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The Effect of Tropical and Cold Cereals Area on Leghorn Performance

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Abstract: The nutritive value of cereal as a major ingredient of poultry feeding may be affected by environmental condition. This reflection may influence poultry production particularly egg production. One hundred and eighty Leghorn pullets were placed in individual cages. They were divided into 9 treatments, four in 20 and 40% of Alvand wheat and Makoie barley (as a cold cereal area). Next four in Chamran wheat and Karoun barley with the same percentage (as a tropical cereal area) were used with control diet. Chemical composition was similar in examined cereal with exception in barley fiber which was higher than others. There were no significant differences in body weight (BW), feed intake (FI) and feed conversation ratio (FCR) between cold and tropical cereal area as well as control diet. Egg weight and eggshell thickness were significantly higher ($P<0.05$) in the control diet compared with the other treatments. The similar trend was appeared in the yolk color ($P<0.05$). Haugh units were significantly greater ($P<0.05$) in 20% of Karoun barley as well as in 20% of Alvand wheat compared with other reflections. On the other hand no significant differences were observed in the egg production, egg shell weight, albumin height and specific gravity in treatments. The result of this study has shown that overall Leghorn performance had similar reaction in response to tropic and cold cereal area with exception in 40% of Karoun barely, which reduced this potential.

Key words: Egg characteristics, Leghorn pullets, cold and tropical cereal area

Introduction

Changes in nutritive value of cereal as the major ingredient of poultry feeding by environmental condition may effect on egg production as well as egg characteristics.

The role of cereal in laying hen nutrition has received a great deal of attention especially with respect to different environmental condition. Cereal is one of the most important part of feed ingredient in poultry industry. In addition it's cost as the highest part of poultry ration (Scott, 1998; Shivazad, 1998). Nutritive value of this cereal such as fiber in particularly NSPs, protein and energy levels may be influenced by this condition. Kolian and Salar Moinie (1999). In general, Cereal nutritive value is constant since with predominant content of starch they are known as an energy source. Based on this evidence energy and protein content of cereal regardless of different condition are in the similar range (Kolian and Salar Moinie, 1999; Latifie and Ghasami, 1999). Lot of work were noted the effect of cultivates and cereal varieties as well as enzyme effect (Glahn and Wlkdem, 1987; Mcnab *et al*., 1996) on their content and nutritive availability. The fiber content in cereal seed also was described in the similar range. In contrast barley with high levels of fiber content (Kolian and Salar Moinie, 1999). Low calcium and high level of phosphorous were recognition in cereal (Zoharie, 1998).

Choct *et al*. (1999) have reported that feed intake of six groups in laying hen with barley, wheat and triticale were higher than those group which were fed with corn and soybean ($P<0.05$). Using barley stored (with reducing slightly NSPs) in laying hen ration at 32-37 weeks had no deleterious effect on egg production (Azarbayjani *et al*., 1998). Some of the nutrient such as fibers in particularly NSPs may increase under the tropical weather compared with temporal situation (Hans *et al*., 1994).

The increasing fiber contents may have the adverse effect on nutrient availability (Hans *et al*., 1994). This could lead to depress the poultry production. Limited work has been conducting to recognition this fact. The nutritive value of cereals and their availability for poultry production in particularly egg production due to environmental condition need to be clarified. Therefore this study has been design to investigation such aspect in poultry industry.

Materials and Methods

One hundred and eighty Leghorn pullets (W_{36} high line) at 18 week old were placed in individual cage for 15 weeks. They were divided into 9 treatments, four in 20 and 40% of Alvand wheat and Makoie barley (as a cold cereal area). Next four in Chamran wheat and Karoun barley with the same percentage (as a tropical cereal area) were used with control diet. A treatment includes 5 birds in each four replicates (9 x 4 x 5 = 180). These birds were arranged in complete random designed (CRD). A Weende analysis method for Feed chemical composition was employed to elucidate of cereal nutrient (Macdonald *et al*., 1995).

Table 1: Ingredient and formulation ration in 5 to 50% egg production in Leghorn Pullets

Ingredient	Control	1	2	3	4	5	6	7	8
Corn	59	48	29.5	47.5	48	29	28	30	47
Soybean meal	13	12.5	11	13	11.5	11	12.5	10	13.5
Wheat bran	10	-	-	-	-	-	-	-	-
Fish meal	4	4	4	4	4	4	4	4	4
Fat	3.5	3.9	5	3.6	3.8	5.1	5	5.3	3.7
Bone meal	-	-	-	-	-	-	-	-	-
Oyster shell	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
DCP	3	3	3	3	3	3	3	3	3
Mineral	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL-Methionine	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Salt	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Calculation									
CP	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
ME	2950	2950	2950	2950	2950	2950	2950	2950	2950
CF	3.3	4.1	5	4.1	4.1	5.5	5.5	4.5	5.5
Ca	3.65	3.57	3.57	3.57	3.57	3.6	3.6	3.6	3.6
P	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mth.	0.54	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

1, 20% Alvand wheat; 2, 40% Chamran Wheat; 3, 20% Makuoie barley; 4, 20% karoun wheat; 5, 40% Makoie barley; 6, 40% Karoun barley; 7, 40% Alvand wheat; 8, 20% Karoun barley. CP, crude protein; ME, metabolize energy, CF, crude fiber; Ca, calcium; P, phosphorous; Mth. , methionine.

Table 2: Ingredient and formulation ration in 50% to peak of egg production in Leghorn pullets

	Control	1	2	3	4	5	6	7	8
Corn	59.5	43.9	27.6	41.8	44.8	23.5	21.5	26.5	41.0
Soybean meal	19.1	16.2	12.2	17.1	15.8	15	16.9	13.4	18
Wheat bran	3	2	2	2	2	1	1	2	2
Fish meal	6	6	5.2	6	5.8	6	6	6	6
Fat	2.5	2	2.1	3.2	1.7	4.6	4.8	2.2	3.2
Bone meal	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Oyster shell	8	8	8	8	8	8	8	8	8
DCP	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mineral	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL-Methionine	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Calculation									
CP	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
ME	2850	2850	2850	2850	2850	2850	2850	2850	2850
CF	3.3	4.1	5	4.1	4.1	5.5	5.5	4.5	5.5
Ca	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65
P	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mth.	0.54	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

1, 20% Alvand wheat; 2, 40% Chamran Wheat; 3, 20% Makuoie barley; 4, 20% karoun wheat; 5, 40% Makoie barley; 6, 40% Karoun barley; 7, 40% Alvand wheat; 8, 20% Karoun barley. CP, crude protein; ME, metabolize energy, CF, crude fiber; Ca, calcium; P, phosphorous; Mth., methionine.

Feed formulation was supplied based on Economic Kosar Organization recommended for W_{36} Leghorn (Sadghi, 2000) Table 1 and 2. Fourteen hours lighting regime with 10 hours dark were used. Body weight (BW), feed intake (FI) feed conversation ratio (FCR) and egg characteristics includes: egg weight (EW), egg production (EP), shell weight (SW), shell thickness (ST), albumin height (AH), yolk color (YC), egg index (EI), egg specific gravity (ESG) and hugh unit (HU) were measured in this study. These characteristics were recorded in every 21 days for 15 weeks. All egg characteristics were determined by methods of Harmes *et al.*, 1995, (Harmes *et al.*, 1990; Williams and Owen, 1995).

Table 3: Chemical composition in wheat and barley in cold and tropical area

Cereal	DM	CP	EE	CF	Ca	P	GE
Alvand wheat	91.26	12.81	1.90	2.84	0.11	0.90	4228.8
Chamran wheat	92.43	14.50	2.02	2.87	0.12	0.40	4209.6
Makoie barley	91.41	12.23	2.92	6.88	0.14	0.35	4158.9
Karoun barley	91.23	11.00	3.37	7.52	0.15	0.40	4128.9

DM, dry matter; CP, crude protein; EE, ether extra; CF, crude fiber; Ca, calcium; P, phosphorous; GE, gross energy.

Table 4: Body weight and feed efficiency of Leghorn pullets in response to cold and tropical cereal area

Treatments	BW/g	BG/g	FI/kg	FCR
20% Al.. W.	1416	228	19.93	3.07
40% Ch. W.	1379	157	19.57	3.68
20% Ma. B.	1430	178	20.82	3.34
20% Ch. W.	1400	180	21.69	4.62
40% Ma. B.	1383	214	19.20	3.32
40% Ka. B.	1379	186	20.94	4.68
40% Al. W.	1364	227	19.79	3.02
20% Ka. B.	1400	259	20.54	4.36
Control Diet	1429	190	20.94	3.84

BW/g, body weight in gram; BG, body gain; FI, feed intake/kg; FCR, feed conversion ratio. No significantly differences ($P<0.05$) were shown in above parameters. Mean in a column without any superscription are no significantly different ($P< 05$). Al, Alvand; W, Wheat; Ch, Chmran; Ma, Makoie; B, Barley; Ka, Karoun.

Table 5: Comparison of the major egg characters in cereal treatments

Treatment and Chamran	Weight/g	Egg prod.%	SPG	Index
20% Al.. W.	52.30 ^{bcd}	41.62 ^{a}	1.079 ^{a}	78.83 ^{a}
40% Ch. W.	52.02 ^{bcd}	66.76 ^{a}	1.079 ^{a}	75.21 ^{ab}
20% Ma. B.	54.03 ^{ab}	62.90 ^{a}	1.078 ^{a}	74.89 ^{b}
20% Ch. W.	52.28 ^{bcd}	58.40 ^{a}	1.078 ^{a}	75.56 ^{ab}
40% Ma. B.	51.62 ^{c}	59.76 ^{a}	1.079 ^{a}	75.05 ^{ab}
40% Ka. B.	51.73 ^{bc}	58.28 ^{a}	1.079 ^{a}	72.38 ^{c}
40% Al. W.	52.58 ^{bc}	66.29 ^{a}	1.080 ^{a}	74.79 ^{b}
20% Ka. B.	51.86 ^{b}	59.77 ^{a}	1.078 ^{a}	75.03 ^{ab}
Control Diet	54.46 ^{a}	62.48 ^{a}	1.078 ^{a}	75.37 ^{b}

Mean in a column without a common superscription are significantly Different ($P< 05$),
Prod., production; SPG, specific Gravity; Al, Alvand; W, Wheat; Ma, Makoie; B, Barley; Ka, Karoun

Table 6: Comparison of eggshell and minors egg characters in cereals treatments

Treatment & characters	Shell weight/g	Shell Thickness/mm	Yolk Color	Albumin Height/mm	Haugh Unit
20%Al.. W.	3.84 ^{a}	0.390 ^{a}	5.94 ^{a}	4.67^{ab}	75.75 ^{a}
40% Ch. W.	4.48 ^{a}	0.400 ^{a}	5.75 ^{a}	3.61^{c}	69.82 ^{b}
20% Ma. B.	4.53 ^{a}	0.390 ^{ab}	6.08 ^{a}	4.67 ^{ab}	75.46 ^{ab}
20% Ch. W.	4.48 ^{a}	0.390 ^{ab}	5.80 ^{a}	4.73 ^{ab}	73.02 ^{ab}
40% Ma. B.	4.34 ^{a}	0.380 ^{b}	5.96 ^{a}	4.15 ^{bc}	74.61 ^{ab}
40% Ka. B.	4.45 ^{a}	0.380 ^{ab}	5.63 ^{a}	3.64 ^{c}	73.66 ^{ab}
40% Al. W.	4.52 ^{a}	0.390 ^{ab}	5.77 ^{a}	3.79 ^{c}	73.11 ^{ab}
20% Ka. B.	4.38 ^{a}	0.380 ^{ab}	6.10 ^{a}	5.25 ^{a}	75.63 ^{a}
Control Diet	4.42 ^{a}	0.400 ^{a}	5.78 ^{a}	5.56 ^{a}	75.39 ^{ab}

Mean in a column without a common superscription is significantly different ($P< 05$). Al, Alvand; W, Wheat; Ma, Makoie; B, Barley; Ka, Karoun

Results

The chemical composition in the different cereal area was determined as an illustrated in the Table 3. Most of measured nutrient in dry matter includes CP, EE, Ca, P and GE are in the similar trend, where that CF of Makoie and Karoun barley were the highest between cereal tested.

No significant differences were observed in body weight,

weight gain, feed intake and feed conversion ratio with respected to cold and tropical cereal area as presented in the Table 4.

Egg weight and egg index were significantly higher ($P<0.05$) in the control diet and 20% of Alvand wheat respectively compared with the other treatments. No significant differences were observed in the egg production and specific gravity in the all treatments (Table 5). The similar trend appeared in the shell weight (g) and albumin height (Table 6). Shell thickness was in the significant highest level ($P<0.05$) at 40% of Chamran wheat and control diet between of treatments.

On the other hand Haugh Unit was significantly greater ($P<0.05$) in 20% of Alvand wheat and karoun barley compared with other reflections. Control diet and 20% of Karoun Barley were shown with the similar response in yolk color and they were significantly greater (P0.05) than the other cases.

Discussion

Cereal as a major content in poultry diet particularly in laying hen is very variable in nutrient content throughout the world. Many factors such as cultivates, soil fertility, rate of raining and harvesting time as well as environmental condition may play the vital role in cereal nutrient content (Carlson and Bonzeer, 1997; Jeroch and Danicke, 1995). In this study dry matter of cold and tropical cereal area and their crude protein, ether extra, calcium and phosphorous are in the similar range. These results have been confirmed by Hans *et al.*, 1994; NRC, 1994; Sadighi, 2000. In contrast high level of fiber was shown in both barley cultivates, similar findings were observed by Kolian and Salar Moinie, 1999; Graham *et al.*, 1990; Maff, 1975; Tohedi, 1995; although similar rate was observed in wheat fibers (Kermanshahie, 2000). No significant differences were found between feed intake and feed conversion ratio. These finding have been noted by Azarbayjani *et al.* (1998); Chot *et al.* (1999). The high rate of feed conversion ratio regarding egg production may be related to the starting of egg production with smaller egg weight compared with peak of egg production (Harms, *et al.*, 1990). No significant changes were noted in body weight and weight gain as mentioned by manual of Leghorn W_{36}, 6.

The egg production and specific gravity of egg were similar in all treatments; Azarbayjani *et al.*, 1998 have also supported these achievements. No differences were observed in egg shell weight, due to cereal treatments (Table 6). This result agrees with the findings of Azarbayjani *et al.*, 1998 and Bandarabadie, 2000. In contrast, significant differences were noted in egg weight (g), shell thickness (mm) yolk color, haugh unit and index of egg ($P<0.05$). These results may concern to the environmental condition. Cereal may store more nutrient in warm climate than cold condition area. On the other hand the NSPs may also increase during this circumstance. This could depress the availability of nutrients in gastrointestinal tract of those young laying hens such as pollutes in this experiment.

In this case fiber may be increased dramatically due to tropical weather. Therefore NSPs may also be increased with this respect. As a result NSPs in the cereal seed particularly in their cell wall not only reduced the cereal digestibility but may be observed as inhibitor (antinutritive factor) of nutrient availability (Hans *et al.*, 1994; Graham *et al.*, 1990; Graham and Bed Ford, 1993; Villamide *et al.*, 1997; Scott, 1998). Since these could depress the availability of nutrients in gastrointestinal tract of these young bird (pullets). The following of these reactions reduction of nutrient absorption could occurred in laying hen as well as in pullets otherwise this might lead to declined of egg production and deleterious of egg characteristics in particularly egg quality.

Conclusion: Leghorn performance had the similar reaction in response to cereals of tropical and cold area with exception in 40% of Karoun barley, which reduced this potential. A number of important questions regarding environmental condition association with cereal nutrient and pullets strains effect as well as reaction of laying hens aged remain to be answered as a future works.

References

Azarbayjani, A., M. Shivazad and Y. Hakimi, 1998. Agricultural science and natural sources of technology, University of Isfhan, 3: 73-79.

Bandarabadie, M., 2000. Ministry of Jahad Kashavarzi, educational and Research center, PP: 10-23.

Carlson, C.W. and B.J. Bonzeer, 1997. Wheat in poultry rations. Cooperative Extension Science, South Dakota State University.

Chot, M., J. Roberts and S. Wlkdem, 1999. Wet droppings in laying hens. Unpublished RIRDC Report, University of New England, Armidale, PP: 1-27.

Glahn, R.P. and J.R.F. Wlkdem, 1999. Enzyme activity of commercial enzyme products. Poult. Sci., 66: 1316.

Kolian, A. and M. Salar Moinie, 1999. Poultry nutrition, Kosar, organization, educational and research center, PP: 27-100.

Graham, H., P. Amon and D. Pettersson, 1990. Chemical Analysis and nutritional Aspects of Dietary Fibres. Animal Nutrition and Transport processes, Mellinger, j. (ed), 5: 242-253.

Graham, M. and R. Bed Ford, 1993. The effect of dietary wheat midds and enzyme supplementation on late egg production efficiency, egg yield and composition, University of Nebraska.

Hans, N.E., M.E. Quigley and J.H. Geoffrey, 1994. Determination of dietary fibre as non-starch polysaccharides with Gas-liquid Chromatographic, High-Performance Liquid chromatographic or Spectrophotometric measurement of constituent sugars. Analyst, 119: 1497-1509.

Harms, R.H., A.F. Rossi and D.R. Sloan, 1990. A method for estimating shell weight and correcting specific gravity for egg weight for eggshell quality studies. Poult. Sci., 69: 48-52.

jeroch, H. and S. Danicke, 1995. Barley in poultry feeding. Wld's Poult. Sci. J., 51: 271-291.

Kermanshahie, H., 2000. Poultry production, 1st Edition, P: 413.

Latifie, N. and M. Ghasami, 1999. Seeds and their consumption. Agricultural and Natural Science of Korkan, P: 80-160.

Maff, 1975. Table of feed composition and energy allowance for ruminants. Ministry of Agriculture, Fishries and food, pinner, Middle sex.

McNab, J.M, K. Bernard, A.I. Knox, L. McNeil and M.R. Bed Ford, 1996. The effect of enzyme addition on digestibility of nitrogen and energy metabolism in young cokereds. Poult. Sci., 75: (Supp.): 33.

N.R.C., 1994. Nutrient Requirement of Poultry, national Academy Press, Washing ton, D. C. P., PP: 19-34.

Shivazad, M., 1998. Manual of Poultry Nutrition, Azad Eslamic University, Karaj, Iran, pp: 1-50.

Sadighi, N., 2000. Manual of management for Leghorn (High line W_{36}). Education and Research Division of Economic Kosar Organization, P: 40.

Scott, T.A., 1998. Factors influencing variability in feeding value of cereal grain for broilers. Agriculture and Agri-food Canada. Finnfeeds international.

Tohedie, M., 1995. The effect of barley with enzyme in laying hens performance. First Conference of poultry, Animal Science Research Institute of Iran, Karaj, PP: 52-54.

Villamide, M.J., J.M. Fuente, P. Peres and A. Flores, 1997. Energy evaluation of eight barley cultivars for poultry effect of dietary enzyme addition. Poult. Sci., 76: 834-840.

William, J.S. and J.C. Owen, 1995. Egg science and technology. Fouth edition. Food products press, New York, P: 591.

Zoharie, M., 1998. Basic Poultry Production, 9th edition, Tehran University, P: 628.