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PRODUCTIVE AND REPRODUCTIVE PERFORMANCE STUDIES ON LAYERS EXPOSED TO LEAD AND THE ROLE OF NATURAL CLAY IN REDUCING ADVERSE EFFECTS OF LEAD POISONING.

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ABSTRACT

This study was conducted to investigate the effect of lead acetate- polluted diet ingestion on some productive and reproductive performance of laying hens, and try to employ some useful properties of clay for reducing the adverse effect of lead contamination. A total number of 180 Gimmizah laying hens at 32 weeks of age were randomly, distributed equally into nine treatments. Birds were offered (1) basal diet; (2) basal diet + 250 ppm Pb ;(3) basal diet + 250 ppm Pb +2.5% clay; (4) basal diet + 250 ppm Pb +5% clay; (5) basal diet + 500 ppm Pb; (6) basal diet +500 ppm Pb +2.5% clay; (7) basal diet + 500 ppm lead+5 % clay; (8) basal diet +2.5% clay and (9) basal diet- + 5% clay. Body weight, weight gain; egg production, feed conversion, egg quality, fertility; hatchability and economical efficiency were determined for two times. The first time was after the positive experimental period and the second time was after the negative experimental period. Results obtained for the first period indicated that, lead – polluted diets significantly decreased weight gain; egg number; hen day percentage; egg mass (g /day); feed conversion (g feed/ g egg)day ; shell weight and percentage, yolk weight and percentage, Haugh units score, fertility percentage and hatchability percentage. However, feed intake, egg weight, albumen weight and percentage and embryonic mortality percentage without piping were significantly increased. Adding clay to lead polluted diets significantly reduced the adverse effect of lead in the previous parameters. Supplementation of clay to the diet only insignificantly increased, weight gain , egg production percentage , egg weight , egg mass (g /day)and improved feed conversion, while the finial body weight; egg mass (g /day); feed intake; egg components weight and percentage; Haugh units score; fertility and hatchability percentages and embryonic mortality percentage without piping were not significantly affected by feeding natural clay in laying diets. After the negative experimental period all the previous parameters were go back around the control and the differences were not significant except, feed intake which significantly decreased, but egg weight, shape index, yolk weight and albumen weight were fluctuating as compared with control.

It could be concluded that supplementation the natural clay at level 5% to layer diet contaminated with lead can prevent adverse effect of lead.

Keywords: layers – lead – clay – egg production – egg quality – fertility – hatchability).

INTRODUCTION

One of the most important environmental issues is feed contamination. Lead has been one of the main causes of poisoning in man, since ancient times due to its use in many activities, although it is only recently that toxicity has been recognized. Moreover, the use of lead pellets for shooting has resulted in the release of lead into the environment , with serious repercussions for many bird species population, which have ingested lead either directly or indirectly. Small particles of lead inter the digestive tract. Start dissolving in the form of lead salts, are incorporated into the bloodstream and the rest of the body, accumulate in the organs like the liver or kidneys, and cause physiological or behavioral effect. Damron *et al* (1969) showed that supplementation 1000-PPM lead to the diet reduced growth. Egg production has been shown to decrease from increased lead intake(NAS; 1980). Edens and Garlich (1983) reported that the addition of 200- PPM lead to the hen diets reduced egg production. Similarly Vodela *et al.,* (1997) observed reduction in egg production in chickens consuming lead at 200 mg / kg diet or greater. It is possible to reduced or mostly diminish the toxic heavy metals effects (Pais *et al;* 1994). The results obtained by Park and Kim (1984) showed that lead poisoning can be partly reduced by providing supplementary Iron and Zinc. Recently, Selenium, Zinc, and natural clay has drown the attention of researchers working with heavy metals pollution, addition of zeolite (5%) was found to reduce aflatoxin toxicity to growth chicks by 41% as indicated by gain weight and liver weight. Dobeic (1994) postulated that zeolite at levels 1,2,or 4% in the diet increased live weight gain, finial body weight and feed conversion efficiency. The highest growth rate and feed conversion were with 2% zeolite in chicks. On the other hand, Lemser *et al;* (1992) reported that 1.5, 3, or 5% bentonite decreased body weight by 11.6, 14.5% and 12% respectively, while zeolite supplements in broilers diet showed no effect. Vasilev and Mirzaliev (1989) found that with 2.5% bentonite egg yield was the highest, while feed intake per unit of egg yield was 13% less and egg – shell weight was 12-13% more than with basal diet given alone. Kalyuzhnov *et al*; (1988) also reported that with zeolite dietary supplement, hens egg yield increased by 3 to 6%, but Lemser *et al;* (1992) indicated that supplementation of poultry diets with natural clay showed a negative effect on layer performance, but no effect was observed on egg quality. Similarly, Berrios *et al;* (1983) reported that number of eggs per hen and average egg weight, did not differ significantly among treatments (0, 2.5, 5 or 10% zeolite) , while feed conversion was more efficiency. Evans and farrell (1991) also concluded that supplemented zeolite (2.5 or 5%) fed to laying hens did not improve or adversely affect egg shell quality.

Furthermore, there is little information on the interaction of lead and natural clay in a breeder chicken performance. The objectives of this study were to investigate the effect of adding different levels of lead and/or natural clay to laying hen diets on productive and the economical performance of laying chicken.

MATERIALS AND METHODS

The present study was carried out at Gimmizah Research Station, Animal production Research, Institute Agric. Res. Center, Ministry of Agric. A total number of 180 Gimmizah laying hens 32 weeks old were randomly chosen from a large flock reared on the floor and distributed into nine groups of 20 hens in each group. Birds were housed in individual wire cages and maintained under the same managerial , hygienic and environmental conditions for an experimental period of 14 weeks. During the experimental period feed and water were provided *ad- labium* and hens were exposed to 16-hr light daily. The Basal diet group was fed the basal diet (a commercial laying ration containing 16.13 % CP and 2727 k cal ME/ kg (Table 1a). Composition of the natural clay is shown in Table 1b. The experimental groups were fed the basal diet supplemented with different levels of clay and lead (in a lead acetate form). The experimental design is presented in Table 2. The 14 weeks experimental period was divided into two equal periods. The positive experimental period (P. EXP. P), in which birds were fed the experimental ration and the negative experimental period(N. EXP. P or recovery period) in which all experimental groups were fed on the basal diet alone .

Table 1a : Composition of the basal diet.

Ingredient	%
Yellow corn	64.00
Soya bean meal (44% cp)	22.60
Wheat bran	4.00
Dicalcium Phosphate	1.50
Limestone	7.10
Salt	0.30
Vit & Min. mix*	0.30
DL- Methionine	0.20
Total	100
Calculated analysis**	
Crude protein %	16.13
ME (Kcal)	2727
Calcium %	3.17
Available Phosphorus %	0.39
Lysine %	0.80
Methionine %	0.46
Determined values***	
Dry matter %	88.63
Crude protein %	15.87
Crude fiber %	3.14
Ether Extract %	2.43
Ash %	11.37

10,000 mg Vit. E;1,000mg Vit. K; 1,000mg Vit. B1; 5,000mg Vit. B2; 1,500mg Vit B6; 10mg Vit. B12; 50mg; Niaci, 20 gm ; Panatothenic acid, 1gm, Biotin;l,000mg Folic acid;250,000mg choline; 80g manganese; 40g iron; 40g zinc; 2g copper; 2g iodine; 1gm Seleinium and 2g cobalt.

****Calculated according to NRC (1994).**

*****Detrmined according to the methods of A.O.A.C (1994).**

Table (1b) Composition of the natural clay.

Item	%
SiO_2	50 - 55
Al_2O_3	18 - 22
Fe_2O_3	3 – 5
Na_2O	2.0 - 3.2
CaO	0.1- 0.3
MgO	0.5 – 1.6
K_2O	1.2 – 2.2
L.O.I.	8 –14
Moisture content (110 C°)	10.0 max
Surface area (m^2 /gm) of raw	27
Mineralogical composition	**%**
Montmorillonite	72 - > 75
Kaolinite	< 8
Non – clay	< 5

Table(2): The experimental design (experimental groups and diets).

	Experimental diet	
	Supplemented level of lead (ppm)	Supplemented level of clay (%)
Control	----	----
A	250	----
B	250	2.5
C	250	5.0
D	500	----
E	500	2.5
F	500	5.0
G	----	2.5
H	-----	5.0

All birds were individually weighed at the beginning and at the end of experimental period. To get a good mixture the amount of lead acetate and /or natural clay was mixed with small amount of basal diet by using gradual mixing system by mix the amount of Lead acetate and / or natural clay (for each 50 kg ration) until it completely mixed and distributed in the ration.
Egg number and weight were recorded daily. Feed intake was recorded weekly. For measuring egg quality. 108 eggs (6 eggs for each group) were taken at the end of P. Exp. P and at the end of N. Exp. P., The eggs were weighed to the nearest 0.1gm and then broken, yolk was separated from the albumen and the egg components were calculated as percentages. Haugh units score was calculate using the following formula:

$$\mathbf{H.U. = 100 \log (H - 1.7\, W^{0.37} + 7.57).}$$

Where: H =Albumen height, W = Egg weight in grams.

To estimate fertility and hatchability percentages the groups of hens were inseminated twice a week with 0.05 ml of semen mixed with 0.05 ml saline 0.9%. Eggs for each group hens were collected from the corresponding hens marked beginning the second day after insemination and were stored at room temperature (20 C and RH 60%). The eggs were incubated and hatched to determine fertility, hatchability and embryonic mortality percentages after 4 weeks of initial positive experimental period (P.Exp. P.) and after 4 weeks of initial negative experimental period (N. Exp.P.).

Statistical analysis.

Data were analysed using one way analysis of variance, to estimate the significant differences between treatments, *were calculated by using (Spss 8, 1997).* Duncan"s Multiple range test *(Duncan, 1955) was used to test mean differences at p ? 0.05* .

RESULTS AND DISCUSSION

Body weight.

Data are presented in Table (3) showed that the addition of lead alone to the diet by levels 250 and 500 ppm lead/kg resulted inhibition of growth. The finial body weight insignificantly decreased in laying hens fed diets contaminated with lead levels. The reduction in finial body weight increased with increasing the lead levels in hen's diet. Also weight gain significantly ($P<0.01$) decreased with lead contaminated in the diets (Table 3). The weight gain decreased at the end of the experimental period by 19.2% and 45.2 % in laying fed diets supplemented with 250, and 500 PPM, respectively as compared with control group. These results are in close agreement with that reported by Damron *et al* (1969) who showed that supplementation of 1000-PPM lead to the diet reduced growth in adult hens. Wittmann *et al*; (1994) who found that body weight gain depression was occurred after chronic exposure to lead and El -Zait (2002) who found that laying hens decreased in body weight and weight gain when fed diets contained 250 and 500 mg lead / kg diet as compared with control. Kendalla and Scanlon (1982) reported that adult make ranged turtledoves with acetate at the highest level (75 PPM) of lead the birds lost 17% of body weight. The reduction in growth rate as affected with the lead pollution may be related to the diminishing in hemoglobin synthesis and can react with cell membranes. Lead binds with the sulfhydryl bonds and inactivates the cysteine – containing enzymes, which allows more internal toxicity from free radicals, chemicals, and other heavy metals (Hais , 1992) . At any lead level, clay supplementation in laying hen diets recorded higher body weight than those fed control diet except the group fed natural clay 2.5% with 250 ppm lead contamination. These findings agree with those obtained by EL-Zait,.(2003), who showed that clay supplementation in hen diets contaminated with lead level recorded higher body weight . It may be concluded that natural clay supplementation reduced the lead toxicity.

Results in Table (3) showed that layers offered a diet supplemented with 250 and /or 500-PPM lead in combination with natural clay had numerically heavier weight gain when compared with control group at the end of P.Exp.P. These results are inagreement with the finding of Fisinin *et al.*,(1985) , Zolbin, (1990) ; and EL-Zait (2003)in laying hen diets. It may be due to digestibility of organic matter, fat and nitrogen- free extract and utilization were increased by supplementary Zeolite (Andronikashvili et al .,1994). It may be also due to that the natural clay can adsorb toxic products of digestion and decrease accumulation of toxic substances in tissues, which may decrease the incidence of internal disorders (Mumpton and Fishman, 1977). Also, bentonite feeding reduces T-2 toxicity by reducing intestinal absorption and increasing fecal excretion of the toxin (Carson and Smith,1983); i,e. natural clays adsorb the toxic material and excrete it in feaces. It is suggested that lead toxicity is induced by interference with natural clay supplementation. Laying hen fed a diet supplemented with natural clay only insignificant increased in live body weight and significantly

($P \leq 0.01$)increased in weight gain as compared with control. Similar results were obtained by Dobeïc (1994) who postulated that zeolite at levels 1, 2, or 4% in the diet increased live weight gain, and finial body weigh. The highest growth rate was with 2% zeolite in chicks and this was in close agreement with those obtained by El-Zait, (2003)in laying hens. In contrary, Lemser *et al;* (1992) reported that 1.5, 3, or 5% bentonite decreased body weight by 11.6, 14.5% and 12%, respectively. Final body weight and weight gain were not affected by the various diets during N.Exp.P.

Egg production traits .

Egg number and hen day percentage:

Data in Table 4 showed that supplementation of lead with natural clay or natural clay only in hen diets were improved and significantly increased egg number and hen day percentages at positive experimental period (P.Exp.P). Egg number and hen day percentages decreased with increasing the lead level. The lowest egg number and hen day percentages were in hens feed on diet contained 500 ppm lead / kg diet as compared with other treatments. These results agreed with that obtained by Stone and Soares (1974) who found sharp decline in the rate of egg production in White Leghorn hens fed on diets contained 630 mg /kg diet lead oxide or more. Edens and Garlich (1983) and Vodela et al (1997) reported that the addition of 200 ppm lead /kg diet in layers diets reduced egg production. Also El-Zait (2003) concluded the same result in laying hens. On the other hand, Whisenhunt and Maurice (1981) postulated that feeding laying hens on diet containing 500 mg lead /kg diet showed no significant effects on egg production. Supplementation of natural clay only to the diets increased egg number and hen day percentage as compared with other treatments (Table 4). Egg production percentage increased by 17.38% and 17.02% respectively, in hens fed diets supplemented with 5 and 2.5% natural clay, respectively, when compared with control. These findings are good agreement with those obtained by Vasilev and Mirzaliev (1989) who found that with 2.5% bentonite egg yield was the highest, Kalyuzhnov *et al* ;(1988) also reported that with zeolite dietary supplement, hens egg yield increased by 3 to 6% , and El-Zait (2003) showed that addition of 3% natural clay in laying diet increased egg production percentage by 20.41%; but Lemser *et al;* (1992) indicated that supplementation of poultry diets with natural clay showed a negative effect on layer performance. Similarly, Berrios *et al;* (1983) reported that number of eggs per hen did not differ significantly among treatments (0, 2.5, 5 or 10% zeolite). Evans and Farrell (1991) also concluded that supplemented zeolite (2.5 or 5%) fed to laying hens did not improve egg production. Within the lead levels, natural clay supplementation increased egg production (egg number and hen day percentage) when compared with hens fed control/ or other treatments. These results agreed with that revealed by El-zait (2003) who found that egg production percentage increased by interaction of natural clay and lead pollution at the experimental diets.

Table 3: Means (X±SE) of body weight and weight gain /loss as affected by dietary supplementation of lead (Pb) natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.E xp.P in Gimmizah laying hen.

Treatments	P.Exp.P [1]			N.Exp.P [1]		
	IBW	FBW	Gain (g)	IBW	FBW	Gain (g)
Basal diet	1728.00±15.26	1832.00±20.26 ab	104.00±12.25 b	1832.00±20.26 ab	1862.00±87.51	30.00±18.08
Bas. + 250 ppm pb	1728.00±43.16	1812.00±41.02 ab	84.00±16.89 a	1812.00±41.02 ab	1853.00±58.92	41.00±36.71
Bas. + 250 ppm Pb + 2.5 % clay	1726.00±47.45	1830.00±64.22 ab	104.00±39.35 ab	1830.00±64.22 ab	1922.00±66.63	92.00±41.20
Bas. + 250 ppm Pb + 5 % clay	1741.00±50.65	1916.00±56.98 b	175.00±22.75 bc	1916.00±56.98 b	1985.00±51.44	69.00±23.74
Bas. + 500 ppm Pb	1685.00±38.69	1742.00±56.87 a	57.00±17.29 a	1742.00±56.87 a	1838.00±85.97	96.00±23.78
Bas. + 500 ppm Pb + 2.5 % clay	1720.00±40.12	1884.00±47.68 ab	164.00±29.24 bc	1884.00±47.68 ab	1968.00±73.29	84.00±22.16
Bas. + 500 ppm Pb + 5 % clay	1748.00±46.34	1921.00±64.66 b	173.00±28.28 bc	1921.00±64.66 b	1993.00±58.02	72.00±24.69
Bas. + 2.5 % clay	1749.00±55.13	1935.00±66.99 b	186.00±36.87 c	1935.00±66.99 b	2030.00±56.81	95.00±41.67
Bas. + 5 % Clay	1711.00±21.04	1900.00±46.22 ab	189.00±20.36 c	1900.00±46.22 ab	1958.00±67.12	58.00±27.51
Over all Mean	1726.00±13.45	1863.00±17.64	137.00±8.98	1863.00±17.64	1934.00±23.12	71.00±09.84
ANOVA						
Bet Treatments	NS	*	**	*	NS	NS

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet

Means within the same column with different superscripts are significantly (P?0.05).;

*** = (P?0.001); ** = (P?0.01); * = (P?0.05);

NS = Not significant. ;IBW= initial body weight (g) ; FBW = Finial body weight (g) ;

Table 4: Means (X±SE) of egg production as affected by dietary supplementation of lead (Pb), natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.Exp.P in Gimmizah laying hen.

Treatments	P.Exp.P [1]				N.Exp.P [1]			
	EN	EW	HD %	EM	EN	EW	HD %	EM
Basal diet	31.07± 0.84 b	47.51±0.35a	63.41±0.12b	30.13±1.53 b	27.00±2.22	55.88±0.44 bc	55.13±0.215	30.81±2.55
Bas.+ 250 ppm Pb	29.75± 1.19 ab	50.42±0.32b	60.71±0.11ab	30.37±1.64 ab	32.67±2.23	55.63±0.58 abc	67.16±0.23	37.36±2.69
Bas.+ 250 ppm Pb + 2.5 % clay	37.20± 1.33 d	51.02±0.34 c	75.92±0.26d	38.73±2.10 c	33.37±1.54	54.40±0.44 ab	66.59±0.13	33.22±3.03
Bas.+ 250 ppm Pb + 5 % clay	35.40± 2.31 cd	51.03±0.39bc	73.18±0.32cd	37.34±2.34 bc	30.40±2.26	56.51±0.55 c	62.21±0.32	35.16±1.38
Bas.+ 500 ppm Pb	28.31± 1.54a	50.43±0.42b	57.78±0.18a	29.14±2.17 a	31.44±1.87	56.76±0.77 c	64.52±0.16	36.62±2.48
Bas.+ 500 ppm Pb + 2.5 % clay	34.07± 1.77cd	52.24±0.37 c	69.53±0.29cd	36.32±2.53bc	29.50±2.21	55.90±0.44 bc	60.56±0.22	33.85±2.53
Bas.+ 500 ppm Pb + 5 % clay	33.80± 1.19cd	52.21±0.73 c	68.98±0.44cd	36.02±2.29bc	31.70±2.25	55.54±0.83 bc	64.16±0.20	35.36±3.49
Bas. + 2.5 % clay	36.36± 2.06d	49.76±0.46b	74.20±0.35d	36.92±2.11bc	31.42±2.22	53.31±0.56 a	64.80±0.23	34.55±3.19
Bas. + 5 % Clay	36.47± 2.03 d	50.63±0.44b	74.43±0.23d	37.68±2.01bc	32.18±2.09	55.77±0.47 bc	66.02±0.20	36.82±4.64
Over all Mean	33.60± 0.70	50.62±0.18	68.68± 0.03	34.74±1.53	31.10±0.72	55.42±0.21	63.60±0.02	35.25±0.99
ANOVA								
Bet Treatments	***	***	***	***	NS	***	NS	NS

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet

Means within the same column with different superscripts are significantly different (P?0.05).

*** = (P?0.001); ** = (P?0.01); * = (P?0.05);

NS = Not significant. ; EN= Egg number ; EW = Egg weight (g) ; HD% = Hen day percentage ; EM = Egg mass (g day)

In general, the obtained results indicate that the use of the natural clay exchange capability to reduce the uptake of these heavy metals in poultry tissues is promising. Evans and Farrell (1993) concluded that the use of synthetic and natural zealites have limited economic benefit or application for improving the performance in poultry. After the negative experimental period (N.Exp.P) egg number and hen day percentage were in their normal range for all experimental groups and the differences among treatments were insignificant (Table 4).

Egg weight:

It is evident from (Table 4) that egg weight was affected significantly with both of lead contamination and supplementation natural clay in hen diets at the positive experimental period (P.Exp.P.) as compared with the control diet. Egg weight increased with increasing lead contamination level in layers diets. These finding may be attributed to the decrease in egg production, when hens fed on the diets contaminated with lead. This reduction in egg production was observed in hens consuming lead at 200 mg /kg diet or greater (Vodela *et al.*, 1997). Supplementation of natural clay in hen diets increased egg weight. These results are in agreement with those results revealed by El-Zait , (2003). On the contrary to the finding of Berrios *et al;* (1983) who reported that average egg weight, did not differ significantly among treatments (0, 2.5, 5 or 10% zeolite). Within lead levels supplementation natural clay in hen diets increased egg weight. Similar results are showen by El-Zait (2003) who reported that egg weight was significantly (P?0.001) increased by lead pollution, natural clay and interaction between lead pollution with natural clay in poultry. After the negative experimental period (N.Exp.P), egg weight was significantly (P?0.001) affected by treatments during positive experimental period (P. Exp.P) due to the increased egg size by all treatments at the same period than the control (Table4).

Egg mass:

Data in Table 4 illustrated that egg mass (g)/day was affected by lead contamination; natural clay level and combination between lead and clay in the positive experimental period (P.Exp.P). Birds fed 500 ppm lead/kg treated diets decreased in egg mass (g)/ day, while birds fed 250 ppm lead/kg diets egg mass increased slightly as compared with control. It may be due to reduction in total plasma proteins, which reduced by increasing lead levels in diet and also attributed to late egg formation in layers. Addition of natural clay to laying diet by 2.5% and / or 5% increased egg mass (g)/day with 22.54 and 25.06% respectively; as compared with control. It may be due to the increase in egg production percentage and in egg weight due to addition of natural clay. Within any lead level, clay supplementation increased egg mass (g) /day when compared with layers fed control diets. The highest egg mass (g)/day was recorded in hens fed diets contained 250 ppm lead combined with 2.5% clay, but the lowest egg mass was in hens fed diet contaminated with 500 ppm lead during of P.Exp.P., This may be attributed to the increase of egg production percentage and in egg weight . Egg mass (g)/day during of N.Exp.P was not affected by treatments because egg number and hen day percentage was normal for all experimental groups and the differences among treatments were insignificant (Table 4).

Feed intake:

. It is evident from (Table 5) that feed intake was affected significantly ($P \leq 0.01$) by lead contamination at 500 ppm level in laying diets as compared with control diet in the P. Exp. P., while no significant differences were observed between the other treatments . The highest feed intake was of hens fed 500-ppm lead contamination with diets; while the lowest was in hens fed diet supplemented 250 ppm lead mixed with 5% natural clay as compared with other treatments in the P.Exp.P. Supplementation of natural clay in the diet with 2.5 % and / or 5 % levels did not significantly affect feed intake as compared with control. Similar finding was obtained by McCollum and Galyean (1983) who detected no differences in feed intake among treatments when using diets supplemented without or with 2.5% natural Zeolite. Feed intake was significantly ($P<0.05$) decreased in all treatments as compared with control diet; while no significant differences were observed between treatments during N. Exp. P. (Table 5).

Table 5 : Means (X±SE) feed intake, feed conversion (g feed/ g eggs) day as affected by dietary supplementation of lead (Pb) natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.Exp.P in Gimmizah laying hen

Treatments	P.Exp.P [1]		N.Exp.P [1]	
	FI	FC	FI	FC
Basal diet	116.69±2.824ab	3.67±0.20 b	129.18±0.97 b	4.65±0.55
Bas. + 250 ppm Pb	115.27±2.77 ab	3.80±0.18 b	121.95±1.41 a	3.59±0.43
Bas. + 250 ppm Pb + 2.5 % clay	112.59±2.94 ab	2.93±0.17 a	120.82±1.64 a	3.35±0.17
Bas. + 250 ppm Pb + 5 % clay	112.16±3.07 a	3.01±0.21 a	123.89±1.26 a	3.37±0.13
Bas. + 500 ppm Pb	126.44±2.34 c	4.34±0.35 c	122.49±1.32 a	3.52±0.28
Bas. + 500 ppm Pb + 2.5 % clay	113.53±2.76 ab	3.13±0.22 ab	123.20±1.24 a	3.70±0.30
Bas. + 500 ppm Pb + 5 % clay	121.17±2.87 bc	3.36±0.20 ab	121.76±1.51 a	3.60±0.27
Bas. + 2.5 % clay	116.18±2.39 ab	3.15±0.22 ab	120.80±1.33 a	3.76±0.29
Bas. + 5 % Clay	119.85±2.52 abc	3.18±0.21 ab	122.09±1.01 a	3.60±0.58
Over all Mean	116.99±0.96	3.41±0.08	122.90±0.48	3.71±0.13
ANOVA				
Bet Treatments	**	**	*	NS

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet

Means within the same column with different superscripts are significantly different (P?0.05).

***** = (P?0.001); * * = (P?0.01); * = (P?0.05); NS = Not significant. ;**

FI = Feed intake (g) day ; FC = Feed conversion (g feed / g eggs day) ;

Feed conversion:

Feed conversion was significantly ($P \leq 0.01$) affected by lead contamination; at 500 ppm lead, 250 ppm lead with 2.5 % and 5% natural clay layer diets, while no significant differences were observed between the other treatments as compared with control diet in the P. Exp. P. (Table 5). Supplementation of 500 ppm lead in laying diets decreased feed conversion efficiency as compared with control, while insignificant effect was observed by contamination with 250 ppm lead. Mixed both lead levels of 250 ppm and

/or 500 ppm lead with 2.5 or 5% natural clay improved feed conversion as compared with control / or with the addition of 500 ppm lead only in the diet of laying hens.

This may be due to the increase of toxic products of digestion that reduce toxicity of lead, ability of clays to diminish the harmful effects of radiation and regulate the PH; also natural clays acts as feed binders (pellets). Addition of natural clay with 2.5 and / or 5% improved feed conversion with 18.60% and 17.83 % respectively, when compared with control in P.Exp. P. These results agree with those obtained by Vesilev and Mirzaliev (1989) who found that with 2.5 % bentonite , feed intake per unit of egg yield was 13% less. Ward *et al* (1993) and Dobeic (1994) who found that natural zeolite improved feed conversion efficiency. Also, Berrios *et al* (1983) clarified that feed conversion was significantly more efficient; consumption of protein and ME were low and cost of diet was reduced with zeolite dietary supplementation. Conversely, Al-Zubaidy (1992) indicated that supplementation of poultry diets with natural clay showed a negative effect on kg feed / kg eggs. Feed conversion was insignificantly improved, where combination of 250 ppm.lead contamination with 2.5 and 5 % natural clay or addition of 2.5% clay only gave the best feed conversion efficiency as compared with control /or other treatments during N.Exp.P.(Table 5) .

Egg quality traits :-

Shape index:

Shape index was not affected by various diets at P.Exp.P., also no significant differences were observed between all treatments as compared with control diet at N. Exp. P. (Table 6). The longest eggs were found in hens fed diet contained 500 ppm lead contamination and / or in hens fed diet supplemented combination 500 ppm lead with 2.5 % natural clay, while the roundest eggs were recorded in hens fed diets supplemented 250 ppm lead only / or 2.5 % natural clay as compared with the other treatments at the N. Exp.P., (table6). It may be due to the variations in functional efficiency manifested by their effect on the shape of the egg particularly in the muscular zone of the oviduct.

Egg components:

There was a highly significant ($p<0.01$) effect for impairing and decreasing values of shell weight and percentage, yolk weight and percentage and Haugh units score, while albumen weight and percentage were increased in birds consumed diet polluted with 250 and / or 500 ppm lead as compared with other treatments in positive experimental period (P.Exp.P) as showen in Tables (6 and 7). These results confirmed those reported by El-Zait .(2003) in yolk and albumen weights and percentages, but not in shell weight and percentage. The results obtained indicated that increasing albumen weight and percentage were due to the decrease of other egg components. The reduction in shell weight and percentage may be due to decrease plasma concentration in total calcium. Abo-Etta *et al* 2002 suggested that lead may have a direct effect on the mechanism of calcium metabolism.

Table 6: Means (X±SE) Shape index and egg components as affected by by dietary supplementation of lead (Pb); natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.Exp.Pin Gimmizah laying hen.

Treatment	P.Exp.P[1]				N.Exp.P[1]			
	SHI	Sh.W	YW	ALB W	SHI	Sh.W	YW	ALB W
Basal diet	76.20± 0.67	6.10±0.35 b	16.41±0.50 b	28.54±0.49 a	75.89±0.94 ab	6.10±0.19	17.28±0.17 bc	32.50±0.76 bc
Bas. + 250 ppm Pb	72.70± 1.89	5.58± 0.33 a	14.47±0.29 a	32.18±1.25 abc	78.43±0.52 b	6.00±0.16	17.80±0.37 bc	35.10±0.57 c
Bas. + 250 ppm Pb + 2.5 % clay	72.45± 1.54	6.90± 0.14 c	17.82±0.39 bc	30.50±0.38 c	77.82±2.29 ab	6.00±0.45	17.80±0.73 bc	34.30±0.86 bc
Bas. + 250 ppm Pb +,5 % clay	76.79± 1.39	6.92± 0.36 c	17.04±0.38 bc	33.85±1.02 c	77.05±1.76 ab	6.00±0.35	16.25±0.48 b	33.00±0.98 bc
Bas. + 500 ppm Pb	75.77± 1.11	5.69± 0.16 a	14.33±0.29 a	32.05±0.95 abc	73.03±1.13 a	6.00±0.16	17.70±0.37 bc	34.10±0.43 bc
Bas. + 500 ppm Pb + 2.5 % clay	75.97± 1.98	7.06± 0.13 c	17.51±0.19 bc	30.51±1.41 c	73.57±1.60 a	6.20±0.12	17.20±0.37 bc	34.40±0.58 bc
Bas. + 500 ppm Pb + 5 % clay	77.25± 2.64	6.83± 0.24 bc	17.14±0.48 bc	32.96±1.20 bc	77.34±0.93 ab	6.20±0.12	18.00±0.63 c	34.60±1.02 bc
Bas. + 2.5 % clay	75.99± 0.44	6.56± 0.04 bc	16.39±0.38 b	29.65±1.07 ab	78.31±1.60 b	5.60±0.19	15.60±0.24 a	31.20±1.42 a
Bas. + 5 % Clay	74.99± 1.18	6.80± 0.25 bc	17.42±0.46 bc	30.68±1.62 abc	76.43±1.39 ab	6.00±0.22	17.00±0.32 bc	33.90±0.51 bc
Over all Mean	76.20± 0.67	6.49± 0.11	16.50±0.22	31.21±0.41	76.76±0.48	6.01±0.07	17.28±0.17	33.69±0.31
ANOVA								
Bet Treatments	NS	***	**	**	*	NS	**	**

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet
Means within the same column with different superscripts are significantly different (P?0.05).;
*** = (P?0.001); * * = (P?0.01); * = (P?0.05);
Ns = Not significant.; SHI= Shape index ; Sh.W. = Shell weight ; YW= Yolk weight ; ALBW= Albumen weight .

Table 7 : Means (X±SE) egg components relative percentage and Haugh units score as affected by by dietary supplementation of lead (Pb); natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.Exp.P in Gimmizah laying hen.

Treatment	P.Exp.P [1]				N.Exp.P [1]			
	SH%	Y%	ALB %	HU	SH%	Y%	ALB %	HU
Basal diet	11.56±0.66 b	32.12±0.51 c	56.32±0.96 ab	82.86±1.68 d	10.93±0.20	31.19±0.27	58.27±0.57	81.78±1.89
Bas. + 250 ppm Pb	10.59±0.49 a	27.34±.0.66 a	61.13±0.77 cd	68.07±2.27 ab	10.20±0.25	29.60±0.92	59.69±0.87	82.73±1.77
Bas. + 250 ppm Pb + 2.5 % clay	12.49±0.18 c	32.27±0.66 c	55.24±0.58 a	73.15±1.51 abc	10.40±0.46	31.01±0.62	59.85±0.76	80.25±4.05
Bas. + 250 ppm Pb + 5 % clay	11.95±0.39 bc	29.44±0.43 b	58.55±0.56 bc	75.88±2.67 bcd	10.84±0.51	29.41±0.72	59.75±0.55	77.89±1.93
Bas. + 500 ppm Pb	10.95±0.32 a	27.55±0.51 a	61.50±0.57 d	64.68±1.37 a	10.34±0.19	30.52±0.60	58.80±0.58	82.37±2.82
Bas. + 500 ppm Pb + 2.5 % clay	12.85±0.33 c	31.88±0.85 c	55.27±1.05 a	75.83±4.36 bcd	10.73±0.25	29.76±0.61	59.51±0.75	78.14±1.95
Bas. + 500 ppm Pb + 5 % clay	12.02±0.39 bc	30.13±0.61 bc	57.86±0.78 ab	76.31±2.96 bcd	10.56±0.25	30.60±0.48	58.84±0.55	80.16±2.50
Bas. + 2.5 % clay	12.49±0.28 c	31.20±0.79 bc	56.31±0.92 ab	75.21±3.96 bcd	10.71±0.37	29.97±0.60	59.35±0.37	79.59±1.36
Bas. + 5 % Clay	12.40±0.49 c	31.81±1.32 c	55.70±1.58 ab	80.35±3.32 cd	10.55±0.22	29.94±0.49	60.08±0.33	77.58±1.38
Over all Mean	11.92±0.16	30.42±0.32	57.54±0.44	74.81±1.16	10.58±0.09	30.29±0.20	59.34±0.20	80.10±0.76
ANOVA								
Bet Treatments	**	***	***	***	NS	NS	NS	NS

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet
Means within the same column with different superscripts are significantly different (P?0.05). ;*** = (P?0.001); * * = (P?0.01); * = (P?0.05);
Ns = Not significant.; SH%= Shell percentage ; Y% = Yolk percentage : ALB% = Albumen percentage; HU= Haugh unitsscore.

Shell weight and percentage; yolk weight and percentage and Haugh units score were significantly (P<0.01) increased in hens fed lead supplemented diets in combination with clay in compared with lead contamination , but adverse effect on albumen weight and percentage was observed in the P,Exp.P.(Tables 6 and 7). It may be concluded that combination of clay with 2.5 and / 5 % were better in improving eggshell and yolk against lead contamination diets. These results disagree with those found by El-Zait. (2003) who showed that egg components weight and percentage were not affected by the interaction between clay and lead levels in hen diets. Supplementation of natural clay by 2.5% and /or 5% in hen diets did not significantly affect egg component (shell, yolk and albumen) weight or percentage and Haugh units score as compared with control diet at the P.Exp.P. (Tables 6 and 7). Similar trends were shown by Al- Zubaidy (1992) and Lasmer *et al* (1993) who indicated that supplementation of poultry diets with natural clays minerals showed no effect on egg component yield. After the negative experimental period (N. Exp. P) yolk weight and albumen weight significantly (P<0.01) affected by the experimental treatment of supplementation of nature clay by 2.5% diet only, while no significant were observed between the other experimental treatments diets and the control group. The highest yolk and albumen weights were observed in hens fed diets mixed with 500 ppm lead plus 5% clay and 250 ppm lead contaminated in diet only; respectively, while the lowest values of yolk and albumen weights were observed in hens fed diet supplemented with 2.5 % clay (Table 6). This may be due to differences in egg weight. On the other hand shell weight, egg components percentage and Haugh units score were recovered for all experimental groups and the differences among the different treatments and control group were insignificant (Tables 6 and7). It may be attributed to plasma concentration (total protein, albumen, total calcium and liver function) were in their normal range for all experimental groups (Abo-Etta *et al*, 2002).

Reproductive parameters.

Fertility and hatchability

The present data in Table (8) showed that birds fed diets treated with 250 and /or 500 ppm lead showed significant (P<0.001) decrease in fertility and hatchability percentages during the P.Exp.P. They were decreased with increasing lead levels in hen diets when compared with control diet and with the other treatments. The present results paralleled with that obtained by El-Zait, (2003) who found that fertility and hatchability percentages decreased with increasing lead level in hen diet. They may be due to reproductive dysfunction (Edens *et al.,* 1976) or the decline of Haugh unite score in eggs (Nofal *et al.*, 1999). Combination of natural clay to lead treated diets at all levels showed improve and increase the fertility and hatchability percentages than lead treated hens. The fertility percentage was insignificantly increased in all treatments as compared with control, except the group supplemented with 500 ppm lead plus 2.5 % natural clay decreased. Also group supplemented with 500 ppm lead plus 2.5 % natural clay the hatchability percentage was insignificantly decreased than control group (Table 8).

Table 8: Means (X±SE) of reproductive performance as affected by dietary supplementation of lead (Pb); natural clay and combination between lead levels with natural clay levels during of P.Exp.P and N.Exp.P in Gimmizah laying hen.

Treatments	P.Exp.P [1]			N.Exp.P [1]		
	F %	H %	ED %	F %	H %	ED %
Basal diet	87.30±0.030 b	82.34±0.17 cd	3.15±0.01 a	89.18±0.37	83.16±0.37	5.73±0.09
Bas. + 250 ppm Pb	73.95±0.14 a	66.93±0.04 ab	8.80±0.02 b	83.84±0.24	74.25±0.13	6.95±0.02
Bas. + 250 ppm Pb + 2.5 % clay	91.10±0.52 b	83.59±0.46 cd	7.00±0.01 b	92.09±0.31	80.52±0.20	9.69±0.05
Bas. + 250 ppm Pb + 5 % clay	91.58±0.20 b	76.18±0.28 bc	14.24±0.02 d	89.97±0.48	82.62±0.24	5.15±0.05
Bas. + 500 ppm Pb	72.64±0.17 a	59.07±0.23 a	11.70±0.01 c	81.77±0.18	73.33±0.11	6.80±0.21
Bas. + 500 ppm Pb + 2.5 % clay	89.10±0.23 b	75.01±0.20 bc	7.25±0.01 b	86.00±0.24	76.63±0.19	6.87±0.09
Bas. + 500 ppm Pb + 5 % clay	93.19±0.342 b	78.86±0.09 cd	13.39±0.01 c	87.63±0.51	77.06±0.58	9.21±0.19
Bas. + 2.5 % clay	92.10±0.07 b	85.96±0.05 d	4.40±0.01 a	88.65±0.37	77.13±0.38	8.52±0.20
Bas. + 5 % Clay	91.66±.23 b	86.84±0.10 d	4.46±0.02 a	92.40±0.34	83.30±0.16	7.02±0.10
Over all Mean	86.67±0.04	76.93±0.03	8.45±0.09	88.14±0.04	78.79±0.03	7.33±0.01
ANOVA						
Bet Treatments	***	***	***	NS	NS	NS

1 P.Exp.P and N.Exp. P. means the positive and negative experimental period, respectively. Bas.= basal diet
Means within the same column with different superscripts are significantly different (P?0.05)..; *** = (P?0.001);
** = (P?0.01); * = (P?0.05); NS = Not significant. ; F % = Fertility percentage ; H % = Hatchability percentage of total eggs ;
ED% = Embryonic dead percentage without piping .

Addition of natural clay to lead contamination diet alleviated the adverse effects of lead toxic on fertility and hatchability percentages in the positive experimental period (P. Exp. P.) These results are in good agreement with those revealed by El- Zait.,(2003) who observed that supplementation of clay to hen diet contaminated with lead improved egg fertility and hatchability percentages. It may be attributed to the improve of albumen quality in egg (Nofal *et al.*, 1999). It may be concluded that supplementation of natural clay to the diet polluted lead improved fertility and hatchability percentages. Supplementation of natural clay in hen diets increased fertility and hatchability percentages than control, but the differences were not significant (Table8). After the negative experimental period (N.Exp.P) fertility and hatchability percentages were not affected by treatments because the aforesaid parameters were recovered for all experimental groups and the differences among treatments each other and control group were not insignificant Table 8.

Embryonic mortality

Embryonic mortality percentage before pipping was significantly ($P<0.001$) affected by lead polluted, mixed lead with natural clay and natural clay levels Table 8. Birds fed lead treated diets of 250 and 500 ppm lead were increased significantly ($P<0.001$) the embryonic mortality percentage before pipping when compared with control and other treatments. These results are in close agreement with those obtained by De Gennaro (1978) who reported that the lead treated embryos failed to hatch and the embryos dead before 21 day of incubation. Also; Vodela *et al* (1997) indicated that the broiler breeder drinking water containing 6.7 ppm lead significantly increased the embryonic mortality compared with control. It may be attributed to the decrease Haugh units score (Nofal *et al.*,1999) who found that correlation between Haugh units score with embryonic mortality percentage was negatively and significant ($P<0.01$) at positive experimental period (P. Exp. P). Combination of lead polluted with natural clay significantly ($P<0.001$) increased the embryonic mortality percentage before pipping as compared with control at positive experimental period (Table 8). The highest embryonic mortality percentage without pipping were recorded in groups fed diet supplemented with both 250 ppm and /or 500 ppm lead mixed with 5% natural clay. Adding natural clay to laying diets without contamination lead did not significantly affect the embryonic mortality percentage before pipping as compared with control, but they were significantly ($p<0.001$) less than the other treatments. After the negative experimental period (N.Exp.P) embryonic mortality percentage before pipping was not affected by treatments (Table 8).

CONCULSION

On the basis of the results obtained in this study, it can be concluded that the consumption of diet polluted with heavy metals such as lead causes a dysfunction in productive and reproductive systems in laying hens which are represented as a decrease in live body weight, weight gain, egg production, egg components, Haugh units score and fertility and hatchability percentages. The results call attention to the harmful effects of heavy metals such as lead in the laying hens diets. Also, addition of the natural clay to the laying diets can be effective in the prevention of the lead toxicity.

REFERENCES

Abo-Etta, M. Eman, Salem, A. Amina, and Nofal, M.E., (2003). Physiological and biochemical studies on layer exposed to lead and the role of natural clay in preventing adverse effects and reducing lead retention. J. Agric. Sci. Mansoura Univ.,27(12) 8251-8265.

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 (1):13-19.

Andronikashvili, T.G.,Tsereteli, B.S., Dolidze, V.K., and Iremashvili, N.G., (1994). Zeolite supplements in diets for birds. Zootekhniya, 5 : 17-18. (cited from El-Zait , A.A., (2003)

Association of Official Analytical Chemists, 1980 (A.O.A.C) . Methods of analysis. 13th edition, Assoc. Offic. Anal. Chem., Arlington, VA. USA.

Berrios, I., Castro,M., and Cardenas ,M., (1983). Zeolite inclusion in feeds for laying hens fed *ad-libitum* . Cuban journal of Agricultural Science. 17(2)169-174.(cited from El-Zait , A.A., (2003)

Carson M.S.,and Smith T.K., (1983). Role of pentonite in prevention of T-2 Toxicosis in rats . Journal of Animal Science , 57 (6): 1498- 1506.

Damron, B.L.,Simpson, C.F., and Harms,(1969). The effects of feeding various levels of lead on the performance of broilers . Poultry Sci. 48: 1507- 1509.

De Gennaro L.D., (1978). The effects of lead nitrate on the central nervous system of the chick embryo. 1. Observation of light and electron microscopy. Growth, 24: 14 –155. (cited from El-Zait , A.A., (2003).

Dobeic M., (1994). Influence of clinoptilolites on chicken growth. Veterinarska- Stanica, 25 (6) :323 - 332(cited from El-Zait , A.A., (2003).

Duncan D.B., (1955). Multiple Range and Multiple F- Test . Biometrics, 11 : 1 –42.

Edens F.W.,and Garlich J.D., (1983). Lead induced egg production decreases in Leghorn and Japanese quail hens . Poultry sci. 62: 1757 – 1763.

El-Zait , A.A., (2003).Effect of ration polluted with same poisonous materials in predictive performance on laying hens. Ph. D. Theis Faculty of Agriculture Zigzag University.

Evans , M . and Farrell, D.J., (1991). Do zeolities enhance performance and egg shell quality of laying hens ? . Recent advances in animal nutrition in Australia , Edited by D.J. Ferrell , pp 326- 338. University of New England , Armidale, Australia.

Evans M. and Farrell D,J., (1993). Are there economic benefits to adding zeolites to poultry diets?. Recent advances in animal nutrition in Australia, University of New England, Armidale, Australia, 303 – 316.

Fisinin, V., Ageev , V., Sintserove, O., Lencove,T., and Kvashali, N.,(1985). Zeolites in diets for poultry . Ptitsevodstvo, 9 : 25-26. (cited from El-Zait, A.A., (2003).

Gonalez L.M., Valdivie M. and Lon – Wo.E., (1996).Sacchaina and Zeolite in broiler feeding .Cuban, Journal of agriculture Science, 30: 300-313. (cited from El-Zait , A.A., (2003).

Hais E., (1992). Staying Healthy with nutrition; The complete Guide to diet and nutritional Medicine. 10 th printing Celestial Arts (Berkeley, CA), 1168 P. Health World, Helth Bookstore – ISBN 0890874816.

Kalyuzhnov, V.,T., Zlobina, I.E.,and Nikulina L.,G.,(1988). Physiological basis of including zeolite in diets of poultry. Spolzovanie Tseolitov Sibiri Dalnego Vostokav Selskom Khozyaistve , pp 15- 20. Novosibirsk. (cited from El-Zait , A.A., (2003).

Kendalla, R.J.,and Scanlon, F.,(1982). The toxicology of ingested lead acetate in ranged turtle dove's Streptopelia risoria . Enverion. Poult., 27: 255 - 262.

Lemser A., Orchrimenko W.I., and Richter G., (1992). Ion exchangers in ray-based broiler diets and N losses in excrements of goats and poultry mixed with bentonite . Kongressband 1992 Gottingen . Vortage zum Generalthema des 104 Gottingen : Oko ogische Aspekte Extensiver Landbewirtschaftung , 801- 804. (cited from El-Zait , A.A., (2003).

Mc Collum F.T., and Galyean M.L., (1983) Effects of clinoptilolits on rumen fermentation, digestion and feedlot performance in beef steers fed high concentrate diets . Journal of Animal Science. 56 (3) : 517 –524.

Mumpton F. A., and Fishman P.H., (1977). The application of natural zeolites in animal science and aquaculture . Journal of Animal Science, 45 (5) : 1188 –1203.

National Research Council,(1994). Nutrient requirements of poultry .9 th ed. National Academy of Sci. Washington, D.C.USA. Academy of Sci. Washington, D.C.USA.

NAS(1980). National Academy of Science - Subcommittee on mineral toxicity in animals. Minerals Tolerance Animals Washington, D. C.

Nofal M.E, Salem, A. Amina .and, Abo-Etta, M. Eman, (1999). Effect of pre – incubation storage period on egg characteristics and hatching traits in some local strains of chickens. J. Agric. Sci. Mansoura Univ.,24(9) : 4551- 4583.

NRC (1994). Nutrient Requirements of Poultry . 9 th Revised Edition , National academy Press, Wasington , D.C., USA.

Pais, I., El-Sebai, A., and Abaza, M. (1994). Nutritional applications of trace elements enriched yeast. Proceeding of the Forth Hungarian- Korean Seminar, food industry: A challenge to Biotechnology, P. 37-40 .

Park J.H., and Kim C.S., (1984). Effects of over –doses lead and its interaction with iron , copper , zinc or protein supplement in chicks. Korean Journal of veterinary Research, Korea 24 (1) : 24- 30. (cited from El-Zait , A.A., (2003).

SPSS.(1997). SPSS Users Guide Statistics. Version 8. Copyright SPSS Inc., USA.

Stone C.L., and Soares J . H., (1974). Studies on the metabolism of lead in the Japanese quail . Poultry Sci., 53 : 1982.

Vasilev K. and Mirzaliev Y.U.,(1989). A mineral supplement (in the diet for hens). Ptitsevodstov, 11:30 –31.

Vodela J.K., Lens S.D., Renden J.A., Mcelhenney W.H. and Kemppainen B.W., (1997). Drinking water contaminated (arsenic, cadmium, lead, benzene and trichloroethylene). 2. Effects on reproductive performance egg quality and embryo toxicity in broiler breeders. Poultry sci., 76: 1493-1500.

Ward T.,L., Watkins K.,L., and Southern L.L., (1993). Interactive effect of sodium zeolite A and Eimeria acervulina infection on growth and tissue minerals in chicks. Journal of Poultry Sci. , 72 (11): 2172 – 2175.

Whisenhunt J.E. and Maurice D.V., (1981). The response of egg shell quality to dietary manganese and lead. Poultry Sci., 60 :1609.

Wittmann M., Kirchgessener M., and Roth F.X. (1994). Self selection of lead supplemented diets by broilers. 2. Effects of different dietary lead contents . Archiv fur Geflugelkunde Freising Weihenstephan, Germany, 58 (1): 38-45. (cited from El-Zait , A.A., (2003).

Zlobina I.E., (1990). Retention of trace elements from zeolites in birds and the effect of pegasin on the meat quality of broiler chickens . Sibirskoe Otdelenie, Sibirskii Nauchno Issledovatel skii Proektno Tekhnologicheskii institut Zhivotnovodstva, 2 : 28 – 30. (cited from El-Zait , A.A., (2003).

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دراسة الأداء الانتاجى والتناسلى على الدجاج البياض المعـــرض لتلـــوث العليقــة بالرصاص ودور الطفلة فى تقليل التأثيرات السامة للرصاص

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أجريت هذه الدراسة لتقدير تأثير تغذية الدجاج البياض على علائق معاملة بالرصـــــاص (فى صورة خلات رصاص) على الأداء الانتاجى والتناسلى ومحاوله استخدام الطفلة فـــى تقليـــل التأثيرات السامة. فى هذه الدراسة تم توزيع عدد ١٨٠ دجاجة بياضة عمر ٣٢ أســـبوع علـــى ٨ معاملات بالاضافة إلى الكنترول بكل معاملة ٢٠ دجاجة كالتالى ١- عليقه أساسية (عليقه بياض) ٢- كنترول مضاف إليه ٢٥٠ جزء فى المليون رصاص/ كجم علف ٣- كنترول مضـــاف إليـــه ٢٥٠ جزء فى المليون رصاص/ كجم علف +٢,٥؟ طفلة ٤- كنترول مضاف إليه ٢٥٠ جزء فـــى المليون رصاص/ كجم علف + ٥؟ طفلة ٥- كنترول مضاف اليـــه٥٠٠ جـــزء فـــى المليـــون رصاص/ كجم علف ٦- كنترول مضاف إليه ٥٠٠ جزء فى المليون رصاص/كجم علـــف +٢,٥؟ طفلة ٧- كنترول مضاف إليه ٥٠٠ جزء فى المليون رصاص/ كجـــم علـــف +٥ ؟ طفلـــة ٨- كنترول مضاف إليه +٢,٥؟ طفلة ٩- كنترول مضاف إليه + ٥؟ طفلة. استمرت الطيـــور فـــى التغذية على هذه المعاملات يوميا لمدة ٧ أسابيع وتم قياس الصفات الآتية:- التغير فى وزن الجسم - النمو- انتاج البيض- كفاءة التحويل الغذائى- جودة البيض- نسب الخصوبة والفقـــس. وبعـــد ايقاف الإضافات تم قياس نفس الصفات السابقة بعد ٧ أسابيع أخرى وكانت النتائج كالتالى:

١- أدى تلوث العلائق بالرصاص إلى انخفاض معنوى فى كل من الزيادة فى وزن الجسم- عدد البيض- معدل إنتاج البيض- كتلة البيض (جم/ يوم)- كفاءة التحويل الغذائى- وزن ونســـبة القشرة- وزن ونسبة الصفار- وحدات Haugh - نسب الخصوبة والفقس.
٢- أدى تلوث العلائق بالرصاص إلى زيادة معنوية فى كل من الغذاء الماكول- وزن البيضـــة- وزن و نسبة البياض- نسب النفوق الجنينى.
٣- أدى إضافة الطفلة إلى العلائق الملوثة بالرصاص إلى زيادة معنوية لكل من الزيادة فـــى وزن الجسم- نسب إنتاج البيض- وزن البيضة- كتلة البيض (جم/ يوم)- تحسن كفـــاءة التحويـــل الغذائى. بينما لم يتأثر معنويا كلا من وزن الجسم النهائى- وزن الغذاء الماكول- وزن ونسب مكونات البيضة- وحدات Haughs - نسب الخصوبة والفقس.
٤- بعد إيقاف المعاملات لوحظ تلاشى كل الفروق السابقة ما عدا كمية الغذاء المـــاكول التـــى انخفضت معنويا بينما كل من وزن وشكل البيضة وأيضا وزن الصفار والبياض كان مذبذبـــا عند مقارنته بالكنترول.

من خلال النتائج السابقة يمكن التوصية بإضافة الطفلة الطبيعية بمستوى ٥؟ إلى علائـــق الدجاج البياض الملوثة بالرصاص وذلك لمنع التأثير السيىء للرصاص.