LITTER COMPOSITION OF FOUR DIFFERENT BROILER CHICKEN STRAINS FED WITH TWO TYPES OF COMMON AND SPECIFIC FEEDS

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ABSTRACT

The aim of this study was to investigate the effect of different strains of broiler chickens and feed types used on broiler litter quality. For this study, 416 broiler chickens were used as factorial experiment in a completely randomized design with two factors, four replicates and 13 chickens per pen. The first factor consisted of Ross 308, Arian, Cobb and A^+ strains and the second factor included two types of common and specific feeds. The effect of the above factors was studied on quantitative and qualitative indices of the litter, general Linear Model was used in SAS software. There was no significant effect ($p>0.05$). The highest moisture, crude protein and nitrogen percentage were related to Ross (23.82 %), Cobb (22.67 %) and Arian (3.59 %), respectively. Also, the highest moisture, crude protein and nitrogen percentage of the feeds were 24.05%, 22.43% and 3.59%, respectively, which was observed in the common feed. Differences between strains and also, between compositions of feeds did not lead to a difference in the composition of the chicken farm litter.

Keywords: Broiler, Chicken, Strain, Feed, Starter, Grower, Finisher, Litter, Mineral, Moisture

INTRODUCTIONS

Management of environmental conditions and especially broiler chicken litters are among the effective factors to maximize economic production. The presence of suitable litter indicates the suitability of breeding environmental conditions. Broiler chickens are in constant contact with the litter. A litter quality directly affects the performance, health and welfare of chickens (Nagaraj *et al.,* 2007; Farhadi *et al.,* 2011). The litter is referred to as a mixture of chicken fecal and straw dispersed in the breeding salon. The main components of the poultry litter include the litter materials, feathers, fecal and uneaten feeds (Grimes *et al.,* 2002; Ojedapo *et al.,* 2008). An appropriate litter should be dry, moisture absorbent, homogeneous, free of dust, free of pathogens, non-toxic, non-eatable by the chickens and inexpensive (Grimes *et al.,* 2002; Pourreza *et al.,* 2004).

Ammonia gas production is one of the most common and worrying factors in broiler farms. This gas is produce by the microbial degradation of uric acid found in faceals and uneaten feed that scattered on the litter. High concentration of ammonia in poultry farms lead to decreased performance and increased susceptibility to various diseases and ultimately increased mortality (Reece *et al.*, 1980; Ghahri *et al.*, 2010). Feed ingredients are the most important factors affecting the quality of the litter. Feed compositions, especially its crude protein, has positive influence on the quality of the litter (Ferguson *et al.,* 1998; Sognule *et al.,* 2006). Research results have shown that reducing the ration protein levels leads to a decrease in nitrogen, pH and litter moisture, which leads to improved air quality in the chicken farm (Ghahri *et al.,* 2010). Different strains of the broiler chickens may have a different ability to digest, feed absorption and dispose of waste materials due to the genetic differences that they have with each other. However, when the compositions of the rations are the same, the difference in the compositions of the chicken fecal suggests its genetic differences (Sognule *et al.,* 2006). The aim of this study was to investigate the effect of different strains of broiler chickens and feed types used on broiler litter quality.

MATERIALS AND METHODS

Chicken Sources and Housing: This research was carried out using 416 broiler chicks in a research farm of the Islamic Azad University of Qaemshahr branch in a factorial experiment using a completely randomized design with two factors, four replicates and 13 chickens per each pen. The dimensions of each pen were 1 x 1 meter. The first factor was the commercial broiler chicken strains comprising of four strains: Ross 308, Arian, Cobb and A^{+}. All birds were of the same age and had similar physiological conditions. The second factor was the feed in two levels of common and specific. These feeds were prepared according to the manufacturer's recommendation. Experimental birds were randomly assigned to the pens. The farm temperature was controlled by an automatic heater. The temperature in the first week of breeding was 32°C. Every three days, a degree was reduced. The temperature was fixed at 24°C. A number of thermometers were installed at 30 cm height of the litter. The humidity of the salon during the breeding period was between 55 – 65 %. Air into the salon was supplied through the northern windows. The salon ventilation was done by ventilators. After 48 hours of continuous lighting, the lighting program was adjusted to 23 hours of light and 1 hour of darkness until the end of day 42.

Littre Composition: The litter was a mixture of chicken feces, residual feeds, feathers and material used as bedding such as wood shavings and sawdust.

Feed Formulation: To formulate feeds, the breeding period was divided into three phases: starter, grower and finisher. Dietary ingredients for feed preparation, and the feeds were all analysed for their proximate and chemical compositions. Accordingly, the feeds were prepared as tabulated (Tables 1, 2 and 3) for starter, grower and finisher, respectively. The feeds included a common feed for all strains and a specific feed for each strain.

Sampling and Lab Analysis: At the end of rearing period, sampled litter were collected randomly from 3 parts of the pen and mixed together. For measuring the litter moisture, 10 g of sample of each pen was stored in an oven unit at 105 ° C for 24 hours. The litter nitrogen was determined by AOAC method (AOAC, 1994). Samples were sent to a specialized laboratory to measure the concentration of chemical compounds and a mineral present in the litter. In the laboratory, measurements of the litter chemical compounds were performed with x-ray fluorescence spectroscopy (XRF). The chemical compounds and a mineral measured were: sodium dioxide, calcium oxide, ferric oxide, aluminium oxide, silicon dioxide, phosphorus pentoxide, manganese (ii) oxide, titanium monoxide, magnesium oxide, potassium oxide and sulfur (Beckhoff *et al*., 2007). Also measured was the loss on ignition (LOI).

Statistical Model and Analysis: Data from the measurement of traits were recorded on the computer. Excel software was used to set and classify data. To investigate the effect of the studied factors on the traits, the general linear model was used in SAS statistical software. The mean comparison of the effects was done using Duncan's multiple range tests at the 5 % level. The statistical model used was as follows: $y_{ijk} = \mu + A_i + B_j + AB_{ij} + e_{ijk}$, Where, y_{ijk}: The amount of each observation for each trait, μ: mean, A_i: Strain effect, B_j: Feed effect, AB_{ij}: Strain and feed intraction effect and e_{ijk}: Experimental error effect.

RESULTS

The effect of different strains of broiler chicken and feeds on the litter quality indices was not significantly different (p>0.05) (Table 4).

Table 1: Starter feeds prepared for different strain of broiler chicks at the early phase (first two weeks)

Feed ingredient compositions (%)	Common feed	Specific feeds			
		Ross	Cobb	A^+	Arian
Corn	63.90	62.50	64.78	63.80	64.80
Soybean meal	31.50	32.86	30.53	31.50	30.50
Soy oil	1.22	1.25	1.26	1.28	1.27
Shell	1.28	1.31	1.35	1.34	1.35
Di-calcium phosphate	0.97	0.95	0.95	0.95	0.95
Vitamin supplement[1]	0.25	0.25	0.25	0.25	0.25
Mineral supplement[2]	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.13	0.13	0.13	0.13	0.13
Proximate and chemical compositions					
ME(kcal/kg)[3]	3100	3000	3023	3100	2900
Crude protein (%)	23	23	22	23	20.84
Calcium (%)	0.95	0.96	0.96	0.95	0.95
Available phosphorus (%)	0.47	0.48	0.45	0.47	0.50
Sodium (%)	0.18	0.16	0.20	0.18	0.18
Methionine (%)	0.47	0.56	0.50	0.47	0.45
Lysine (%)	1.20	1.30	1.17	1.20	1.15
Methionine+Cysteine (%)	0.85	0.96	0.97	0.95	0.91

1: A kg vitamin supplement, provides the following (3500000 international units of vitamin A, 1000000 IU's of Vitamin D3, 9000 IU of Vitamin E, 1000 mg vitamin K3, 900 mg of vitamin B1, 3300 mg vitamin B2, 5000 mg vitamin B3, 1500 mg vitamin B5, 150 mg vitamin B6, 500 mg vitamin B9, 7.5 mg vitamin B12, 250000 mg vitamin choline and 500 mg vitamin biotin, 2: A kg mineral supplement, provides the following (50000 mg of manganese, mg 25000 iron, 50000 mg zinc, 5000 mg copper, 500 mg iodine, 100 mg selenium), 3: Metabolizable energy (kcal/kg).

Table 2: Grower feeds prepared for different strain of broiler chicks at the growing phase (weeks 3 and 4)

Feed ingredient compositions (%)	Common feed	Specific feeds			
		Ross	Cobb	A^+	Arian
Corn	66.00	67.16	67.50	67.88	67.44
Soybean meal	29.30	28.30	27.90	27.50	27.90
Soy oil	1.30	1.20	1.25	1.28	1.30
Shell	1.30	1.25	1.27	1.25	1.28
Di-calcium phosphate	0.97	0.96	0.95	0.96	0.95
Vitamin supplement[1]	0.25	0.25	0.25	0.25	0.25
Mineral supplement[2]	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.13	0.13	0.13	0.13	0.13
Proximate and chemical compositions					
ME(kcal/kg)[3]	3175	3100	3166	3200	2960
Crude protein (%)	21	21	21	20	18.80
Calcium (%)	0.90	0.87	0.90	0.90	0.95
Available phosphorus (%)	0.36	0.44	0.37	0.41	0.42
Sodium (%)	0.42	0.46	0.48	0.44	0.45
Methionine (%)	0.41	0.48	0.43	0.41	0.45
Lysine (%)	1.05	1.18	1.14	1.03	1.01
Methionine+Cysteine (%)	0.76	0.89	0.85	0.83	0.82

1: A kg vitamin supplement, provides the following (3500000 international units of vitamin A, 1000000 IU's of Vitamin D3, 9000 IU of Vitamin E, 1000 mg vitamin K3, 900 mg of vitamin B1, 3300 mg vitamin B2, 5000 mg vitamin B3, 1500 mg vitamin B5, 150 mg vitamin B6, 500 mg vitamin B9, 7.5 mg vitamin B12, 250000 mg vitamin choline and 500 mg vitamin biotin, 2: A kg mineral supplement, provides the following (50000 mg of manganese, mg 25000 iron, 50000 mg zinc, 5000 mg copper, 500 mg iodine, 100 mg selenium), 3: Metabolizable energy (kcal/kg)

Table 3: Finisher feeds prepared for different strain of broiler chicks at the finish phase (weeks 5 and 6)

Feed ingredient compositions (%)	Common feed	Specific feeds			
		Ross	Cobb	A^+	Arian
Corn	67.17	68.07	68.08	68.74	69.84
Soybean meal	28.10	27.15	27.20	26.53	25.50
Soy oil	1.30	1.38	1.35	1.32	1.30
Shell	1.35	1.29	1.28	1.31	1.27
Di-calcium phosphate	0.95	0.98	0.96	0.97	0.96
Vitamin supplement[1]	0.25	0.25	0.25	0.25	0.25
Mineral supplement[2]	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.13	0.13	0.13	0.13	0.13
Proximate and chemical compositions					
ME(kcal/kg)[3]	3225	3200	3200	3200	3070
Crude protein (%)	19	19	19	18.5	17.15
Calcium (%)	0.90	0.82	0.90	0.85	0.86
Available phosphorus (%)	0.45	0.41	0.45	0.43	0.43
Sodium (%)	0.16	0.16	0.16	0.16	0.18
Methionine (%)	0.39	0.41	0.43	0.39	0.45
Lysine (%)	0.88	0.95	0.95	0.92	0.89
Methionine+Cysteine (%)	0.69	0.76	0.73	0.71	0.73

1: A kg vitamin supplement, provides the following (3500000 international units of vitamin A, 1000000 IU's of Vitamin D3, 9000 IU of Vitamin E, 1000 mg vitamin K3, 900 mg of vitamin B1, 3300 mg vitamin B2, 5000 mg vitamin B3, 1500 mg vitamin B5, 150 mg vitamin B6, 500 mg vitamin B9, 7.5 mg vitamin B12, 250000 mg vitamin choline and 500 mg vitamin biotin, 2: A kg mineral supplement, provides the following (50000 mg of manganese, mg 25000 iron, 50000 mg zinc, 5000 mg copper, 500 mg iodine, 100 mg selenium), 3: Metabolizable energy (kcal/kg).

The pecentage moisture in the litter having the different strains was: Ross (23.82 ± 2.59 %), A^+ (23.26 ± 3.56 %), Cobb (23.15 ± 3.52 %) and Arian (22.55 ± 3.50 %). These values were statistical not significantly diferent ($p>0.05$).

The pecentage crude protein in the litter having the different strains was: Cobb (22.67 ± 0.12 %), Arian (22.34 ± 0.12 %), A^+ (22.19 ± 0.09 %) and Ross (22.15 ± 0.11 %). These values were statistical not significantly diferent ($p>0.05$).

The pecentage nitrogen in the litter having the different strains was: Cobb (3.62 ± 0.03 %), Arian (3.59 ± 0.03 %), A^+(3.58 ± 0.04 %) and Ross (3.53 ± 0.02 %). These values were statistical not significantly diferent ($p>0.05$). Also, the highest moisture, crude protein and nitrogen percentage were 24.05 ± 2.51 %, 22.43 ± 0.10% and 3.59 ± 0.21 %, respectively, observed in the common feed. The data presented in Table 5 showed that the interactions between broiler chicken strains and feeds on the litter quality indices were not significant different ($p>0.05$).

The highest moisture, crude protein and litter nitrogen percentage were related to the interaction between the Ross and specific feed (23.58 ± 0.47 %), the interaction between the Cobb and common feed (22.81 ± 0.20 %) and the interaction between the Cobb and common feed (3.64 ± 0.04 %), respectively.

As shown in Tables 6 and 7, the effect of different strains of the broiler chickens, feeds and their interactions on the chemical compounds and a mineral present in the litter was not significant ($p>0.05$).

In Table 6, the highest and lowest concentrations of chemical coumpound were recorded in CaO and TiO respectively. The highest concentration of CaO was recorded in Ross litter (3.60 ± 0.31 pg/g). Also, the highest and lowest P_2O_5 concentrations was recorded in Ross litter (2.16 ± 0.10 pg/g) and Arian (2.02 ± 0.10 pg/g) and A^+ (2.02 ± 0.10 pg/g). The highest concentration of CaO was recorded in the litter with the common feed (3.40 ± 0.20 pg/g) and the lowest concentration of TiO belonged to the litter with the specific feed (0.03 ± 0.02 pg/g).

Table 4: The effect of the broiler chicken strains and feeds on the litter quality indices

Variables	Moisture (%)	Crude protein (%)	Nitrogen (%)
Arian	22.55 ± 3.50[a]	22.34 ± 0.12[a]	3.59 ± 0.03[a]
Ross	23.82 ± 2.59[a]	22.15 ± 0.11[a]	3.53 ± 0.02[a]
Cobb	23.15 ± 3.52[a]	22.67 ± 0.12[a]	3.62 ± 0.03[a]
A^+	23.26 ± 3.56[a]	22.19 ± 0.09[a]	3.58 ± 0.04[a]
CF	24.05 ± 2.51[a]	22.43 ± 0.10[a]	3.59 ± 0.21[a]
SF	23.84 ± 2.55[a]	22.21 ± 0.13[a]	3.56 ± 0.19[a]

CF = Common feed, SF = Specific feed, Means with similar alphabet on the same column are not significantly different (p>0.05)

Table 5: The interaction of the broiler chicken strains and feeds on the litter quality indices

Interaction	Moisture (%)	Crude protein (%)	Nitrogen (%)
Arian & CF	22.38 ± 0.50[a]	22.26 ± 0.21[a]	3.58 ± 0.04[a]
Arian & SF	22.73 ± 0.48[a]	22.42 ± 0.20[a]	3.58 ± 0.03[a]
Ross & CF	23.06 ± 0.50[a]	22.14 ± 0.19[a]	3.46 ± 0.04[a]
Ross & SF	23.58 ± 0.47[a]	22.17 ± 0.20[a]	3.61 ± 0.02[a]
Cobb & CF	22.74 ± 0.51[a]	22.81 ± 0.20[a]	3.64 ± 0.04[a]
Cobb & SF	23.57 ± 0.50[a]	22.54 ± 0.18[a]	3.60 ± 0.04[a]
A^+ & CF	23.02 ± 0.49[a]	22.46 ± 0.20[a]	3.59 ± 0.05[a]
A^+ & SF	23.50 ± 0.50[a]	21.92 ± 0.20[a]	3.58 ± 0.04[a]

CF = Common feed, SF = Specific feed, Means with similar alphabet on the same column are not significantly different (p>0.05)

The highest and lowest P_2O_5 concentration was recorded in the litter of the common feed (2.12 ± 0.07 pg/g) and specific feed (2.04 ± 0.07 pg/g), respectively.

In Table 7, the highest and lowest concentrations of the chemical coumpound were recorded in CaO and TiO respectively. The highest concentration of CaO was recorded in the interaction between the Ross and the common feed (3.16 ± 0.40 pg/g) and the lowest concentration of TiO was recorded in the interaction between the Arian and the specific feed (0.03 ± 0.00 pg/g). Also, the highest and lowest concentrations of P_2O_5 were observed in the interaction between the Arian and the common feed (2.10 ± 0.15 pg/g) and the interaction between the Ross and the specific feed (1.92 ± 0.15 pg/g), respectively. Details of other interactions are presented on Tables 6 and 7.

DISCUSSION

With the expansion of the poultry industry and the inceasing number of poultry farms, the amount of organic fertilizer produced has also increased.

For farmers, the amount of nitrogen, phosphorus and potassium from the chicken manure is very important with regards its effect in increasing soil fertility (Pourreza *et al.,* 2004; Ghahri *et al.,* 2010).

The crude protein percentage of the Arian strain feed was lower than other strains, but the crude protein and nitrogen percentage of its litter was higher than other strains except for Cobb strain. The high percentage of the nitrogen excretion in the Arian strain can be attributed to the low physiological ability of this strain. In fact, by decreasing the digestion and absorption of the protein, the amount of nitrogen excretion of the chickens increased and, consequently, the nitrogen percentage of the litter increased. This can occur probably through low secretion of the pancreatic protease enzyme or low levels of chloride acid for breaking down peptide bonds or inactive intestinal absorption. On the other hand, a large amount of water is needed for protein digestion (Pourreza *et al.,* 2004; Farhadi *et al.,* 2011). In this study, it was observed that the litter moisture percentage was highest in the Ross strain and lowest in the Arian strain.

Table 6: The effect of the broiler chicken strains and feeds on the concentrations of chemical compounds and a mineral of the litter

Variables	Concentrations of chemical compounds and mineral (pg/g)											LOI
	Na_2O	CaO	Fe_2O_3	Al_2O_3	SiO_2	P_2O_5	MnO	TiO	MgO	K_2O	S	
Arian	0.11±0.01	3.17±0.30	0.32±0.09	0.18±0.20	0.89±0.05	2.02±0.10	0.07±0.01	0.04±0.00	0.83±0.05	2.16±0.07	0.47±0.02	90.12±0.60
Ross	0.09±0.01	3.60±0.31	0.47±0.08	0.19±0.19	0.92±0.05	2.16±0.10	0.05±0.00	0.04±0.01	0.87±0.05	2.44±0.05	0.49±0.02	88.91±0.59
Cobb	0.10±0.00	3.21±0.30	0.35±0.10	0.18±0.22	0.91±0.05	2.13±0.11	0.04±0.01	0.04±0.01	0.84±0.04	2.23±0.07	0.53±0.03	89.64±0.65
A^{+}	0.09±0.01	3.09±0.33	0.53±0.09	0.20±0.20	0.98±0.05	2.02±0.10	0.04±0.01	0.04±0.00	0.83±0.04	2.33±0.08	0.49±0.02	89.66±0.60
CF	0.09±0.02	3.40±0.20	0.36±0.07	0.19±0.01	0.98±0.07	2.12±0.07	0.05±0.00	0.04±0.01	0.86±0.03	2.35±0.04	0.50±0.01	89.30±2.40
SF	0.10±0.01	3.10±0.20	0.47±0.07	0.18±0.00	0.87±0.07	2.04±0.07	0.04±0.01	0.03±0.02	0.82±0.03	2.23±0.03	0.49±0.01	89.80±2.43

Key: *Na_2O = Sodium dioxide, CaO = Calcium oxide, Fe_2O_3 = Ferric oxide, Al_2O_3 = Aluminium oxide, SiO_2 = Silicon dioxide, P_2O_5 = Phosphorus pentoxide, MnO = Manganese (II) oxide, TiO = Titanium monoxide, MgO = Magnesium oxide, K_2O = Potassium oxide, S = Sulfur, CF = Common feed, SF = Specific feed, LOI = Loss on Ignition. Means with similar alphabet on the same column are not significantly different ($P > 0.05$)*

Table 7: The interaction of the broiler chicken strains and feeds on the concentrations of chemical compounds and a mineral of the litter

Interaction	Concentrations of chemical compounds and mineral (pg/g)											LOI
	Na_2O	CaO	Fe_2O_3	Al_2O_3	SiO_2	P_2O_5	MnO	TiO	MgO	K_2O	S	
Arian & CF	0.11±0.02^{a}	3.09±0.40^{a}	0.30±0.04^{a}	0.25±0.03^{a}	0.94±0.07^{a}	2.10±0.15^{a}	0.07±0.00^{a}	0.04±0.00	0.82±0.07	2.21±0.12	0.49±0.03	89.58±2.67
Arian & SF	0.11±0.03^{a}	2.85±0.41^{a}	0.28±0.04^{a}	0.19±0.03^{a}	0.89±0.08^{a}	1.94±0.14^{a}	0.08±0.01^{a}	0.03±0.00	0.83±0.07	2.11±0.14	0.45±0.02	90.24±2.66
Ross & CF	0.11±0.02^{a}	3.16±0.40^{a}	0.29±0.05^{a}	0.23±0.01^{a}	1.07±0.07^{a}	2.08±0.15^{a}	0.07±0.00^{a}	0.04±0.01	0.91±0.06	2.22±0.12	0.50±0.02	89.42±2.66
Ross & SF	0.09±0.04^{a}	3.13±0.39^{a}	0.27±0.04^{a}	0.19±0.01^{a}	0.98±0.07^{a}	1.92±0.15^{a}	0.07±0.00^{a}	0.04±0.00	0.83±0.06	2.07±0.12	0.46±0.03	89.93±2.67
Cobb & CF	0.09±0.01^{a}	3.08±0.40^{a}	0.28±0.04^{a}	0.19±0.02^{a}	0.93±0.06^{a}	2.05±0.12^{a}	0.08±0.01^{a}	0.04±0.00	0.90±0.07	2.13±0.15	0.50±0.03	89.73±2.65
Cobb & SF	0.11±0.02^{a}	3.05±0.38^{a}	0.32±0.03^{a}	0.19±0.03^{a}	0.90±0.07^{a}	2.05±0.16^{a}	0.07±0.00^{a}	0.04±0.01	0.85±0.07	2.19±0.12	0.51±0.01	89.62±2.63
A^{+} & CF	0.09±0.02^{a}	2.99±0.41^{a}	0.30±0.03^{a}	0.18±0.03^{a}	0.93±0.07^{a}	1.96±0.13^{a}	0.08±0.03^{a}	0.04±0.00	0.87±0.07	2.15±0.13	0.49±0.01	89.92±2.67
A^{+} & SF	0.11±0.01^{a}	3.01±0.40^{a}	0.30±0.04^{a}	0.20±0.03^{a}	0.98±0.04^{a}	2.08±0.16^{a}	0.08±0.02^{a}	0.04±0.01	0.85±0.05	2.15±0.11	0.53±0.03	89.67±2.61

Key: *Na_2O = Sodium dioxide, CaO = Calcium oxide, Fe_2O_3 = Ferric oxide, Al_2O_3 = Aluminium oxide, SiO_2 = Silicon dioxide, P_2O_5 = Phosphorus pentoxide, MnO = Manganese (II) oxide, TiO = Titanium monoxide, MgO = Magnesium oxide, K_2O = Potassium oxide, S = Sulfur, CF = Common feed, SF = Specific feed, LOI = Loss on Ignition. Means with similar alphabet on the same column are not significantly different ($p>0.05$)*

One of the reasons for lowering the litter moisture percentage of the Arian strain may be the high consumption of water in the protein digestion process. Also, in this study, the litter moisture percentage of the common feed was higher than the specific feed. By studying the feed composition it is observed that the percentage of the common feed protein of the Arian strain was lower than of the specific feed. If the humidity of the salon was not carefully monitored, the salon litter will be soaked and superficially slippery and sticky. The consequence will be the spread of the bacterial diseases through the unhealthy environment created.

In an experiment, the effect of protein and phosphorus in the feed was investigated on the nitrogen, phosphorus and ammonia compositions of the chicken litter. It was observed that by decreasing the protein and phosphorus in the feed, the litter nitrogen and phosphorus concents decreased significantly ($p<0.01$). Also the ammonia gas, moisture content and pH of the litter were affected by feeds with the low protein percentages and phosphorus (Ferguson *et al.,* 1998). In another study, the effects of feed protein levels on the litter compositions and ammonium gas were investigated. It was observed that with a decrease in the level of the feed crude protein, the amount of nitrogen of the litter decreased by 4.8 %. It was also reported that by reducing the feed crude protein by 1.5 %, the litter condition improved (Hernandez *et al.,* 2013). In the present study, no significant differences were observed ($p>0.05$).

Conclusions: Based on the results of this study, the genetic differences between the different strains and the different composition of feeds did not lead to a difference in the composition of the poultry farm litter.

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