabolizable energy too (Wold Tsadick, M.S. and D.B. Bragg, 1980; Audren, G.P., 2002; Bennett, C., 2002). They reported the metabolizable energy and other nutrients in Wm is higher than wheat grain. These performance results are in accordance with the our findings. Amount of whole grains of wheat in grade1 Wm in our results is 34.2% that are in accordance with (Gheisari, A., 2003). They reported that the whole wheat grain is 33.8% in grade 1 Wm(Gheisari, A., 2003). Stapelton reported the less results of whole wheat grains content in Wm(Stapelton, P., 1980). Differences in reports is because of differences in screening machines performances(Gheisari, A., 2003). Percent of weed seeds and broken grains of Wm are in accordance with reports of Gheisari and et al and with K.State University reports about Wm, composition, feeding value, and storage guidelines (Gheisari, A., 2003; K. State University, 1998).

There is no references about use of Wm in turkey's diets and this experiment is the first project and the results gets from broiler's or layer's results. The use of Wm in different percentages of diets in turkeys were not significant differences ($p>0.05$) in weekly body gain, final weight, feed convertion rate(fcr), cost of one kg meat production and carcass traits in turkeys. The results show that the use of Wm in turkeys do not have any bad or adverse effect on performances of turkeys and it is economical. Gheisary and et al reported there were no significant differences between treatments of Wm (with 0,15,30,45 percentage levels) on broiler's daily weight gain during the trial until 56 days(Gheisari, A., 2003).

Proudfoot and Hulan found no significant differences in egg production, egg weight, shell quality, yolk quality, and feed efficiency when adult Leghorn hen diets contained up to 45% of wheat screenings(Proudfoot, F.G. and H.W. Hulan, 1986). Proudfoot and Hulan found no significant differences in broiler chicken performances when wheat screenings represented 45% of the diet(Proudfoot, F.G. and H.W. Hulan, 1988).

Stapelton reported that no significant differences were found on final weight, feed conversion ratio, and daily weight gain of broilers(Stapelton, P., 1980). Wold. Tsadick after determining the chemical composition of Wm and use it instead of wheat grains reported that there were no bad or adverse effect on live weight, feed conversion ratio, and health of chicks in 21-42 days of age(Wold Tsadick, M.S. and D.B. Bragg, 1980). They reported that the amino acid profile of Wm is better than wheat grain (Wold Tsadick, M.S. and D.B. Bragg, 1980). Audren and et al determined the chemical and botanical composition and metabolizable energy of the wheat screening and then reported that nutrients in wheat screening are normal and its use in broiler's diets up to 75% instead of wheat grain were no bad or adverse effects on live weight, daily weight gain, feed convertion ratio(Audren, G.P., 2002). Bennet reported that no significant differences were found between different treatments of use of Wm (0%, 25%, 50%) in daily weight gain, and final weight of broilers in 0-36 days of age(Bennett, C., 2002). Saki andAlipana reported that no significant differences were found on final weight, feed consumption, and carcass taits of broilers in trial period 21-46 d (Saki, A.A. and A.A. Ali Pana, 2005). The amount of NSP in the Wm and levels of Wm in these experiments has not been so dramatically adverse effect on feed intake of broiler chickens. Saki and Alipana reported that were no significant differences between control and other groups of treatments on production index (PI) on broilers(Saki, A.A. and A.A. Ali Pana, 2005).

Althogh there were no significant differences between differet treatment on price of one kilo meat but we found considerable differences in ducnan methods between treatments 20%, 30%, and control treatment (Table 4), (Figure 1). In according to final weight and total feed consumption and number of turkeys in farm we found large and considerable economical use of Wm in turkeys diets. Differences show in Figure 1 and the positive economic effects of the use of grade 1 Wm in turkeys diets is abvious (Figure 1).

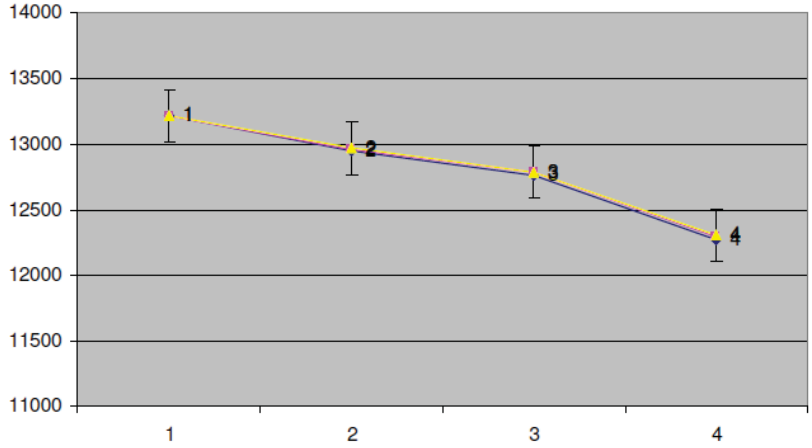

Fig. 1: Effect of wheat middlingss on cost of one kg meat production.
Treatments: 1= 0%(13218 rial/kg). 2=10%(129558480 rial/kg). 3=20%(127658362 rial/kg). 4= 30%(122708353 rial/kg).

Conclusions and Suggestions:

Considering the results of this repot and other similar reports, it can be concluded that using of grade 1 Wm up to 30% without processing does not any bad or adverse or unfavorable effects on weight gain, feed consumption, final weight, feed conversion ratio, carcass traits, production index. Use of grade1 Wm can reduce considerably costs of production and it is economically and is not compete with human as a food and can be used totally as a animal and poultry and turkeys feedstuffs. It is suggested that experiments using different processing methods, for example using enzymes with higher and various levels of grade 1 and 2 Wm will be done.

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