MANGANESE REQUIREMENT OF DANDARAWI AND DOKKI4 LAYING HENS

BY

Attia M.Y ;.M.A.M Sayed ; M.H.Abdel-Samad; M.A.Abdel-Galil

Anim. Prod. Res. Instit. , Agric. Res. Center, Dokki, Cairo, Egypt.

Received: **28/10/2008** Accepted: **24/11/2008**

ABSTRACT: *The experiment was conducted to determine the effect of using different levels of dietary manganese on egg production and egg quality of two local strains: Dandarawi and Dokki4 layer hens to determine their manganese (Mn) requirement.*

Two hundred and fifty six hens (23 weeks old), 128 hens for each strain divided into 4 groups (8 replicates/group),(4 hens/replicate). Hens were fed on four experimental diets : a basal diet (without supplemental Mn) and three basal diets supplemented with Mn (as manganese sulphate) at levels of 30,60 and 90 mg Mn/ kg diet. The experiment extended for 12 weeks in 3 intervals, 4 weeks each. Egg production measurements and egg quality parameters were recorded at 4 weeks intervals. The multi-layer structure of the eggshell was studied using Scanning Electron Microscopy (SEM).

Main results obtained can be summarized as follows:

- *Results of the overall period showed that egg production parameters for the two strains: Dandarawi and Dokki4 had the same trend. There were a significant differences between hens fed on the basal diet and all treatments in egg number (EN), egg weight (EW), egg mass (EM), feed intake (FI) and feed conversion (FC).*
- *Concerning egg quality parameters it was found that shell thickness of both Dandarawi and Dokki4 hens had improved significantly with increasing manganese supplementation.*
- *Results showed that both Dandarawi and Dokki4 hens fed on the basal diet supplemented with 90 ppm Mn gave the best shell thickness (ST).*
- *The level of 90 mg Mn/kg diet was the sufficient level for egg production and the best shell thickness.*

INTRODUCTION

Minerals are the inorganic part of feeds or tissues. Manganese (Mn) is required in small amount in the diet (NRC, 1994). Requirements of Mn for poultry are higher than those of mammals (Georgievski, 1982).

Dietary supplementation of Mn is especially important for poultry because diets based on corn and soybean meal are deficient in Mn unless supplemented with feedstuffs rich in Mn. Cereal grains and their by-products are vary greatly in Mn concentrations (Mertz, 1987). Corn is very low in Mn (7 ppm) while, soybean meal contains 29 to 43 ppm Mn depending on the method of processing (NRC, 1994).

The importance of Mn for poultry has been recognized for almost 70 years, ever since Wilgus et al. (1986) demonstrated that Mn could prevent perosis in chicks. Subsequent research has shown that Mn is vital for growth, egg production and proper development of the chick embryo and is essential in the activation of numerous enzymes

(Underwood, 1977).

Manganese supplementation is especially important in avian species because dietary Mn is relatively inefficient in birds (Turk et al., 1982). Georgievski and Zharova, 1973 recommended 30-35 mg Mn/kg feed to ensure high (70-80%) egg yield, and for the highest quality of egg shell, they recomended55-60 mg Mn/kg feed. While, Zamani et al. (2005) found that Mn levels and age of birds had no effect on productive performance of laying hens. Addition of Mn, Zn and Cu in combination to laying hen diets increased their concentrations in egg yolk (Mabe et al., 2003).

Manganese has also been shown to be an essential nutrient for the laying hen. A deficiency in this nutrient will result in decreased egg production and eggshell thickness

(Leach and Gross, 1983).

Concerning the variations in eggshell quality between the local breeds (Fathi et al., 2007) found that Fayoumi breed had genetically not only better egg production and egg quality but also good ultrastructural formation of eggshell compared to Dandrawi breed.

Several attempts have been carried out in Egypt to develop more productive poultry breeds through selective breeding. New locally improved breeds or strains were produced (El-Itriby and Sayed, 1966 and Abdel-Gawad et al., (1976).

This study was conducted with two developed local strains "Dokki4" and "Dandarawi" layers with the objective of determining the Mn requirement for these layer hens.

MATERIALS AND METHODS

The present study was carried out at Seds Research Station, Beny Suif, Animal Production Research Institute, Agricultural Research Center, Egypt. The study involved one experiment designed to determine the effect of using three levels of dietary manganese using two local strains: local breed "Dandarawi" and the developed local strain "Dokki 4"

(Fayoumi x Barred Plymouth Rocks).

Two hundred and fifty six hens (23 weeks old),128 hens for each strain were used. Hens were selected from farm flocks of Dandarawi (D) and Dokki4 (K) to be similar in weight and distributed at random into 64 cages (32 cage/ strain) (4 hens/cage). They were fed on four experimental feeds based on a basal corn-soybean meal diet. Composition and chemical analysis of the basal diet (T1) (without supplemental manganese) is presented in (Table 1). The experimental basal diet was supplemented with manganese (Mn) (as manganese sulphate) at levels of 30 (T2) , 60 (T3) and 90 (T4) mg Mn/kg diet. Layer hens from each strain divided into 4 groups (8 replicates/ group), (4hens/ replicate). Hen groups were given the 4 experimental diets at random and provided with feed and water *ad.lib.* for 16 hours photo period. The experiment extended for 12 weeks in 3 intervals, 4 weeks each.

At the end of each 4 weeks interval, parameters of egg production as egg number (EN), egg weight, g. (EW), egg mass, g.(EM), feed intake, g.(FI) and feed conversion, g. egg/ g. feed (FC) were determined. Also, random samples of eggs representing the four treatments for each strain, were taken to estimate egg quality parameters as albumin weight % (AW), yolk weight% (YW), shell weight % (SW), shell thickness, mm (ST), egg length, cm (EL), egg width, cm (EW), shape index(SI) was estimated as the percentage of (EW) to (EL), yolk height, mm (YH), yolk width, mm(YD) and yolk index (YI) was estimated as the percentage of (YH) to (YD).

Samples were selected at random from some egg shell taken from Dandarwi and Dokki4 strains to investigate ultrastructural variation. These samples were examined using JEOL, JXA-840A scanning electron microscopy belonging to National Research Center, Dokki, Egypt.

Data obtained for egg production and egg quality were examined statistically using one way analysis of variance and Duncan's multiple range test procedures (Duncan, 1955) within the statistical analysis system (SAS,1990).

RESULTS AND DISCUSSION

Manganese supplementation and egg production

Results in Table (2)of the first experimental period (from 23 to 26 wks old) showed that significant differences were found between (D) hens fed on the basal diet (T1) and all treatments in FN. Also, differences between T1 and (T3 and T4) in EW, EM, FI and FC were significant. Insignificant differences were found between T2, T3, and T4 in EW and FC.

Significant differences were observed between T1 and all treatments in EN, EM and FC during the second period (27 to 30 wks old). Also, significant differences were found between T1 and (T3 and T4) in EW. Differences between T2 , T3 and T4 in EN, EM, FI and FC were insignificant.

Significant differences between hens fed on the basal diet and all treatments in EN, and FC during the third period (31 to 34 wks). Significant differences were found between T1 and (T3 and T4) in EW, EM and FI. However, differences between T2, T3 and T4 in FI and FC were insignificant.

The overall egg production results showed that significant differences between hens fed on the basal diet and the three supplemental levels of Mn in EN, EW, EM, FI and FC (Table, 2).There were insignificant differences between hens fed on T3 and T4 in EN, EW, EM, FI and FC. Supplementing the basal diet with 30 ppm Mn increased significantly increased EN, EW and EM by 20.09, 4.66 and 25.70%, respectively, and improved FC by 16.39% relative to the basal diet. Values of EN, EW and EM increased by 31.74, 9.33 and 44.05%, respectively, and improved FC by 21.79% relative to those of the basal diet when 60 ppm Mn was added. Further increase in Mn from 60 to 90 ppm increased EN, EW and EM by 41.48, 11.00 and 57.07%, respectively, and improved FC by 27.00% relative to the basal diet.

Results showing the effect of using different levels of (Mn) on productive performance parameters of Dokki 4 (K) hens are shown in Table3.

Significant differences were found between hens fed on the basal diet and all treatments in EW, FI and FC at first experimental period. Also, significant differences were observed between T1 and (T3 andT4) in EN and EM at first and second experimental period. Insignificant differences were observed between T2, T3 and T4 in EW, EM, FI and FC at the first experimental period.

Significant differences were found between hens fed on the basal diet and the three supplemental levels of Mn in EW and FC during the second period. Also, differences between T1 and (T3 and T4) in EN and EM were significant.There were no significant differences between T2,T3 and T4 in EN, EW; EM and FI.

Significant differences were observed between hens fed on the basal diet and all treatments in EW and FC at the third experimental period. Significant differences were observed between T1 and (T3 and T4) in EN, EM and FI. Insignificant differences were observed between T2, T3 and T4 in EW and FC.

A significant differences were found between hens fed on the basal diet and all treatments in EN, EW, EM, FI and FC a the overall period (Table, 3). Insignificant differences were found between T3 and T4 in EN, EW, EM, FI and FC.

Supplementing the basal diet with 30 ppm Mn caused an increase by 15.09, 8.04 and 24.36%in EN, EW and EM, respectively, and improved FC by 13.63% relative to the basal diet. However, adding 60 ppm Mn to the basal diet increased EN, EW and EM by 25.00, 11.53 and 39.40%, respectively, and improved FC by 20.07% as compared with the basal diet. Supplying the basal diet with 90 ppm Mn increased EN, EW, and EM by 35.86, 11.41 and 51.36%, respectively, and improved FC by 25.60% relative to those of the basal diet.

The results of the overall period showed that the egg production data for the two strains: Dandarawi (D) and Dokki4 (K) had the same trend. There were significant differences between hens fed on the basal diet and all treatments in EN, EW, EM, FI, and FC. Differences between layer hens fed on T3 and T4 were insignificant.

The results concerning dietary manganese effect on productive performance parameters agreed with that reported by Inal et al., (2001) who found that 25 mg Mn/ kg in the diet is sufficient for maximum egg production, egg weight and feed conversion, but for optimal shell quality the requirement of Mn for laying hens is much higher. This may be interpreted based on the requirements for trace minerals are often fulfilled by concentrations present in conventional feed ingredients (NRC, 1994). However, poultry diets may require supplementation to ensure adequate intake of trace minerals. Because of the interaction that occur between various minerals such as calcium and manganese (Mertz, 1987). Moreover, leach and Gross, 1983 reported that manganese deficiency in the laying hens result in decreased egg production. However, these results disagree with those of Zamani et al., (2005) who found that manganese level and age had no effect on productive performance. Also, Maurice and Whisenhut (1980) reported no significant change in egg number and egg weight when manganese level increased from 25 to 200 mg/kg diet. Sazzad et al., (1994) reported that insignificant differences in egg production, egg weight and feed conversion was observed when the supplement of manganese in the diet increased from 0 to 80 mg/kg diet. Holder and Huntley (1978) found that insignificant differences in egg production with a supplement of 180 mg Mn/kg diet.

Manganese supplementation and egg quality:

The effect of using different levels of manganese on egg quality parameters of Dandarawi hens are presented in (Table 4).

Insignificant differences were observed between hens fed on the basal diet and all treatments in AW, YW, SW, EL, EW, SI, YD and YI during the first experimental period. While significant differences were observed between T1 and T2 in YH. Also, there were significant differences between T3 and T4 in SW, EL, EW and YD. Hens fed on the diet supplemented with 90 ppm Mn showed 7.50% significant increase in ST as compared to the basal diet.

Insignificant differences were observed between hens fed on the basal diet and all treatments in AW, SW, EL and EW at the second experimental period. Also, differences between T1 and T2 in YW and SI were significant. There were a significant differences between T1 and T4 in ST, YH and YI. Hens fed on diet supplemented with 90 ppm Mn showed a significant increase by 21.66% in ST as compared to the basal diet.

Insignificant differences were observed between hens fed on the basal diet and all treatments in AW, YW, EL, SI and YD at the third period. A significant differences were found between T1 and T4 in SW, ST, YH and YI. Also, a significant increase was noticed for T4 by 14.85% in ST as compared to the basal diet..

The effect of manganese supplementation on the egg quality parameters of Dokki4 hens is shown in (Table 5). Insignificant differences were observed between hens fed on the basal diet and the all treatments in AW, YW, SW, EL, EW, SI, YH, YD and YI during the three experimental periods. Hens fed on the diet supplemented with 90 ppm Mn / kg diet recorded significantly increase by 14.04%, 12.11% and 5.61% in ST as compared to the basal diet for the first, second and third experimental period, respectively.

Concerning the egg traits parameters it was found that Dandrawi hens fed on the basal diet supplemented with 90 ppm Mn (T4) gave the best shell thickness (ST), 0.430 mm in the first period, 0.410 mm in the second period and 0.416 mm in the third period. Also, Dokki4 hens fed on the basal diet supplemented with 90 ppm Mn gave the best (ST) 0.463 mm in the first period, 0.458 mm in the second period and 0.433 mm in the third period. Results showed that shell thickness was improved significantly with increasing the supplement level of Mn .

These results are in agreement with Sazzad et al., (1994) who reported that shell thickness improved significantly when the supplement of manganese in the diet increased from 0 to 80 mg/ kg diet. In addition, Essary and Holmes (1964) reported that improved egg shell quality when manganese was increased from 33 to 84 mg/kg diet. Moreover, Holder and Huntly (1978) reported that Mn at level of 180 mg/kg diet significantly improved eggshell quality. Also, leach and Gross,1983 reported that manganese deficiency in the laying hen diets results in decreased eggshell thickness. Inal et al., 2001 reported that the requirement of manganese for laying hens is much higher for optimal eggshell quality.

However, Cox and Balloun (1968) found no improvement in egg shell quality when Mn was increased from 20 to 66 mg /kg diet. Also, Maurice and Whisenhut (1980) reported that increasing manganese from 25 to 200 mg/ kg diet reduced egg breakage without any significant change in shell thickness or breaking strength These contradictions between results, my be due to differences between strains, age at which treatments were applied and/or type of manganese used in the different studies.

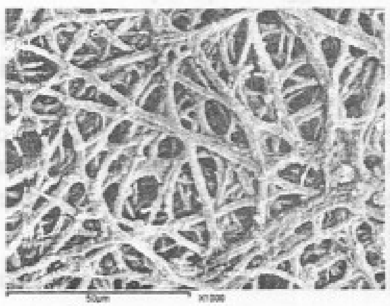
The effect of manganese supplementation on the ultrastracture of the eggshell:

Improvement of eggshell thickness was obviously found in the three periods of egg production as a result of supplementing the basal diet with 90 ppm Mn for both Dandarawi and Dokki4 strains. From the photomicrographs of the eggshell layers by the scanning electron microscope (SEM), it was found that there was a positive effect on the thickness and density of each discriminated layer (cuticle, palisade layer, mammillary layer, outer membrane and inner membrane) at this level of supplementation.

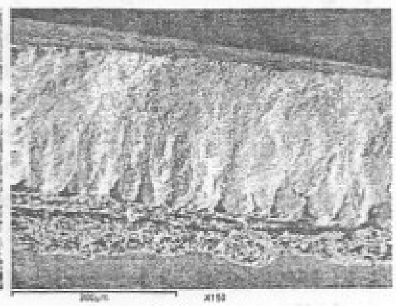
Comparing the photomicrographs of (T4) for the third period for Dandarawi hens (Fig. 2) with those of the basal diet (Fig.1), Also, comparing the photomicrographs of (T4) of Dokki4 hens during the third period (Fig.4) with those of the basal diet (Fig.3) showed that Mn supplementation with 90 ppm resulted in more dense and thicker layers, which would increase breaking strength of eggs.

In this respect, Vantoledo et al., (1982) observed that mammillary knob density was lower and diameter was greater in eggs from high breaking strength lines of layers.

Extensive studies were conducted to evaluate the ultrastructural variations in egg shell quality among breeds and species of poultry (Bain, 1990; Solomon, 1991; Solomon, 1999; Ruiz and Lunam, 2000; Fathi, 2001 and Afifi et al., 2007). Salomon (1991 and 1999) suggested that the organization of the palisade columns is a major determinant of shell stiffness and therefore of shell strength. Ruiz and Lunam (2000) reported that shell strength is directly related to shell thickness, therefore, it is likely that alteration in the thickness of the palisade layer, independent of structural reorganization of the palisade columns could affect shell strength. The material properties of the egg shell depend on its microstructure and chemical composition, both of which vary through the shell thickness (Rodriguez-Navarro et al ., 2002 ; Nys et al., 2004 and Bain et al ., 2006).

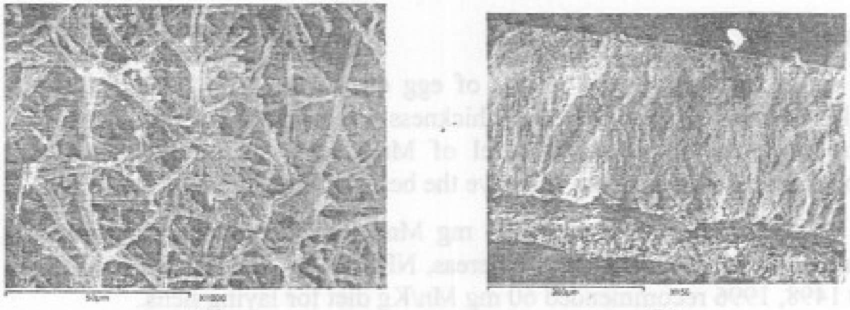


(a)



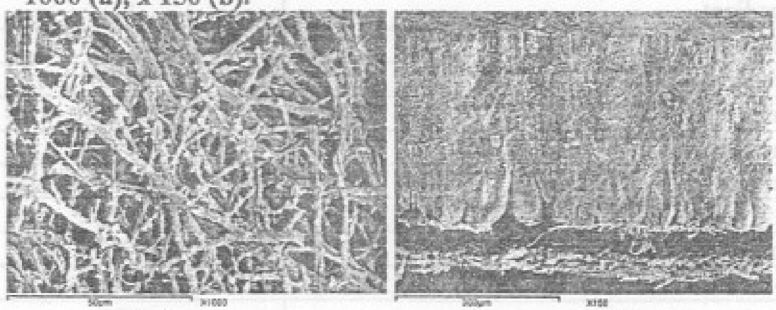
(b)

Fig .1. Eggshell photomicrograph of Dandarawi hen fed on the basal diet during the third period , x 1000 (a), x 150 (b).



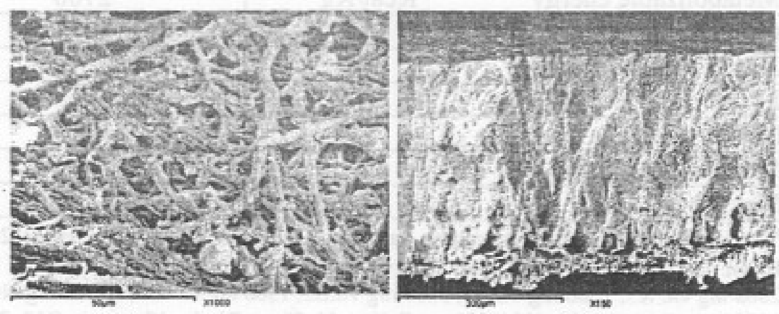
(a) (b)

Fig .2. Eggshell photomicrograph of Dandarawi hen fed on the basal diet supplemented with 90 ppm Mn during the third period , x 1000 (a), x 150 (b).



(a) (b)

Fig .3. Eggshell photomicrograph of Dokki 4 hen fed on the basal diet during the third period., x 1000 (a), x 150 (b).



(a) (b)

Fig .4. Eggshell photomicrograph of Dokki 4 hen fed on the basal diet supplemented with 90 ppm Mn during the third period , x 1000 (a), x 150 (b).

Conclusion

In conclusion, the results of egg quality for both Dandarawi and Dokki4 strains showed that shell thickness was improved significantly with increasing the supplemental level of Mn. Hens fed on the basal diet supplemented with 90 ppm Mn gave the best shell thickness.

Therefore, the level of 90 mg Mn/kg diet could be suggested for Dandarawi and Dokki4 hens. Whereas, NRC, 1994 and Ministerial Decree No 1498, 1996 recommended 60 mg Mn/Kg diet for laying hens.

Table1. Composition and calculated analysis of the basal diet.

Ingredient		%
Yellow corn		62.77
Soybean meal 44%		26.04
Wheat bran		1.12
Limestone		7.77
Dicalcium Phosphate		1.54
Salt (Nacl)		0.40
Vitamin and Mineral mixture*		0.30
DL-Methionine 99%		0.06
Total		**100**
Calculated chemical analysis:**		
Crude protein	%	16.49
Metabolizable energy	Kcal/Kg	2700
Calcium	%	3.33
Available phosphorus	%	0.41
Lysine	%	0.92
Methionine	%	0.35
Methionine+cystine	%	0.63
Manganese	mg/kg	17.83

*Formulated to be free of manganese, each 3 kg of vit. and min. mix Contains:12000000 IU vit A, 2500000 IU vit.D3 , 30000mg vit. E,
2000 mg vit. K3, 1000 mg vit.B1, 5000 mg vit.B2, 1500 mg vit .B6, 30000 mg Niacin, 15000 mg Pantothenic acid, 1500 mg Folic acid, 50 mg Biotin, 12 mg vit. B12, 300000 mg Choline, 50000 mg Zinc, 30000 mg Iron, 4000 mg Copper, 1000 mg Iodine, 100 mg Selenium, 100 mg Cobalt.

** Calculated according to NRC (1994).

Table 2. Effect of supplementing the basal diet with different levels of manganese on egg production of Dandarawi hens.

Item	T1	T2	T3	T4
First period:				
Egg number (EN)	11.50^{c}	13.35^{b}	15.25^{ab}	16.40^{a}
Egg weight (EW)	41.75^{b}	43.50^{ab}	45.15^{a}	45.90^{a}
Egg mass (EM)	480.13^{c}	580.73^{bc}	688.54^{ab}	752.76^{a}
Feed intake (FI)	2419^{b}	2563^{b}	2887^{a}	2930^{a}
Feed conversion (FC)	5.04^{a}	4.41^{ab}	4.19^{b}	3.89^{b}
Second period:				
Egg number (EN)	11.25^{b}	14.15^{a}	14.85^{a}	15.75^{a}
Egg weight (EW)	42.18^{c}	44.25^{bc}	46.38^{b}	47.15^{a}
Egg mass (EM)	474.53^{b}	626.14^{a}	687.56^{a}	742.61^{a}
Feed intake (FI)	2805	2935	3014	3056
Feed conversion (FC)	5.91^{a}	4.69^{b}	4.38^{b}	4.12^{b}
Third period:				
Egg number (EN)	11.75^{c}	13.95^{b}	15.35^{ab}	16.65^{a}
Egg weight (EW)	41.50^{c}	43.45^{bc}	45.70^{ab}	46.25^{a}
Egg mass (EM)	487.63^{c}	606.13^{bc}	701.50^{ab}	770.06^{a}
Feed intake (FI)	2523^{b}	2652^{ab}	2835^{a}	2899^{a}
Feed conversion (FC)	5.17^{a}	4.38^{b}	4.04^{b}	3.76^{b}
Overall period:				
Egg number (EN)	11.50^{c}	13.81^{b}	15.15^{a}	16.27^{a}
Egg weight (EW)	41.81^{c}	43.76^{b}	45.71^{a}	46.41^{a}
Egg mass (EM)	480.76^{c}	604.33^{b}	692.53^{a}	755.14^{a}
Feed intake (FI)	2582^{c}	2717^{b}	2912^{a}	2961^{a}
Feed conversion (FC)	5.37^{a}	4.49^{b}	4.20^{bc}	3.92^{c}

Means having different superscripts in the same row are significantly different ($P<0.05$).

Table 3. Effect of supplementing the basal diet with different levels of manganese on egg production of Dokki 4 hens.

Item	T1	T2	T3	T4
First period:				
Egg number (EN)	13.25[c]	15.13[bc]	17.20[ab]	18.56[a]
Egg weight (EW)	43.60[b]	47.58[a]	48.25[a]	47.95[a]
Egg mass (EM)	577.70[b]	719.89[ab]	829.90[a]	889.95[a]
Feed intake (FI)	3015[b]	3348[a]	3457[a]	3498[a]
Feed conversion (FC)	5.22[a]	4.65[b]	4.17[b]	3.93[b]
Second period:				
Egg number (EN)	14.15[b]	16.30[ab]	16.95[a]	18.25[a]
Egg weight (EW)	44.10[b]	46.75[a]	48.63[a]	49.15[a]
Egg mass (EM)	624.02[b]	762.03[ab]	824.28[a]	896.99[a]
Feed intake (FI)	3526	3673	3725	3633
Feed conversion (FC)	5.65[a]	4.82[b]	4.52[bc]	4.05[c]
Third period:				
Egg number (EN)	13.75[c]	15.95[bc]	17.31[ab]	19.10[a]
Egg weight (EW)	43.25[b]	47.15[a]	49.10[a]	48.80[a]
Egg mass (EM)	594.69[c]	752.04[bc]	849.92[ab]	932.08[a]
Feed intake (FI)	3214[c]	3452[bc]	3677[ab]	3866[a]
Feed conversion (FC)	5.40[a]	4.59[b]	4.33[b]	4.14[b]
Overall period:				
Egg number (EN)	13.72[c]	15.79[b]	17.15[a]	18.64[a]
Egg weight (EW)	43.64[c]	47.15[b]	48.67[a]	48.62[a]
Egg mass (EM)	598.80[c]	744.65[b]	834.70[a]	906.34[a]
Feed intake (FI)	3252[c]	3491[b]	3620[a]	3664[a]
Feed conversion (FC)	5.43[a]	4.69[b]	4.34[bc]	4.04[c]

Means having different superscripts in the same row are significantly different ($P<0.05$).

Table 4. Effect of supplementing the basal diet with different levels of manganese on egg quality of Dandarawi hens.

Item	T1	T2	T3	T4
First period :				
Albumin weight, %(AW)	55.67	55.00	56.82	54.05
Yolk weight, % (YW)	33.93	34.60	33.47	34.43
Shell weight, % (SW)	10.31[ab]	10.40[ab]	9.71[b]	11.52[a]
Shell thickness, mm(ST)	0.400[b]	0.403[b]	0.417[ab]	0.430[a]
Egg length, cm (EL)	5.17[ab]	5.41[a]	5.40[a]	5.07[b]
Egg width, cm (EW)	4.00[ab]	4.13[a]	4.20[a]	3.87[b]
Shape index, (SI)	77.37	76.34	77.78	76.33
Yolk height, mm (YH)	1.70[b]	1.90[a]	1.76[ab]	1.66[b]
Yolk width, mm (YD)	4.03[ab]	4.13[a]	4.20[a]	3.90[b]
Yolk index, (YI)	42.18	46.00	41.90	42.56
Second period:				
Albumin weight, (AW)	53.21	55.98	55.58	52.79
Yolk weight, % (YW)	37.73[a]	33.37[c]	34.87[bc]	36.43[ab]
Shell weight, % (SW)	9.06	10.65	9.55	10.78
Shell thickness, mm(ST)	0.337[b]	0.360[ab]	0.387[ab]	0.410[a]
Egg length, cm (EL)	5.30	5.16	5.20	5.10
Egg width, cm (EW)	4.16	4.60	4.17	4.13
Shape index, (SI)	78.49[b]	89.15[a]	80.19[b]	80.98[ab]
Yolk height, mm (YH)	1.87[a]	1.71[ab]	1.67[ab]	1.60[b]
Yolk width, mm (YD)	3.93[b]	4.10[ab]	4.30[a]	4.01[ab]
Yolk index, (YI)	47.58[a]	41.71[ab]	38.84[b]	39.90[b]
Third period :				
Albumin weight,%(AW)	56.29	54.24	56.76	54.74
Yolk weight, % (YW)	34.73	35.67	32.97	34.71
Shell weight, % (SW)	8.98[b]	10.09[a]	10.27[a]	10.55[a]
Shell thickness, mm(ST)	0.357[b]	0.383[ab]	0.394[ab]	0.416[a]
Egg length, cm (EL)	5.10[ab]	4.97[b]	5.40[a]	5.04[b]
Egg width, cm (EW)	3.87[bc]	3.80[c]	4.20[a]	4.01[b]
Shape index, (SI)	75.88	76.46	77.78	79.56
Yolk height, mm (YH)	1.73[a]	1.53[b]	1.60[ab]	1.47[b]
Yolk width, mm (YD)	4.20	4.03	4.37	4.17
Yolk index, (YI)	41.19[a]	37.97[ab]	36.61[b]	35.25[b]

Means having different superscripts in the same row are significantly different ($P<0.05$) .

Table 5. Effect of supplementing the basal diet with different levels of manganese on egg quality of Dokki 4 hens.

Item	T1	T2	T3	T4
First period :				
Albumin weight, %(AW)	55.96	55.36	54.42	54.44
Yolk weight, % (YW)	33.73	34.01	34.23	35.03
Shell weight, % (SW)	10.31	10.63	11.35	10.53
Shell thickness, mm(ST)	0.406^{b}	0.427^{ab}	0.453^{ab}	0.463^{a}
Egg length, cm (EL)	5.47	5.20	5.40	5.43
Egg width, cm (EW)	4.07	4.22	4.06	4.03
Shape index, (SI)	74.41	81.15	75.19	74.22
Yolk height, mm (YH)	1.77	1.81	1.80	1.73
Yolk width, mm (YD)	4.27	4.33	4.26	4.27
Yolk index, (YI)	41.45	41.80	42.25	40.52
Second period:				
Albumin weight, %(AW)	55.75	52.97	56.03	52.98
Yolk weight, % (YW)	33.57	36.12	33.23	35.93
Shell weight, % (SW)	10.68	10.91	10.74	11.09
Shell thickness, mm(ST)	0.413^{b}	0.436^{ab}	0.447^{ab}	0.458^{a}
Egg length, cm (EL)	5.57	5.60	5.47	5.21
Egg width, cm (EW)	4.06	4.07	4.06	3.93
Shape index, (SI)	72.89	72.68	74.22	75.43
Yolk height, mm (YH)	1.71	1.76	1.77	1.61
Yolk width, mm (YD)	4.20	4.30	4.34	4.20
Yolk index, (YI)	40.71	40.93	40.78	38.33
Third period:				
Albumin weight, %(AW)	56.58	56.28	56.21	58.01
Yolk weight, % (YW)	33.70	33.78	33.34	31.33
Shell weight, % (SW)	9.72	9.94	10.45	10.66
Shell thickness, mm(ST)	0.410^{b}	0.413^{b}	0.423^{ab}	0.433^{a}
Egg length, cm (EL)	5.33	5.43	5.37	5.34
Egg width, cm (EW)	3.97	4.01	4.11	4.10
Shape index, (SI)	74.48	73.85	76.54	76.78
Yolk height, mm (YH)	1.67	1.80	1.73	1.76
Yolk width, mm (YD)	4.31^{ab}	4.23^{ab}	4.43^{a}	4.13^{b}
Yolk index, (YI)	38.75	42.55	39.05	42.62

Means having different superscripts in the same row are significantly different ($P<0.05$).

REFERENCES

Abdel-Gawad, Elham; M.F.Shawer and M.M.Khalifa,

1976. *Eght years of selection for impoving the performance of inbred lines developed from Dokki 4 chicks. The Seventh Annual Meeting of the Egyptian Socity of Genetics, Egyptian J. of Genetics and Cytology, 5:488.*

Afifi, Y.K.; S.A.El-Safty and M.M.Fathi, 2007. *Assessment of eggshell quality measurements in some Egyptian local breeds of chicken using scanning electron microscopy. 1-Early egg production cycle. Proceedings of 4th World's Conference, Sharm El-Sheikh, PP:219-233.*

Bain, M.M., 1990. *Eggshell strength: a mechanical /ultrastructural evaluation. Ph.D. Thesis, University of Glsgow, UK.*

Bain, M.M.; N.Macleod; R. Thomson and J.W. Hancock, 2006. *Micro-cracks in eggs. Poult. Sci., 85: 2001- 2008.*

Cox, A.C. and S.L. Balloun, 1968. *Manganese supplementation for commercial egg production. Poult. Sci., 47:1664.*

Duncan,D.B.,(1955). *Multiple range and multiple F-Test. Biometrics 11:1-42.*

El-Itriby, A.A. and I.F. Sayed, 1966. *Dokki 4 , a new breed of poultry. Agric. Res. Rev., Cairo, 44: 102-109.*

Essary, E.O. and C.E. Holmes, 1964.*Influence of feeding vitamin c, minerals and additives in layer rations on egg production, feed conversion, shell quality and Haugh units. Poult.Sci., 43: 1316.*

Fathi, M.M., 2001. *Ultrastructural evaluation of eggshell quality produced from two different genetic groups of chicken. Egypt. Poult. Sci., 21:263-276.*

Fathi, M.M.; A. Zein El-Dein; S.A. El-Safty and Lamiaa, M.Radwan, 2007. *Using scanning electron microscopy to detect the ultrstructural variations in eggshell quality of Fayoumi and Dandarawi chicken breeds . International J.of Poult. Sci., 6 (4):236-241.*

Georgienski, V. L. and E.P.Zharova, 1973. *Pervyi Vsesoyzni ,Simpozium po mineralnomu abmenuiego regulyatsü, U S-kh Zhivontnykh, Borovsk.*

Georgienski, V. L., 1982. *In : Mineral Nutrition of Animals. Butterworths, UK, PP:422-426.*

Holder, D.P. and D.M. Huntley, 1978. *Influence of added manganese, magnesium, Zinc and calcium level on eggshell quality. Poult.Sci., 57:1629-1634.*

Inal.F., Coskun B., Gulsen N., Kurtoglu V. (2001). The *effects of withdrawal of vitamin and trace mineral supplements from layer diets on egg yield and trace mineral composition . Birch poultry Sci. 42: 77-80*

Leach, Jr., R.M. and J.R. Gross, 1983. *The effect of manganese deficiency upon the ultrastructure of the eggshell. Poult.Sci., 62:499-504.*

Mabe, I.; C.Rapp; M.M. Bain and Y.Nys, 2003. *Supplementation of a corn-soybean meal diet with manganese, Copper and Zinc from organic or inorganic sources improves eggshell quality in aged laying hens. Poult.Sci., 82: 1903-1913.*

Maurice , D.V. and J.E. Whisenhut, 1980. *Response of eggshell quality to dietary manganese supplementation. Poult.Sci.., 59: 1567-1568.*

Mertz, W., 1987."*Manganese" Pages 185-223 in : trace elements in human and animal nutrition. 5th ed., Academic press. New York, NY.*

Ministry of Agriculture, 1996. *The ministerial decree No.1498, of feed manufacturing and quality control.(In Arabic)*

National Research Council, NRC, 1994 *Nutrient requirements of poultry 9th rev. ed., National Academy of Sciences, Washington, D.C.*

Nys, Y.; J. Gautron ; J.M. Garcia- Ruiz and M.T.Hincke, 2004. *Avian eggshell mineralization: Biochemical and functional characterization of matrix proteins. C.R. Palevol, 3:549-562.*

Rodriguez- Navarro, A.; O. Kalin; Y. Nys and J.M. Garcia-Ruiz,2002. *Influence of the microstructure and crystallographic texture on the fracture strength of hen's eggshell. Br. Poult. Sci., 43: 395-403.*

Ruiz, J. and C.A. Lunam, 2000. *Ultrastructural analysis of the eggshell: contribution of the individual calcified layers and the cuticle to hatchability and egg viability in broiler breeders. Br. Poult.Sci., 41: 584-592.*

SAS Institute 1990. *SAS® institute User's Guide: Statistics. Version 5 Edition. SAS Institute Inc., Cary, NC.*

Sazzad, H.M.; A.G. Bertechini and P.T.C. Nobre, 1994. *egg production, tissue deposition and mineral metabolism in two strains of commercial layers with various levels of manganese in diets. Animal Feed Science and Technology, 46: 271-275.*

Solomon, S.E., 1991. *Egg and eggshell quality, Wolf Publishing Ltd., London.*

Solomon, S.E., 1999. *An eggs ist ein ei, es un huevo , est un oeuf. Br. Poult. Sci ., 40: 5-11*

Turk, R.G.; D.S. Grunji and P. Molitares, 1982. *Coccidial infections and manganese absorption. Poult. Sci., 61: 2430- 2434.*

Underwood, E.J., 1977. *Trace Elements in Human and Animal Nutrition, 4th ed. Academic press, New York, PP: 170-190.*

Vantoledo, B.; A.H. Parsons and G.F.J. Combs, 1982. *Role of ultrastructure in determining eggshell strength. Pout. Sci.,, 61: 569-572.*

Wilugs, H.S; L.C. Norris and G.F. Heuser, 1986. *The role of certain inorganic elements in the cause and prevention of perosis. Science, 84: 252-253.*

Zamani, A.; H. Bahmani and J. Pourreza, 2005. *Effect of different levels of manganese and zinc supplement on the performance traits and egg quality of laying hens . Pakistan. J. of Biol. Sci., 8: 1035- 1040.*

الملخص العربى

الاحتياجات الغذائية من المنجنيزللدجاج البياض من سلالتى الدندراوى و دقى ٤

مصطفى يوسف عطية- محمد أحمد محمد سيد- محمود حسن عبدالصمد-
محمد عبدالعزيز عبدالجليل

معهد بحوث الأنتاج الحيوانى- مركز البحوث الزراعية- الدقى- القاهرة- مصر

تهدف هذة الدراسة الى دراسة تأثير استخدام مستويات مختلفة من المنجنيز على أنتاج البيض و صفات جودة البيض لسلالتين من السلالات المحلية هما الدندراوى و الدقى ٤ لتقدير احتياجاتها من عنصر المنجنيز.

تم أستخدام عدد ٢٥٦ دجاجة بياضةعمر ٢٣ أسبوع (١٢٨دجاجة لكل سلالة) وتم تقسيم كل سلالة الى ٤ مجاميع فى كل مجموعة ٨ مكررات وفى كل مكرر ٤ دجاجات .تم تغذية الدجاج على ٤ علائق تجريبية : العليقة الأ ساسية (بدون أضافة المنجنيز) و ثلاث علائق أضيف الى العليقة الأساسية المنجنيز (فى صورة كبريتات المنجنيز) بمستويات ٣٠ و ٦٠ و ٩٠ ملجم منجنيز/ كجم عليقة . أستمرت التجربة لمدة ١٢ أسبوع على ٣ فترات كل منها ٤ أسابيع .

تم أخذ قياسات انتاج البيض و صفات جودة البيض فى نهاية كل ٤ أسابيع . تم دراسة التركيب المتعدد لقشرة البيض باستخدام الميكروسكوب الألكترونى.

أوضحت أهم النتائج المتحصل عليها مايلى:-

- أوضحت نتائج قياسات انتاج البيض أن هناك أختلافات معنوية بين الدجاج المغذى على العليقة الأساسية وباقى المعاملات فى عدد البيض ووزن البيض و كتلة البيض و كمية الغذاء المأكول و كفاءة التحويل الغذائى لكل من سلالتى الدندراوى و الدقى ٤ .
- بالنسبة لنتائج صفات جودة البيض لوحظ أن سمك قشرة البيض لكل من سلالتى الدندراوى و دقى ٤ تحسنت معنويا بزيادة مستوى المنجنيز فى العليقة.
- لوحظ من النتائج أن دجاج الدندراوى و دقى ٤ المغذى على عليقة أساسية مضاف إليها ٩٠ ملليجرام من المنجنيز/ كجم عليقة أعطى أفضل سمك لقشرة البيض عن المعاملات الأخرى.
- ويتضح من النتائج أن مستوى ٩٠ ملليجرام من المنجنيز/ كجم عليقة كافى لإعطاء أفضل إنتاج بيض و سمك قشرة البيض.