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A Study On Wheat Middling's Usage On Layer'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 layer diets were investigated.Experiment 1 evaluated the chemical composition, and energy and protein content. The experiment 2 was conducted by 240 hyline w36 layers from 24 to 40 weeks of age. Four rations were used as a four treatments includes (0, 7.5,15,22.5%) of wheat middlings in layer diets. Four replicates with 15 birds were arranged in each.All of diets were Isoenergetic and isonitrogenous.. Experiment statistical was in complete random design (CRD), data analysed by SAS programme 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 and egg production percentage (P%) between different levels of wheat middlings in diets (p>0.05).In egg composition including egg weight, egg mass, albumen%, yolk%, shell%, dirty eggs% ,no significant were found (p>0.05).There were significant variables in cost of 1kg of egg production. The treatments fed with wheat middlings have had less cost than control treatment (p<0.05).However, it would suggested that 22.5% of wheat middlings in layer ration could leads to decrease the ration price and egg production cost and approach more benefits for poultry industry.

Key words: layer, 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 by-products 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 byproduct'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 grad2.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(Gheisari *et al.,* 2003). Stapelton and *et al* 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 *et al.,* 1980). In k.state report amount of of broken grains and weed seeds is reported about 2%-3% (K.State University, 1998).

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Previous research has suggested that WM can be used successfully in poultry feeding.Amino acid content of WM is higher than wheat grains and its use in broiler diets have not undesirable effects on broiler performance (Stapelton *et al.,* 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 *et al.,* 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 *et al.,* 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 (Classen, 1996). The above data indicate a high degree of potential for the use of wheat screenings in poultry diets. Therefore, the following study was designed to study the nutritive value and use of WM in layer 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 (Sibbald, 1986). 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 gastrointestinal tract. 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 (Table 3).

Experiment 2:

The experiment 2 was conducted by 240 hy-line w36 layers from 24 to 40 weeks of age.The hens were housed in layer cages (412 cm2 per bird). Four rations were used as a four treatments includes (0, 7.5,15,22.5%) of Wm in layer diets. Four replicates with 15 birds were arranged in each. Feed consumption were equal in all of treatment and were 100 gr/b/d. All of diets were Isoenergetic and isonitrogenous exceed w36 hy-line requirement catalougue (Hy-line variety, 2007-2008), (Table 1),(Table 2). 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 (SAS Institue, Inc. 1999).

Statistical design mathematical model above is as follows.
Xij=+ai+ij
In the above model:
Xij: numeric value of each view
: population mean
ai: effect of each treatment
ij: is the effect of experimental error.

Before starting the experiment one week adaptability to different diets were done.The catalougue of hy-line w36 commercial guide used to lighting methods. Daily egg production, Body weight, Feed convertion rate, were measured in weekly periods .Egg traits include egg weight, egg mass, percent of albumen, percent of yolk, percent of egg shell, percent of dirty eggs were measured weekly. The components of egg (albumen, yolk, and shell) were measured weekly breakouts on two eggs per replicate pen and expressed as percentage of eggweight.Cost of 1 kilo egg production were measured finally.

Results:

Experiment 1:

WM botanical composition shows in table2

Table 1: Composition of diets for broiler chickens

Ingredients %	0%	7.5%	15%	22.5%
Corn	57.3	52.19	45.63	38.78
SBM	24	22.15	21.29	20.35
Protein concentrate 1	5	5	5	5
Wheat Middlings	0	7.5	15	22.5
Oil	3.5	3.35	3.42	3.53
NaCl	0.125	0.12445	0.125	0.125
Dical phosphate	0.6	0.20	0.30	0.5
Limestone	3.5	4.45	4.35	4.25
Oyster shell	4.5	3.6544	3.7	3.71
Layer premix 2	1.014	1	1	1
Enzymite 3	0.461	0.38115	0.185	0.255
Calculated values	----	----	----	----
TME kcal\kg	2853	2853	2853.54	2853.12
CP%	17.88	17.81	17.84	17.82
Ca %	3.86	3.82	3.82	3.85
P a %	0.475	0.482	0.469	0.467
Cost (rial/kg) 4	4460	4300	4210	41201.

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 and nutritive value of WM is showed.

Table3: 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

Body weight:

WM levels did not affect layer's body weight for the period of 24 to 40 weeks ($p>0.05$). However the body weight of treatment of 0% is less.(Table 4).

Egg production:

No significant differences were found in egg production for the periods of 24 to 40 weeks by different levels of Wm($p>0.05$). The results show that the control treatment is less higher (Table 4).

Feed convertion rate (FCR):

No significant differences were found in feed convertion rate for the periods of 24 to 40 weeks by different levels of Wm($p>0.05$), (Table 4).

Cost of 1 Kg Egg Production:

There were significant differences between treatments in cost of 1 kg egg production ($p<0.05$). The treatment of 22.5% of WM were less than others and the control treatment show the highest cost of one kg egg production in this experiment (Table 4).

Egg weight gr, Egg mass gr/b/d , Egg components (Albumen%, Yolk%, Egg Shell %) Dirty eggs %. On Egg weight gr, Egg mass gr/b/d , Egg components (Albumen%, Yolk%, Egg Shell %) Dirty eggs % no significant differences between different treatments were found($p>0.05$) (Table 5).

Table 4: Effect of wheat middlings on body weight, egg production, feed convertion rate, cost of one kg egg production .

	Treatment					
	0%	7.5%	15%	22.5%	SEM	Probability
Body weight (gr)	1520	1550	1540	1570	0.001	NS
Egg production (%)	85.56	82.57	83.78	83.77	0.061	NS
Feed convertion rate	2.187	2.182	2.240	2.183	0.007	NS
Cost of 1 kg egg	9754 a	9383 b	9430 b	8994 c	1241.729	*

1- 1 $= 10000 rials. Cost of 1 kg egg produced based on diets include different Wm contents.
• - There were significant differences (p<0.05)

Table 5: Effect of wheat middlings on egg weight, egg mass, albumen %, yolk%, egg shell%, dirty eggs% .

	Treatment					
	0%	7.5%	15%	22.5%	SEM	Probability
Egg weight (gr)	53.43	55.50	53.30	54.67	0.065	NS
Egg mass(gr/b/d)	45.71	45.83	44.65	45.79	0.035	NS
Albumen %	60.50	60.60	60.70	60.70	0.011	NS
Yolk %	27.08	27.00	27.00	27.00	0.018	NS
Egg Shell %	11.05	11.12	11.15	11.12	0.001	NS
Dirty eggs %	4.25	4.42	4.65	4.62	0.003	NS

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 *et al.,* 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 *et al.,* 1980). Similar results reported about better profile of amino acids in WM compaired with wheat grain, reports of Wold. Tsadick , audren and *et al,* Bennet determined the chemical composition and metabolizable energy too (Wold *et al.,* 1980; Audren *et al.,* 2002; Bennett, 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 *et al.,* 2003). They reported that the whole wheat grain is 33.8% in grade 1 WM. Stapelton reported the less results of whole wheat grains content in WM (Stapelton *et al.,* 1980). Differences in reports is because of differences in screening machines performances (Gheisari *et al.,* 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 *et al.,* 2003; Hy-line variety ,2003-2005).

There were no significant differences on body weight, egg production and feed convertion rate (p>0.05). In groups with using WM the body weight is slightly higher than control group. On the feed conversion ratio results are very close and it show that nutrients content of WM is very balanced and uniformed (Table 4). Results in reports of layer's performances in our experiment (body wheight, egg production, feed convertion rate, cost of egg production, egg traits) are similar to results of some reports as below.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 and Hulan, 1986).

Bai, Y. and Sundle ML reported that no significant differences on egg production and feed consumption and feed convertion rate in layers feed with 25% WM in diet with 6 different strains (Bai *et al.,* 1992). WM is used as a replacement feedstuff in layer's diet. They reported that egg weight is higher in treatments with using WM than control group.They reported that using of WM in layer's diet do not have any bad or adverse effect on normal egg production process (Bai *et al.,* 1992). These performance results are in accordance with the our findings (Bai *et al.,* 1992). Roberts,S.andK.Bregendahl. reported that 7.5 % of WM in layer's diet have not any significant differences(p>0.05) with control group on egg production, feed consumption, feed convertion rate, albumen%, yolk%, egg shell% (Roberts and Bregendahl, 2006). These performance results are in accordance with the our findings (Roberts and Bregendahl, 2006). Divya Jaroni and etal found no significant differences between 0% and 8% and 16% WM with and without xylanase and protease enzymes on egg production in two strains of hens including Dekalb Delta and Hisex White (Jaroni, 1999). They tested the effects of Wm (WM) with and without enzyme (xylanase and protease) supplementation on late egg production (EP), egg yields, and egg composition in two strains of Leghorn hens (DeKalb Delta and Hisex White).Six diets were randomly assigned to 300 birds (150 birds per strain) from 42 to 60 wk of age. Diet 1 was a cornsoybean meal control, Diets 2 and 3 had 8 and 16% WM,respectively, Diet 4 had 8% WM with 0.1% enzyme, and Diets 5 and 6 had 16% WM with 0.1 and 0.2% enzyme,respectively. Each dietary treatment was replicated five times per strain. Egg production, feed consumption(FC), feed efficiency (FE), percentage dirty eggs, specific measured on a weekly basis. Egg components (EC) were measured biweekly and birds were weighed every 4 wk.Egg production was not significantly affected by diet,with averages of 83.7, 85.7, 84.1, 84.2, 82.3, and 84.0% for diets, 1, 2, 3, 4, 5, and 6, respectively.that is similar to our results. Strain and diet had a significant effect on EC with higher percentages of albumen and yolk for diets with enzyme and for DeKalb hens. Percentage shell was lower for DeKalb hens than for Hisex hens but was not affected by diet. There was also a significant increase in EW for Diets 4 (63.1 g), 5 (63.8 g), and 6 (63.2 g) compared to Diets 1 (62.1 g), 2 (62.4 g), and 3 (63.0 g), with DeKalb hens showing an increase with Diet 5 compared to Hisex hens (Jaroni, 1999). Egg mass improved with the higher rate of enzyme in 16% WM diet compared to the lower enzyme level. Percentage dirty eggs did not differ significantly among treatments but was higher for the Hisex strain than for the DeKalb strain. There were no differences in BW between the two strains of hens or among diets , These performance results are in accordance with the our findings (Jaroni, 1999). They reported that adding protease and xylanase to diets rich in fiber can improve the egg output without affecting production parameters (Jaroni, 1999). The amount of NSP in the WM and levels of WM in these experiments has not been so dramatically adverse effect on health of layer hens.There were significant differences($P<0.05$) between differet treatment on cost of one kilo egg production.we found considerable differences in ducnan methods between treatments 0%, 7.5%, 15%, 22.5%. There are large and considerable economical use of WM in layer diets. Differences show in Figure 1 and the positive economic effects of the use of grade 1 WM in layer diets is abvious(Figure 1). These performance results are in accordance with Saki and Alipana reports18. (Saki *et al.,* 2005)

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 22.5% without processing does not any bad or adverse or unfavorable effects on body weight, egg production, feed convertion ratio, egg weight, egg mass, albumen%, yolk%, egg shell%,dirty eggs%. Use of grade1 WM can reduce considerably costs of egg production and it is economically and is not compete with human as a food and can be used totally as a animal and poultry 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.

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%

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.

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%

Each dollar almost equals 10000 rials. Cost of 1 kg diet.

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