The Effects Of Bentonite (Excell Fs/6) On Egg Performance Of Laying Hens

Fatma İNAL[1], Nurettin GÜLŞEN[1], Behiç ÇOŞKUN[1] and Cavit ARSLAN[2]

ABSTRACT : The experiment was conducted to evaluate the effects of bentonite (Excell FS/63) on egg production, egg weight, egg specific gravity, feed consumptoin and feed efficiency of laying hens 320 Badcock B-380 Srown laying hens at 32 weeks of age fed diets containig 0 (Control), 1.5,2.5, and 3.5 % bentonite.

Egg yield was not affected by bentonite for three months. Damaged egg rates (broken plus abnormal size) were decreased (P-0.05) by feeding 1.5 and 2.5 Excell FS/6. The level of 3.5 % did not affect damaged egg rate Egg weights were 61.42, 61.15, 61.21 and 61.41g of experimental groups, respectively. Both of egg weight and spesific gravity were not influenced by bentonite. While feed efficiency (kg feed/kg egg) was 2.47 in control, 2.45 and 2.43 in the groups fed 1.5 and 2.5 % bentonite.

Key words: Bentonite, Egg performance

Yemlere katılan Bentonitin (Excell FS/6) Yumurta Tavuklarında Verim Performansına Etkisi

ÖZET :Excell FS/6 adlı bir bentonitin yumurta tavuklarında yumurta verimi, yumurta özgül ağırlığı, Yem tüketimi ve yemden yararlanma üzerine etkilerini belirlemek amacıyla yapıldı. Çalışmada 32 haftalık yaşta toplam 320 adet Badcock 13-380 kahverengi yumurtacı tavuk kullanıldı. Tavuklar % 0,1.5, 2.5 ve 3,5 düzeylerinde bentonit içeren yemlerle ad libitum beslendi.

Üç ay süren araştırma boyunca gruplar arasında yumurta verimi bakımından belirgin bir farklılık oluşmadı. Çatlak, kırık ve anormal büyüklükteki yumurtalardan oluşan hasarlı yumurta oranı %1.5 ve 2.5 oranında Excell FS /6 kullanılan gruplarda yaklaşık yarı yarıya azaldığı (P-0.0.5) gözlendi % 3.5 düzeyinde kullanılan bentonitin ise hasarlı yumurta oranı üzerine olumlu bir etkisi bulunmadı.

Yumurta ağırlıkları gruplarda sırasıyla 61.42.61.15.61.21 ve 60.41 g olarak bulundu, gerek yumurta ağırlığı ve gerekse özğül ağırlıklar bentonit ilavesinden etkilenmedi. Bir kg yumurta için tüketilen yem miktarı kontrol grubunda 2.47 kg. % 1.5 ve % 2.5 bentonit yedirilen gruplarda 2.45 ve 2.43 kg olarak bulundu.

Anahtar Kelime: Bentonite, Yumurta performansı

INTODUCTION

The clay minerals from smectite group are called bentonite. Bentonite is a soft and colloidal aluminohydrosilicate which includes 75-80 % montmorillonite (Çelik, 1993, Demirel et al., 1995 Temur, 1994). Bentonites are generally white, yellow, pink or greenish in colour.

A high quality bentonite is hydrophylic, and holds water approximately 6-7 folds (Çelik, 1993).

Turkey is tlie second reach country as bentonite resources which provides nearly 20% of world bentonite beds. The 70-80 % of bentonite produced in Turkey is used for domestic market as civil engineering and agricultural purposes and the remain is exported (Demirel et al., 1995; Kırıkoğlu, 1990; Temur, 1994).

It has been suggested that sodium aluminosilicate supplementation markedly affected P utilization (Monstaghian et al., 1991) and increased egg specific gravity in hens (Monstaghian et al., 1991; Roland, 1990; Roland, 1991). It has been reported that high ion-exchange capability and pH of bentonite has positive effect on egg specific gravity (Roland et al., 1990). It is suggested that negative effect on utilization of phosphorus in gastro-intestinal tract may also be related to formation of a complex between aluminium and feed phosphorus (Monstaghian et al., 1991; Roland, 1990; Roland, 1991).

Spent bentonite that is used in bleaching didn't significantly affect the egg production, feed consumption, feed efficiency, egg weight in hens ($P<0.05$) (Al-Zubaidy, 1992)

In a study used a commercial bentonite, supplementation of 2.5 % bentonite considerable increased the egg production, and decreased 13 % feed intake per unit egg (Vasil'ev and Mirzaliev, 1990).

Also, aliminocilicates have a positive effect to diminish of mycotoxicosis (Kubena et al., 1990). Voss et al., (1993) reported that bentonite was nontoxic and provided significant protection against aflatoxicosis, and safely added to animal feed up to 2.5 % for this purpose.

In addition, bentonite is used feeding broiler. It is reported that bentonite has used refining of canola oil,

1. Department of Animal Nutrition, Faculty of Veterinary, University of Selçuk, 42031, Konya Türkiye
2. Department of Animal Nutrition, Faculty of Veterinary, University of Kafkas, Kar, Türkiye

added 7.5 % level of broiler ration; feed intake, growth rate and feed efficiency didn't effect negatively (Blair et al., 1987).

On the other hand bentonites are composed of important pelleting binding groups. For this aim they are used at 1-2 % level for bird ration by feed plants (Al-Zubaidy, 1992)

This study was conducted to evaluate the effects of an activated bentonite (Excell FS/6.) on egg yield performance in hens.

MATERIALS AND METHODS

In present study, 320 Babcock B-380 brown laying hens at the age of 32 wk were randomly divided four equal groups each 8 replicates of 10 hens per treatments and housed individual cages (45x55x50 cm). The egg production were recorded during 7-d and ensured similar preproduction values of treatments.

Table I. Ingredients and Chemical Composition of Basal Diet

Ingredients	%
Corn	59.5
Soybean meal	9.6
Sunflower meal	13.5
Fish meal	0.8
Meat and bone meal	2.5
Full fat soybean	4.7
Limestone	8.4
Dicalcium phosphate	0.4
Salt	0.26
Vitamin/mineral mix1	0.25
Kemizym	0.05
Methionine	0.4
Chemical analysis	
Dry matter	92.17
Ash	11.28
Crude protein	16.67
Ether extract	3.26
Crude fiber	5.49

' Provided per kilogram of diet: vitamin A, 10 million IU;cholecalciferol, 1,200 ICU; vitamin E, 35 mg; vitamin K3, 5 mg; vitamin B1, 3 mg; vitamin B2,.7 mg; niacin, 20 mg;Ca-d-panthotenate, 10 mg; vitamin B6, 5 mg; vitamin B12, 0.015 mg; folic acid, 1 mg; D-Biotin, 0.045 mg; Choline chloride, 125 mg; vitamin C, 50 mg; charophyll red, 25 mg; charophyll yellow 5 mg; Mn, 80 mg; Fe, 30 mg; Zn, 60 mg; Cu, 5 mg; Co, 0.5 mg; I, 2 mg; $CaCO_3$, 236 mg.

Feed and water supplied for ad libitum throughout the 94-d experimental period. The dietary treatments were the basal diet (Table 1) and the basal diet plus 1.5, 2.5, or 3.5 supplementary dietary activated bentonite. The diets were contained 16 % protein, ME of 2,750 kcal/kg.

Egg production was determined daily and feed consumption and feed efficiency intervals 14-d. Also damaged (broken plus abnormal size) egg rates in total egg production was recorded. Egg weight and egg specific gravity were determined monthly by replicate on all eggs laid in consecutive two days. Egg spesific ,gravity was determined by weighing in the distille water (Hempe et al.,1988).

Dry matter, ash, ether extract, crude protein and crude fibre values were determined by chemical analysis (Akkılıç and Sürmen, 1979) (Table 1)

Data obtained were subjected to analysis of variance using one way ANOVA procedures (SPSS, 1992).

RESULTS AND DISCUSSION

Egg production was not affected by bentonite used at the levels of 1.5, 2.5, and 3.5 % throughout present experiment (Table 2). In the groups, means of egg production were 85.72, 85.25, 85.50, and 85.21 %, respectively ($P>0.05$). It has been reported that spent bentonite did not influence the egg yield in laying hens (Al-Zubaidy, 1992). However, two different bentonite increased egg production, especially at the level of 2.5 %. (Vasil'ev and Mirzaliev, 1990).

During 30-60 d of research, damaged egg rate were significantly less in the groups fed 1.5 % and 2.5 % bentonite than control ($P<0.05$). The inclusion of 1.5 % bentonite significantly reduced damaged egg percentages throughout this study ($P<0.05$). The improved egg shell quality may be due to bentonite's high mineral content. Also, sodium aluminosilicate had a high affinity for Ca and high ion exchange capability (Roland, 1990;1991).

Table2.The Saleable and Damaged Egg Percentages, %

Period	Control	Bentonite		
		1.5 %	2.5 %	3.5 %
Saleable egg %				
0-30 d	92,13	92,33	91,88	91,46
30-60 d	88,61	88,51	89,92	88,75
60-94 d	76,43	74,89	74,71	75,42
Damaged egg %				
0-30 d	0,37	0,18	0,41	0,55
30-60 d	1,50[a]	0,66[a]	0,38[b]	1,14[ab]
60-90 d	1,19	0,64	0,96	1,25

ab Means with a different superscripts within a row are significantly different ($P<0.05$)

In the present study, the damaged egg percentages increased related to bentonite levels (Table 6). The lowest percent was 0.49 % in 1.5 % the highest 0.98 % in 3.5 % bentonite group, but in control group, (1.02 %) was higher than bentonite groups. In another research, a bentonite source used at level of 2.5 % improved the egg specific gravity, but another one decreased the egg shell thickness (Vasil'ev and Mirzaliev, 1990). Egg shell thickness was decreased by 5, 7.5, or 10 % of spent bentonite (Al-Zubaidy, 1992).

During whole periods egg weight and specific gravity were and specific gravity were not statistically significant (P>0.05) (Table 3). Egg weights were similar (61g) among experimental groups. Bleaching bentonite did not affect egg weight, either (Al-Zubaidy, 1992), but a bentonite commercially named Kelesskil decreased egg weights (Vasil'ev and Mirzaliev, 1990). There is a conflict between results of this study and other researchers (Monstaghion *et al.*, 1991; Roland, 1990; 1991).

Supplementation of 1.5, and 2.5 % bentonite increased feed efficiency, but 3.5 percent bentonite decreased (P>0.05) (Table 4). In the other research, bentonite did not influence feed efficiency, either (Al-Zubaidy, 1992). This study is in disagreement with those reported that bentonite decreased feed intake per unit egg (Vasil'ev and Mirzaliev, 1990).

Table 3. The Averages of Egg Weight and Egg Specific Gravity

Period	Control	Bentonite		
		1.5 %	2.5 %	3.5 %
Egg weight, g				
0-30 d	62,61	62,21	61,70	61,59
30-60 d	61,34	60,61	61,21	60,12
60- 94 d	60,30	60,63	60,71	59,54
Egg specific gravtiy				
0-30 d	1,089	1,089	1,090	1,089
30-60 d	1,088	1,087	1,087	1,090
60-94 d	1,090	1,088	1,090	1,090

Table 4. Feed Consumption and Feed Efficiency Values

Period	Control	Bentonite		
		1.5 %	2.5 %	3.5 %
Daily feed consumtion, g				
0-30 d	137,09	133,98	130,19	139,95
30-60 d	132,75	125,95	126,55	136,35
60-94 d	118,08	118,65	120,81	119,68
Feed intake Per kg egg production (kg)				
0-30 d	2,37	2,33	2,30	2,49
30-60 d	2,45	2,35	2,30	2,56
60-94 d	2,58	2,66	2,69	2,71

The inclusion of 1.5, 2. 5, and 3. 5 % commercially named Excell FS/6 into laying diet did not influence egg yield, egg weight, egg specific gravity, and feed efficiency. However, the supplementation of 1.5 and 2.5 % bentonite significantly decreased damaged egg percentage (broken and abnormal size). Addition of bentonite in levels of 1.5 and 2.5 % increased number of saleable eggs 167 and 198 per tonne feed consumed (Table 5). According to result of this research says that Excell FS/6 whatever didn't effect negative up to 3.5 %, but 1.5% and 2.5 are more suitable egg yield performance. To the present study, bentonite may be add into the diets of laying hens without negative effects. Addition of bentonite to the diets of laying hen has not been studied extensively, so further research is required on this subject.

Table 5. Some Performance Parameters in This Study

	Control	Bentonite		
Parameter		1.5 %	2.5 %	3.5 %
Egg production. %	85.72	85.25	85.50	85.21
Damaged egg. %	1.02 a	0.49 b	0.58 ab	0.98 ab
Egg weight. g	61.42	61.15	61.21	60.41
Egg specific gravity. g/cm3	1.089	1.088	1.089	1.090
Feed consumption. g/d	129.31	126.19	125.85	131.99
Feed efficiency. kg feed/kg egg	2.47	2.45	2.43	2.59
Mortality. %	2.50	3.75	1.25	2.50
Live weight change. g	+8.61	+8.89	+14.58	+25.62
Number of saleable egg Per tonne feed	6550.15	6716.86	6747.72	6381.54
Saleable egg change. number	0	+166.71	+197.57	-168.61
Number of saleable egg. %	100	102.55	103.02	92.43

a,b Means with a different superscripts a row are significantly different (P<0.05)

REFERANCES

1.**Akkılıç, M., Sürmen, S.**, 1979. *Yem Maddeleri ve Hayvan Besleme Laboratuvar Kitabı.* Ankara Üniversitesi Basımevi, Ankara.

2.**Al-Zubaidy, S.S.**, 1992. *Evaluation of spent bleaching and filtering clay-a bentonite product from palm oil refining as a potential feed ingredient in layer diets.* Animal Feed Science and Technology, 40: 13-19.

3.**Blair, R., Gagnon, J., Salmon, R.E., Pickard, M.D.**, 1987. *Evaluation of spent bleaching clay as a feed supplement in broiler diets.* Nutrition Abstracts and Reviews, 57: 568.

4.**Çelik, M.**, 1993 *Smektit Grubu.* Özel Mineroloji, Bizim Büro Basımevi, Konya.

5.**Demirel, H., Karapınar, N.,Akça, K.**, 1995. *Bentonit ve diğer killerin absorbant olarak kullanımı.* Endüstriyel Hammaddeler Sempozyumu, 21-22 Nisan, İzmir, Türkiye.

6.**Hempe, J.M., Lauxen, R.C., Savage, J.E.**, 1988. *Rapid determination of egg weight and spesific gravity of eggs.* Poultry Science, 67: 902-907.

7.**Kırıkoğlu, S.**, 1990 *Bentonit.* Endüstriyel Hammaddeler, Teknik Üniversite Matbaası, İstanbul.

8.**Kubena, L.F., Harvey, R.B., Huff, W.E., Corner, D.E.**, 1990. *Efficacy of hydrated sodium calcium aluminosilicate to reduce the toxicity of aflatoxin and T-2 toxin.* Poultry Science, 69: I 078-1086.

9.**Monstaghian, J., Parsons, C.M., Leeper, R.W., Harrison, P.C., Koelkebeck, K.W.**, 1991. *Effect of sodium aluminosilicate on phosphorus utilization by chicks and laying hens.* Poultry Science, 70: 955-962.

10.**Roland, D.A.**, 1990. *The relationship of dietary phosphorus and sodium aluminosilicate to the performance of commercial leghorns.* Poultry Science, 69: 105-112.

11.**Roland, D.A., Rabon, H.W., Frost, T.J.**, 1990. *Response of commercial leghorns to sodium aluminosilicate when fed different levels and sources of available phosphoms.* Poultry Science, 69: 2157-2164.

12.**Roland, D.A.**, 1991. *Influence of sodium aluminosilicate, hydroxy-sodalite, carnegieite, aluminum sulphate, and aluminum phosphate on performance of commercial leghorns.* Poultry Science, 70: 805-811

13.**Spss For Windows** 1992. 5.0.1 SPSS İnc.

14.**Temur, S.**, 1994. *Bentonit Yatakları.* Endüstriyel Hammaddeler, S.Ü. Mühendislik-Mimarlık Fak., Konya.

15.**Vasiliev, K., Mirzaliev, Y.**, 1990. *A mineral supplement (in the diets for hens).* Nutrition Abstracts and Reviews, 60: 639.

16.**Voss, K.A., Dorner, J.W., Cole, R.J.**, 1993. *Amelioration of aflatoxicosis in rats by volclay NF-BC, microfine bentonite.* Journal of Food Protection, 56: 595-598.51: 241-246.