PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF TWO LOCAL STRAINS OF CHICKENS AT EARLY PERIOD OF LAYING AS AFFECTED BY ENZYME SUPPLEMENTATION UNDER SUMMER CONDITIONS OF EGYPT

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Abstract

A total of 360 pullets at 22 weeks of age, from two local strains (Mandarah and Dokki-4) 180 birds each, were used to study the effect of dietary phytase supplementation on productive and physiological performance of two local strains of chickens during early period of laying under summer conditions. The experiment continued for 12 weeks from 22 up to 34 weeks of age.

The birds were randomly distributed into six treatments, each of two replicates (fifteen of each strain).The experimental treatments were two levels of nonphytate phosphorus (NPP) 0.45% (control) and low-NPP (0.25%), and three levels of microbial phytase (0 ,500 and 1000 u/ kg of diet). The experimental treatments were as follows:

1- 0.45% NPP- control diet.
2- low NPP- diet (0.25%).
3- 0.45% NPP- control diet supplemented with microbial phytase at a level of 500 /kg.
4- low NPP-diet (0.25%) supplemented with microbial phytase at a level of 500 U/kg.
5- 0.45% NPP- control diet supplemented with microbial phytase at a level of 1000 U/kg.
6- low NPP- diet (0.25%) supplemented with microbial phytase at a level of 1000 U/kg.

Studied criteria were: performance of egg production, egg quality, plasma Ca, P, cholesterol , total protein, albumin and globulin, and liver parameters (LDL, HDL and total lipids). The obtained results showed that:

- Hens fed 0.45%-NPP-diets supplemented with phytase (500 or 1000 u/kg of diet) gave higher final body weight , body weight gain and significantly improved feed conversion as compared with the hens fed 0.45% or 0.25%-NPP-diets without phytase supplementation.
- Hens fed 0.45%-NPP-diets supplemented with phytase (500 or 1000 u/kg of diet), showed an increase in egg number and egg weight and improvement in some egg quality parameters in Mandarah strain compared to Dokki-4 strain. However, hens fed 0.45%-NPP-diets performed better than those fed 0.25%-NPP-diets for egg production and feed conversion.
- Results showed that hens fed 0.45%-NPP-diets supplemented with phytase (500 or 1000 u/kg of diet), had better ($P<0.05$) total secondary and IgG anti-SRBC's than those fed the 0.25%-NPP-diet with or without phytase.
- Hens of the two strains, fed 0.45%-NPP-diets supplemented with phytase (500 or 1000 U/kg of diet), showed an increase in

plasma calcium, albumin, total protein , globulin , but there was a decrease in plasma phosphorus, cholesterol , liver total lipids, LDL and HDL as compared with other groups.

- Hens of the two strains, fed 0.45%-NPP-diets supplemented with phytase (1000 or 500u/kg of diet), showed an increase in relative weights of some immune internal organs such as spleen , thymus gland, ovary, oviduct organs and oviduct length, while it decreased the abdominal fat weight.

In conclusion, Mandarah and Dokki-4 laying hens fed the 0.25%-NPP- diets, whether supplemented or not with phytase, performed less efficiently for egg production and feed conversion than those fed the 0.45%-NPPdiets supplemented with phytase. Additionally, it would appear that Mandarah laying hens had better performance than Dokki-4 laying hens.

INTRODUCTION

High environmental temperature during summer season in Egypt caused highly detrimental effect on broiler production. Feed consumption, growth rate, mortality and other economic traits governing the prosperity of the industry are adversely affected by high ambient temperature. Other consequence of high environmental temperature, is its effects on the development of a specific immune response in the chicken. In addition, Said (2006) concluded that chicks fed medium protein diet supplemented with phytase resulted in the heaviest live body weight and body weight gain values at 3 weeks of age.

Phytate is a naturally occurring organic compound in plants. It can complex with several minerals such as Ca, Mg, Zn, Fe, K and Cu, as well as with amino acids (Ravindran *et al.,* 1998). This form of phosphorus is largely unavailable to poultry because of inadequate amounts of endogenous phytase secreted by the gastrointestinal tracts of poultry to hydrolyze phytate and release the phytate-bound P., diets are usually supplemented with an inorganic source of P. This supplementation is, not only expensive, but also with excessive dietary supply. P. excretion is concomitantly increased, leading to a potential P. pollution in soil and ground water.

In areas of concentrated animal production, the excretion of excess P. in the manure has posed an environmental concern (Ravindran *et al.,* 1998). As a result of economic and environmental concerns, there is a renewed interest in using phytase to reduce the need for inorganic P. supplements and to improve utilization of P. present in feedstuffs. Supplementation of poultry diets with microbial phytase may increase P. availability and enhance their performance. An improved performance has been observed due to supplementation of diets with microbial phytase in laying hens (Um and Paik, 1999).

Keshavarz (2003) reported that, a level of supplementary phytase (300 units phytase/kg diet) was more effective than a lower level (150 units) in restoring the

performance of laying hens fed low-P diets (0.25, 0.20 or 0.15% to that of their control level (0.45% P diet). On the other hand, supplementation of corn soybean meal diets for laying hens with phytase at a level of 250 or 300 units/kg produced significantly 1.9% improve in body weight and 2.2% improvement in feed conversion ratio, and elicited a favourable effect on shell quality and egg components.

The present work was designed to study the effect of dietary enzyme supplementation on productive performance of two local strains of chickens at early period of laying during summer season.

MATERIALS AND METHODS

1- Phytase enzyme

2- Avyzime enzyme

The experimental work of the present study was carried out at Sakha Poultry Breeding Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Kafr El-Shiekh Governorate. The experiment continued for 12 weeks from 22 up to 34 weeks of age. This work was carried out during summer season (from June to September). The average ambient temperature ranged from 30 -38°C, whereas relative humidity ranged between 50 to 65 %.

A total of 360 Mandarah and Dokki-4 laying hens was used in this study, 180 hens of each strain were divided equally into six treatments each of two replicates (fifteen birds each), two levels of nonphytate phosphorus (NPP) 0.45% (control) and low-NPP level (0.25%), and three levels of microbial phytase (0 ,500 and 1000 u/ kg of diet).

Diets were formulated to contain 16% CP and 2800 Kcal ME/Kg (Table 1).Dicalcium phosphate was the source of Ca and inorganic P in diet without enzyme supplemention. Birds of the second treatments were fed diet 2, containing a lower phosphorus level (0.25% NPP). The experimental treatments were as follows:

1- 0.45% NPP- control diet.

2- low NPP- diet (0.25%).

3- 0.45% NPP- control diet supplemented with microbial phytase at a level of 500 /kg.

4- low NPP-diet (0.25%) supplemented with microbial phytase at a level of 500 U/kg.

5- 0.45% NPP- control diet supplemented with microbial phytase at a level of 1000 U/kg.

6- low NPP- diet (0.25%) supplemented with microbial phytase at a level of 1000 U/kg.

Hens of both strains were randomly taken and housed in open system floor pens and submitted to the same managerial conditions throughout the experimental period.

Feed and water were supplied *ad-libitum* to the hens which were weighed at 22 weeks of age and then weighed at interval periods of 4 weeks .

Criteria of performance and egg production traits

Feed intake was determined weekly and feed conversion was calculated for each interval as well as for the whole experimental period. Individual body weight was recorded at the beginning (22 wks of age) and at the end of the experiment (34 wks of age). Egg number and egg weight were recorded daily up to 34 weeks of age, while the egg quality was measured at the end of the experimental period, where thirty eggs from each treatment of each strain were collected at the last 3 days of the experiment, weighed, broken and separated into shells, yolks and albumens. The weights of yolk, albumen and shell (with membranes) were recorded and calculated as percentages of egg weight.

Immunization and titration against Sheep Red Blood Cells (SRBC's)

At 28 wks of age, hens of all groups were injected intramuscularly (im) with 0.5 ml of 10% saline suspension of Sheep Red Blood Cells (SRBC's). Blood samples of individual hens were collected from brachial vein seven days after SRBC's challenge. Four weeks post- the first challenge, hens were given a second challenge of the same antigen, and blood samples were collected seven days later to quantify anti-SRBC antibody titers. The total mercaptoethanol-sensitive (MES, presumably IgM) and mercaptoethanol-resistant (MER, presumably IgG) anti-SRBC's antibody titers were determined using a micro-heamagglutination technique as described by Yamamoto and Glick (1982). The antibody data were expressed as the log2 of the reciprocal of the highest dilution giving visible agglutination.

Plasma metabolites

At the end of the experimental period, six hens were randomly taken from each treatment and slaughtered. Blood samples were collected during slaughtering, then, they were centrifuged and plasma was separated and stored at -20°C until analysis. Plasma content of calcium, phosphorus, total protein, albumin and globulin were determined using the suitable commercial kits according to the recommendations of the manufacturer. Liver was rapidly dissected out and chilled in ice, one gram of liver was put in glass containing 0.1 ml phosphate buffer solution (pH 7.4) and was homogenized using an electric motor. The homogenate solution was centrifuged at 2000 rpm for 5 minutes. Clear homogenate solution was separated, stored at -20°C until the time of analysis. LDL, HDL, and total lipids were determined using relevant commercial kits.

Internal hen organs (heart, liver, gizzard, stomach, gall bladder, kidney, intestines, pancreas, ovary, oviduct and abdominal fat) were removed and

proportioned to the live hen weight. The immune internal organs (spleen and thymus gland) were weighed to the nearest 0.1 gm. In addition, the oviduct length, numbers of bigger and smaller ovarian follicles were also recorded. Relative weights of carcass and these organs to body weight were calculated.

Statistical analysis

Data were analyzed using SAS general linear model procedure (SAS Institute, 1990). Mean values were compared using Duncan Multiple Rang Test (Duncan, 1955) when significant differences existed.

Two statistical models were used in current study. The first was used to compare treatment within each strain. Data were analyzed using the following model:

$Ykijl = \mu + Sk + Ti + Aj + eijkl$

Where:

Ykijl = Observation of the kij chicken, μ = Overall mean, common element to all observations: Sk = Effect of the strains (k =1,2), Ti = Effect of dietary NPP level treatment (i =1,2), Aj = Effect of phytase supplementation (j = 1,2,3), and eijkl = Random error component assumed to be normally distributed.

The second was used to obtain interactions, among strains, p level, and phytase supplementation. Data were analyzed using the following model:

$Ykijl = \mu + Sk + Ti + Aj + (ST)ki + (SA)kj + (TA)ij + (STA)kij + eijkl$

Where:

Ykijl = Observation of the kij chicken, μ = Overall mean, common element to all observations: Sk = Effect of the strains (k =1,2), Ti = Effect of dietary NPP level treatment (i =1,2), Aj = Effect of phytase supplementation (j = 1,2,3), (STki, SAkj, TAij and STAkij) = Interaction effect between the strains , dietary NPP level treatment and the phytase supplementation: and eijkl = Random error component assumed to be normally distributed.

RESULTS AND DISCUSSION

1- Productive traits

1-1-Live body weight, body weight gain, feed intake and feed conversion

Results in Tables 2 and 3 show that, birds fed high-NPP (0.45%) diet, followed by 0.25%-Npp supplemented with microbial phytase had a significant increase on final body weight (BW), and body gain (BWG) and best feed conversion (FC) compared with those fed control diets throughout the entire experimental period. Hens of Mandarah strain showed significantly ($P \leq 0.05$) higher BWG and feed conversion (FC) than those of Dokki4 strain. These differences in BW between the two strains

may be due to the genetic differences. Treatments had significant ($P \leq 0.05$) increase on BW, since BW in all treatments was improved in the two strains compared with the control groups during the experimental period. Also, the values of BWG and FC were improved in all birds fed high-NPP (0.45%) diet supplemented with microbial phytase at a level of 1000 U/kg compared with the birds fed low-NPP (0.25%) diet supplemented with phytase at a level of 500 U/kg and control groups for both strains during the whole experimental periods. There was significant ($P<0.05$) effects of dietary supplementation with phytase enzyme on body weight (BW), body gain (BWG), feed conversion (FC) while, no significant difference was detected in feed intake (FI) between the birds fed high level of phytase (1000 U/kg of diet) which had higher (BW) and (BWG) compared to control birds.

These results agreed with the findings of Um and Paik (1999) who stated beneficial effects of dietary supplementation with phytase (250 or 300 units) in corn-soybean meal diets and feeding *ad libitum* (control diet) improved feed intake and feed conversion. They found that phytase supplementation significantly ($P<0.01$) improved BWG and FCR and increased feed intake of laying hens.

1-2- Egg production traits

Data presented in Table 4 show that egg production traits (egg number, egg weight and egg mass %) were significantly ($P<0.05$) affected by dietary NPP level. Hens fed 0.45% NPP-diet achieved significantly ($P<0.05$) greater egg weight, egg mass and egg production % than those fed diets with 0.25% NPP. The average of egg production (%) for birds fed the 0.45% NPP-diet during the entire experimental period was 57.0%. It was higher by about 8% than that attained by those fed the 0.25% NPP-diet. Dietary supplements (phytase) had significant ($P<0.05$) effects on egg production and egg mass compared to unsupplemented birds during the whole experimental period. As for the whole experimental period, using phytase (FTU) gave higher egg production traits specially Mandarah strain with using the high level of phytase (1000 FTU /Kg of diet) compared with other groups. Egg production % was significantly ($P<0.05$) affected by phytase supplementation with advantage over the control during the entire experimental period. Hens fed high-NPP (0.45%) diet supplemented with high- phytase (1000 FTU /Kg) had an average egg production of 57.6% compared to 56.2% for control birds. The obtained results agree with the findings of Lim *et al.* (2003) who reported that dietary supplementation with microbial phytase at a level of 1000 units/kg resulted in an improvement in egg production rate of laying hens and was significantly higher than those of control birds.

Besides, Interactions between dietary NPP and supplements phytase had significant ($P<0.05$) effect on egg weight , egg mass and egg production %. Hens fed the

higher-NPP-diets (0.45%) with or without supplements of phytase significantly surpassed those fed the low-NPP-diets (0.25%) in egg weight, egg mass and egg production %. Even though, the beneficial effect of these dietary supplements was more pronounced on the performance of hens fed the low-NPP-diet (0.25%), they still performed significantly less than their counterparts fed the high-NPP-diets (0.45%) as shown in Table 4.

1-3-Egg quality measurements

Data presented in Table 5 show significant differences between treatments in some egg quality parameters. Using dietary supplementation with microbial phytase at a level of (500 or 1000 FTU /kg diet) in the diets of Mandarah and Dokki4 laying hens significantly increased yolk index %, shell thickness and Haugh unit. However, the egg quality parameters did not differ in the control groups of the two strains. Also, the results in Table 5 show that there were significant ($P<0.05$) differences in quality traits of eggs due to the effects of dietary supplementation with microbial phytase. Hens fed 0.45% NPP-diet supplemented with high- phytase (1000 FTU /kg) achieved greater egg quality parameters than those fed the same diet supplemented with 500 FTU of phytase or those fed control diets. Several investigators reported a beneficial effect of dietary supplementation with phytase on egg shell quality (Punna and Roland, 1999).

2-Physiological traits

2-1-Humoral Responses

Results in Tables 6 a and b show that total primary antibodies production was not significantly affected by dietary NPP level or dietary supplements phytase (500 or 1000 FTU /kg diet). Although the control group had the lowest total antibody titers estimated at seven days post the first challenge with SRBC's, insignificant differences were found among all experimental groups (Table 6a,b). Seven days post- second challenge with SRBC's, data revealed that hens fed 0.45% NPP-diet supplemented with phytase had significantly improved the humoral immune responses compared to those fed the low-NPP-diets (0.25%). Hence, hens fed 0.45% NPP-diet supplemented with high- phytase (1000 FTU/kg) exhibited significantly ($p<0.005$) higher humoral immune responses than those fed the same diet supplemented with 500 FTU of phytase or those fed control diets (Tables 6 a, b). With respect to MER and MES antibodies, dietary supplementation of phytase (500 or 1000 FTU/kg of diet) did not significantly affect both MER and MES anti-SRBC's seven days post-primary challenge. Similar trend was obtained for MES post-secondary challenge, however, secondary MER antibodies, improved significantly as total secondary anti-SRBC's. Our findings are in agreement with Zulkifli *et al.* (1994) who reported that FTU supplementation to poultry diets increased antibody titers. With regard to the effect of FTU on antibody

production, the existed results are in accordance with those of Abaza *et al.* (2003) who found better total antibody, IgM and IgG titers against SRBC's in mature Alexandria cockerels fed diet supplemented with phytase (1000 FTU/kg diet). The present results pointed out that, supplementation of phytase at either high (1000 FTU) or low (500 FTU) level was more potent in enhancement of humoral immune response. It was demonstrated that phytase supplementation improved trace mineral availability in monogastric animals, however, action of this enzyme can be limited by dietary calcium level. Several interpretations were suggested to explain the stimulus effect of dietary phytase on immune responses in birds. First, as previously discussed by Gershwin *et al.* (1985) that phytase affects the development and maintenance of immunocompetence through multiple factors, either by acting directly on the immune cells or by indirectly altering metabolic and endocrine parameters, which in turn influence immunity. Second, it seems to exert a complementary effect on the immune system by inhibiting the synthesis of prostaglandins, through modulating of arachidonic metabolism via cyclooxygenase and lipoxygenase pathways. These prostaglandins are produced in the cells following the oxidation of cellular membranes and are responsible for inhibiting the inflammation and immune response. Phytase prevents oxidation and thus, the production of prostaglandins (Williams, 2005). Third, the main mechanism of the bioactivity of phytase could refer to its antioxidant potential in reducing free radical-induced pathology during normal metabolic stress and immune challenge. Phytase affects free radical-mediated signal transduction events and ultimately modulates gene expression caused by free radical signaling.

2-2- Plasma parameters

The data in Tables 7 a and b show that Mandarah and Dokki-4 laying hens fed 0.45% NPP-diet supplemented with microbial phytase at a level of (500 or 1000 FTU /kg diet) had significantly increased plasma calcium, total protein, albumin, globulin and decreased plasma phosphorus, and cholesterol compared to those fed the low-NPP-diets (0.25%) or control group at the end of the experimental period.

In this connection, Youssef *et al.* (2001) reported that phytase addition at 500, and 1000 FTU/kg to Gimmizah laying hens diets containing two levels of available phosphorus (0.40 and 0.25%) from 32-52 wks of age decreased plasma cholesterol with elevated P levels in presence of 1000 FTU phytase/kg. In addition, plasma total protein, albumin, and globulin were increased, while plasma total lipids and cholesterol were decreased.

The effect of phytase on plasma Ca and P was significant ($P<0.05$). Phytase supplementation increased plasma Ca and decreased plasma P. These findings are in

partial agreement with those of Triyuwanta *et al.* (1992) who reported an increase in plasma Ca of laying hens when dietary available P was increased from 0.44 to 0.64 %. On the contrary, Triyuwanta *et al.* (1992) reported that plasma P is positively correlated with dietary P level.

2-3- Immuno organs weights

The data in Table 8 show that Mandarah and Dokki-4 laying hens fed 0.45% NPP-diet supplemented with microbial phytase at a level of (500 or 1000 FTU /Kg of diet) had significantly bigger spleen and thymus gland weights compared to those fed the low-NPP-diets (0.25%) or control group at the end of the experimental period. Hens fed 0.45% NPP-diet supplemented with high- phytase (1000 FTU /Kg) had significantly ($p<0.005$) higher spleen and thymus gland weights than those fed the same diet supplemented with 500 FTU of phytase or those fed control diets.

It is worthy to mention that the available references in this connection are scarce, therefore, the lymphoid organ weights increment might be due to the general improvement of the body weight of birds supplemented with phytase which might cause lymphocytes repletion of lymphoid organs resulting in greater thymus and splenic weights .

3-Internal organs weights

Data in Table 9 a and b show that Mandarah and Dokki-4 laying hens fed 0.45% NPP-diet supplemented with microbial phytase at a level of (500 or 1000 FTU /kg of diet) had significantly increased live body weight and carcass percentage than those fed the low-NPP-diets (0.25%) or control group at the end of the experimental period.

The phytase addition (500 and 1000 FTU /kg diet) also increased ($P<0.05$) relatively liver weight and gave more carcass weight and increased dressing and total meat yield than birds fed the control diet.In an agreement with the recent result, Viveros *et al.* (2002) indicated that phytase addition increased relatively liver weight. Also, some internal organs were increased significantly by using 500 or1000 FTU/kg for Mandarah and Dokki4 laying hens such as ovary, oviduct weights and length, big and small follicular ovary number, while, abdominal fat weights were significantly decreased in groups fed 500 or1000 FTU/kg compared with other groups for Mandarah and Dokki4 laying hens.

The addition of phytase resulted in significant ($P<0.05$) differences in relative organs weight. The main data effect showed an increase ($P<0.05$) in relative spleen, gizzard and heart weight related to the level of 500-1000 FTU /kg diets (Table 10). These results generally agree with those reported by Nahas and Leferancois (2001).

In conclusion, the present study indicated that using 500 or1000 FTU/kg in diets of Mandarah and Dokki-4 laying hens could improve the productive performance, and decrease of cholesterol. It is worthy to note that, using 500 FTU/kg of diets improved the productive performance, physiological and immune response compared with control group, but, with lower degree of success than the high level-1000 FTU/kg. Such improve was more pronounced on Mandarah laying hens than Dokki4 laying hens under the conditions of the present study.

Table 1. Composition and calculated analysis of the basal diet.

Ingredients	0.45%- NPP (Control)	0.25%- NPP
Yellow corn	66.93	66.38
Soybean meal 44%	23.95	23.50
Di-calcium phosphate	1.80	0.75
Limestone	6.60	8.65
Salt (NaCl)	0.35	0.35
DL-Methionine	0.07	0.07
Vit.& Min. Mixture*	0.30	0.30
Total	100.00	100.00
Calculated analysis:		
ME (Kcal / Kg)	2800	2806
Crude protein%	16.20	16.20
Calcium, %	3.32	3.32
Total P., %	0.67	0.48
Available P., %	0.45	0.25
Fiber, %	3.16	3.16
Lysine, %	0.85	0.85
Methionine, %	0.35	0.35

Supplied per kg of diet: Vit. A 10 000 IU, Vit. D3 2000IU, Vit B1 1mg, Vit. B2 5mg, Vit.B6 1.5 mg, Vit.B12 10 mcg,Vit. E 10 mg,Vit. K3 1mg, Niacin 30mg , Pantothenic acid 10mg , Folic acid 1 mg , Biotin 50 mcg ,Choline chloride 520mg , Copper 4mg , Iron 30mg , Manganese 60mg, Zinc 50mg ,Iodine 1.3mg , Selenium 0.1mg , Cobalt 0.1mg .

Table 2. Effect of different levels of phytase (Ph) on initial body weight (g), final body weight, g and body weight gain(g) of two local strains of laying hens.

Treatment		Initial body weight, g		Final body weight, g		body weight gain(g)	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		1217±42	1113±57	1353±37^{b}	1259±21^{b}	135±95^{b}	110±64^{b}
0.25% NPP(control)		1211±23	1209±31	1304±22^{d}	1241±34^{d}	105±98^{d}	97±03^{d}
0.45% NPP +500 u Phytase		1218±53	1216±45	1361±61^{ab}	1275±36^{ab}	143±08^{ab}	124±91^{a}
0.25% NPP +500 u Phytase		1209±37	1201±52	1338±44^{c}	1250±48^{cd}	129±07^{c}	105±96^{c}
0.45% NPP+1000u Phytase		1219±41	1218/±36	1381±17^{a}	1285±14^{a}	152±76^{a}	121±78^{a}
0.25% NPP+1000u Phytase		1212±28	1209±28	1345±73^{bc}	1270±25^{bc}	129±45^{c}	115±97^{ab}
strains	M	1214±37		1347±42^{a}		132±71^{a}	
	D-4	1211±42		1263±63^{b}		112±72^{b}	
Av.P levels	0.45	1216±81		1309±48^{a}		131±85^{a}	
	0.25	1208 ±67		1290±08^{b}		117±25^{b}	
Ph levels	0	1212±89		1287±28^{c}		117±40^{c}	
	500	1211±28		1301±47^{b}		121±25^{b}	
	1000	1213±83		1311±57^{a}		129±99^{a}	
S.O.V		PROBABILITY					
S		NS		**		**	
Av.P		NS		**		**	
Ph		NS		**		**	
S x Av.P x M.Ph		NS		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 3. Effect of different levels of phytase (Ph) on feed intake (g/hen/day) and feed conversion local strains of laying hens (g feed/g egg) of two.

Treatment		Feed intake (g/hen/da		Feed conversion (g feed/g e	
		M	D-4	M	D-4
0.45% NPP(control)		82.4±0.46	81.7±0.28	3.40±0.8^{b}	3.59±0.5^{b}
0.25% NPP(control)		82.6±0.38	81.9±0.41	4.49±0.6^{d}	5.10±0.3^{d}
0.45% NPP +500 u Phytase		82.3±0.34	81.7±0.36	3.25±0.2^{ab}	3.43±0.4^{ab}
0.25% NPP +500 u Phytase		82.2±0.21	81.8±0.47	4.01±0.4^{c}	4.51±0.3^{c}
0.45% NPP+1000u Phytase		82.0±0.51	81.5±0.39	2.97±0.4^{a}	3.32±0.2^{a}
0.25% NPP+1000u Phytase		82.1±0.48	81.6±0.58	3.69±0.4^{bc}	3.65±0.3^{bc}
strains	M	82.2± 1.4		3.61±0.5^{a}	
	D-4	81.7±1.0		3.93±0.3^{b}	
Av.P levels	0.45	81.96±4.9		3.32±0.5^{a}	
	0.25	81.86±5.5		4.23±0.3^{b}	
Ph levels	0	82.2±7.6		4.13±0.4^{c}	
	500	82.0±4.6		3.80±0.3^{b}	
	1000	82.6±3.3		3.40±0.2^{a}	
S.O.V		PROBABILITY			
S		NS		**	
Av.P		NS		**	
Ph		NS		**	
S x Av.P x M.Ph		NS		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 4. Effect of different levels of phytase (Ph) on egg production (%), egg weight (g) and egg mass (g/hen/day) of two local strains of laying hens.

Treatment	Egg production(%)		Egg weight (g)		Egg mass(g/hen/day)	
	M	D-4	M	D-4	M	D-4
0.45% NPP(control)	56.2±1.6^{ab}	82.4±0.46	45.3±0.41^{b}	42.2±0.33^{b}	24.2±0.72^{b}	22.7±0.36^{bc}
0.25% NPP(control)	49.3±1.4^{d}	82.6±0.38	43.5±0.81^{d}	39.3±0.74^{d}	18.4±0.34^{d}	16.2±0.63^{d}
0.45% NPP +500 u Phytase	56.9±1.2^{ab}	82.3±0.34	46.7±0.62^{ab}	42.8±0.59^{b}	25.3±0.62^{ab}	23.8±0.63^{ab}
0.25% NPP +500 u Phytase	51.2±1.3^{c}	82.2±0.21	44.7±0.52^{c}	40.6±0.24^{c}	20.5±0.45^{c}	18.1±0.53^{c}
0.45% NPP+1000u Phytase	57.6±1.7^{a}	82.0±0.51	48.1±0.68^{a}	44.6±0.82^{a}	27.6±0.47^{a}	24.5±0.48^{a}
0.25% NPP+1000u Phytase	54.5±1.5^{b}	82.1±0.48	45.1±0.27^{b}	41.9±0.68^{bc}	22.2±0.51^{bc}	22.3±0.71^{bc}
strains M	54.31±1.5^{a}		45.57±0.55^{a}		23.0±0.52^{a}	
D-4	50.10±1.3^{b}		41.92±0.57^{b}		21.3±0.56^{b}	
Av.P levels 0.45	57.01±1.4^{a}		45.0±71^{a}		24.7±46^{a}	
0.25	49.10 ±1.3^{b}		42.4±31^{b}		19.6±53^{b}	
Ph levels 0	49.15±1.3^{c}		42.6±58^{c}		20.4±52^{c}	
500	53.85±1.3^{b}		43.6±42^{b}		21.9±43^{b}	
1000	56.40±1.4^{a}		44.9±54^{a}		24.2±55^{a}	
S.O.V	PROBABILITY					
S	**		**		**	
Av.P	**		**		**	
Ph	**		**		**	
S x Av.P x M.Ph	**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 5. Effect of different levels of phytase (Ph) on egg quality of two local strains of laying hens.

Treatment	Yolk index(%)		Shell thickness (mm)		Haugh unit(%)	
	M	D-4	M	D-4	M	D-4
0.45% NPP(control)	44.6±1.1^{b}	42.6±1.2^{b}	0.33±0.05^{b}	0.30±0.01^{b}	75.2±2.3^{b}	73.1±2.1^{b}
0.25% NPP(control)	42.3±1.3^{c}	40.3±1.4^{c}	0.31±0.02^{d}	0.28±0.02^{d}	73.5±2.3^{c}	71.5±2.3^{c}
0.45% NPP +500 u Phytase	45.8±1.2^{ab}	42.8±1.5^{b}	0.34±0.04^{ab}	0.31±0.04^{ab}	76.9±2.3^{ab}	74.4±2.4^{ab}
0.25% NPP +500 u Phytase	43.5±1.7^{bc}	41.4±1.3^{bc}	0.32±0.02^{c}	0.31±0.03^{b}	74.4±2.1^{bc}	72.8±2.2^{bc}
0.45% NPP+1000u Phytase	46.7±1.2^{a}	44.6±1.2^{a}	0.36±0.04^{a}	0.33±0.04^{a}	77.5±2.2^{a}	75.5±2.3^{a}
0.25% NPP+1000u Phytase	43.9±1.4^{bc}	41.6±1.1^{bc}	0.32±0.03^{c}	0.30±0.02^{b}	75.6±2.5^{b}	73.4±2.1^{b}
strains M	44.5± 1.2^{a}		0.33±0.03^{a}		75.5±2.3^{a}	
D-4	42.2±1.2^{b}		0.30±0.02^{b}		73.4±2.2^{b}	
Av.P levels 0.45	44.5±1.2^{a}		0.34±0.04^{a}		75.4±2.2^{a}	
0.25	42.1 ±1.3^{b}		0.30±0.03^{b}		73.5±2.3^{b}	
Ph levels 0	42.5±1.2^{c}		0.31±0.03^{c}		73.3±2.2^{c}	
500	43.4±1.4^{b}		0.32±0.03^{b}		74.6±2.2^{b}	
1000	44.2±1.2^{a}		0.33±0.04^{a}		75.5±2.2^{a}	
S.O.V	PROBABILITY					
S	**		**		**	
Av.P	**		**		**	
Ph	**		**		**	
S x Av.P x M.Ph	**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 6-a. Effect of different levels of phytase (Ph) on primary humoral responses of two local strains of laying hens at the end of the experimental period.

Treatment		Total Primary Antibodies		Primary IgM		Primary IgG	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		3.7±0.29	3.6±0.29	3.5±0.25	3.4±0.18	0.47±0.02	0.45±0.04
0.25% NPP(control)		3.6±0.32	3.3±0.32	3.2±0.25	3.1±0.33	0.26±0.02	0.24±0.03
0.45% NPP +500 u Phytase		4.0±0.50	4.0±0.32	3.5±0.34	3.6±0.25	0.50±0.07	0.46±0.04
0.25% NPP +500 u Phytase		3.7±0.25	3.7±0.23	3.4±0.34	3.2±0.33	0.27±0.05	0.25±0.02
0.45% NPP+1000u Phytase		4.0±0.51	4.0±0.41	3.6±0.20	3.6±0.24	0.50±0.08	0.48±0.03
0.25% NPP+1000u Phytase		3.8±0.47	3.7±0.39	3.3±0.19	3.4±0.22	0.27±0.03	0.26±0.01
strains	M	3.81±0.41		3.51±0.39		0.37±0.04	
	D-4	3.72±0.38		3.42±0.34		0.36±0.02	
Av.P levels	0.45	3.86±0.37		3.52±0.26		0.48±0.05	
	0.25	3.60 ±0.33		3.20±0.27		0.26±0.02	
Ph levels	0	3.53±0.31		3.35±0.25		0.36±0.02	
	500	3.85±0.31		3.35±0.31		0.37±0.04	
	1000	3.85±0.44		3.45±0.21		0.38±0.03	
S.O.V		PROBABILITY					
S		NS		NS		NS	
Av.P		NS		NS		NS	
Ph		NS		NS		NS	
S x Av.P x M.Ph		NS		NS		NS	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 6-b. Effect of different levels of phytase (Ph) on secondary humoral responses of two local strains of laying hens at the end of the experimental period.

Treatment		Total secondary Antibodies		Secondary IgM		Secondary IgG	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		5.5±0.29^{cd}	5.1±0.41^{cd}	4.9±0.41^{cd}	4.4±0.18^{cd}	0.74±0.41^{cd}	0.61±0.24^{c}
0.25% NPP(control)		5.2±0.31^{d}	4.7±0.32^{d}	4.3±0.29^{d}	3.8±0.33^{d}	0.53±0.34^{d}	^{d}
0.45% NPP +500 u Phytase		7.9±0.62^{ab}	7.2±0.29^{ab}	7.2±0.55^{ab}	6.7±0.25^{a}	1.25±0.40^{ab}	0.34±0.43 ^{d}
0.25% NPP +500 u Phytase		6.7±0.25^{c}	6.3±0.26^{c}	5.5±0.28^{c}	4.7±0.33^{c}	0.95±0.11^{c}	
0.45% NPP+1000u Phytase		8.5±0.41^{a}	7.9±0.51^{a}	7.6±0.29^{a}	6.8±0.24^{a}	1.50±0.26^{a}	0.98±0.24^{a} ^{b}
0.25% NPP+1000u Phytase		7.2±0.25^{b}	6.8±0.32^{b}	6.0±0.41^{b}	5.4±0.22^{b}	1.05±0.25^{b}	0.74±0.32^{c}
strains	M	6.8± 0.36		5.9±0.37		1.00±0.30^{a}	
	D-4	6.3±0.35		5.3±0.26		0.78±0.23^{b}	
P levels	0.45	7.0±0.41^{a}		6.3±0.24^{a}		1.03±0.28^{a}	
	0.25	6.1 ±0.29^{b}		4.9±0.27^{b}		0.74±0.24^{b}	
Ph levels	0	4.9±0.33^{c}		4.4±0.25^{c}		0.55±0.35^{c}	
	500	6.9±0.35^{b}		5.9±0.31^{b}		0.98±0.27^{b}	
	1000	7.6±0.35^{a}		6.4±0.21^{a}		1.14±0.16^{a}	
S.O.V		PROBABILITY					
S		NS		NS		**	
Av.P		**		**		**	
Ph		**		**		**	
S x Av.P x M.Ph		**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 7-a. Effect of different levels of phytase (Ph) on some plasma parameters of two local strains of laying hens at the end of the experimental period.

treatment		Calcium (mg/dl)		Phosphorus (mg/dl)		Cholesterol (mg/dl	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		6.7±0.29^{b}	6.3±0.41^{b}	5.5±0.41^{b}	6.0±0.18^{b}	0.90±0.41^{c}	1.10±0.24^{c}
0.25% NPP(control)		5.2±0.31^{d}	4.7±0.32^{d}	6.9±0.29^{d}	7.4±0.33^{d}	1.40±0.34^{d}	1.62±0.43^{d}
0.45% NPP +500 u Phytase		7.9±0.62^{ab}	7.2±0.29^{ab}	4.9±0.55^{ab}	5.9±0.25^{ab}	0.85±0.40^{ab}	1.05±0.24^{ab}
0.25% NPP +500 u Phytase		6.2±0.25^{cd}	5.1±0.26^{cd}	6.5±0.28^{cd}	6.7±0.33^{cd}	1.05±0.11^{cd}	1.29±0.32^{c}
0.45% NPP+1000u Phytase		8.5±0.41^{a}	7.9±0.51^{a}	4.3±0.29^{a}	5.1±0.24^{a}	0.63±0.26^{a}	0.86±0.13^{a}
0.25% NPP+1000u Phytase		6.4±0.25^{c}	5.4±0.32^{c}	5.8±0.41^{c}	6.4±0.22^{c}	0.91±0.25^{c}	1.15±0.01^{cd}
strains	M	6.8± 0.36^{a}		5.6±0.37^{a}		1.00±0.30^{a}	
	D-4	5.9±0.35^{b}		6.3±0.26^{b}		0.78±0.23^{b}	
P levels	0.45	7.3±0.42^{a}		5.3±0.27^{a}		0.90±0.26^{a}	
	0.25	5.5 ±0.27^{b}		6.6±0.24^{b}		1.24±0.24^{b}	
Ph levels	0	5.7±0.34^{c}		6.3±0.31^{c}		1.26±0.35^{c}	
	500	6.5±0.35^{b}		6.0±0.26^{b}		1.06±0.26^{b}	
	1000	7.0±0.35^{a}		5.4±0.21^{a}		0.89±0.16^{a}	
S.O.V		PROBABILITY					
S		**		**		**	
Av.P		**		**		**	
Ph		**		**		**	
S x Av.P x M.Ph		**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 7-b. Effect of different levels of phytase (Ph) on some plasma parameters of two local strains of laying hens at the end of the experimental period.

treatment		Total protein (mg/100ml)		Albumin (mg/100ml)		Globulin (mg/100ml)	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		6.5±0.45^{bc}	5.7±0.26^{b}	3.2±	2.7±0.18^{c}	3.3±0.41^{c}	3.0±0.24^{c}
0.25% NPP(control)		6.0±0.31^{c}	5.0±0.42^{d}	0.34^{cd}	2.2±0.33^{d}	3.1±0.34^{d}	2.8±0.43^{d}
0.45% NPP +500 u Phytase		7.2±0.23^{ab}	6.3±0.31^{ab}	2.9±0.29^{d}	3.0±0.25^{b}	3.6±0.40^{ab}	3.3±0.24^{ab}
0.25% NPP +500 u Phytase		6.7±0.25^{b}	5.4±0.35^{c}	3.6±0.55^{ab}	2.5±0.33^{cd}	3.3±0.11^{c}	2.9±0.32^{cd}
0.45% NPP+1000u Phytase		7.8 ±0.19^{a}	6.7 ±0.41^{a}	3.4±0.28^{c}	3.2±0.24^{a}	4.0±0.26^{a}	3.5±0.13^{a}
0.25% NPP+1000u Phytase		7.2± 0.24^{ab}	6.3± 0.35^{ab}	3.8±0.29^{a}	3.1±0.22^{ab}	3.4±0.25^{b}	3.2±0.34^{b}
strains	M	6.9± 0.36^{a}		3.4±0.36^{a}		3.5±0.30^{a}	
	D-4	5.9±0.25^{b}		2.8±0.25^{b}		3.1±0.28^{b}	
P levels	0.45	6.7±0.42^{a}		3.2±0.30^{a}		3.6±0.28a	
	0.25	6.0 ±0.27^{b}		2.8±0.31^{b}		3.0±0.29b	
Ph levels	0	5.8±0.33^{c}		2.7±0.24^{c}		2.9±0.35^{c}	
	500	6.4±0.35^{b}		3.0±0.35^{b}		3.2±0.27^{b}	
	1000	7.1±0.35^{a}		3.3±0.25^{a}		3.5±0.24^{a}	
S.O.V		PROBABILITY					
S		**		**		**	
Av.P		**		**		**	
Ph		**		**		**	
S x Av.P x M.Ph		**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).

X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).

M : Mandarah Strain D-4: Dokki-4 Strain

Table 8. Effect of different levels of phytase (Ph) on immuno organs relative weight of two local strains of laying hens at the end of the experimental period

Treatment		Spleen		Thymus gland	
		M	D-4	M	D-4
0.45% NPP(control)		0.20±0.24^{cd}	0.17±0.21^{cd}	0.34±0.32^{c}	0.31±0.21^{c}
0.25% NPP(control)		0.19±0.35^{d}	0.15±0.26^{d}	0.32±0.41^{d}	0.28±0.33^{d}
0.45% NPP +500 u Phytase		0.23±0.22^{ab}	0.21±0.37^{ab}	0.35±0.29^{b}	0.33±0.26^{b}
0.25% NPP +500 u Phytase		0.21±0.41^{c}	0.18±0.22^{e}	0.32±0.43^{d}	0.28±0.18^{d}
0.45% NPP+1000u Phytase		0.25±0.26^{a}	0.22±0.41^{a}	0.37±0.25^{a}	0.34±0.34^{a}
0.25% NPP+1000u Phytase		0.22±0.19^{b}	0.19±0.35^{c}	0.35±0.37^{b}	0.33±0.25^{b}
strains	M	0.22±0.28^{a}		0.34±0.35^{a}	
	D-4	0.19±0.24^{b}		0.31±0.23^{b}	
Av.P levels	0.45	0.21±0.28^{a}		0.34±0.27^{a}	
	0.25	0.19±0.28^{b}		0.31±0.33^{b}	
Ph levels	0	0.18±0.26^{c}		0.31±0.32^{c}	
	500	0.21±0.31^{b}		0.32±0.29^{b}	
	1000	0.22±0.28^{a}		0.35±0.35^{a}	
S.O.V		PROBABILITY			
S		**		**	
Av.P		**		**	
Ph		**		**	
S x Av.P x M.Ph		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 9-a. Effect of different levels of phytase (Ph) on some internal organs relative weight of two local strains of laying hens at the end of the experimental period.

treatment		Carcass%		Intestines%		Ovary%	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		61.7±5.2^{b}	53.3±5.4^{c}	4.90±0.62	4.68±0.62	2.0±0.35^{b}	1.8±0.35^{b}
0.25% NPP(control)		53.8±5.1^{d}	51.4±5.3^{d}	4.62±0.62	4.42±0.62	1.8±0.35^{d}	1.5±0.35^{d}
0.45% NPP +500 u Phytase		63.6±5.3^{ab}	59.2±5.2^{ab}	5.11±0.62	4.89±0.62	2.4±0.35^{ab}	2.1±0.35^{ab}
0.25% NPP +500 u Phytase		59.2±5.4^{c}	53.5±5.4^{c}	4.79±0.62	4.59±0.62	1.9±0.35^{c}	1.6±0.35^{c}
0.45% NPP+1000u Phytase		66.8±5.3^{a}	62.3±5.3^{a}	5.23±0.62	5.03±0.62	2.7±0.35^{a}	2.3±0.35^{a}
0.25% NPP+1000u Phytase		61.5±5.1^{b}	55.4±5.4^{b}	4.92±0.62	4.62±0.62	2.0±0.35^{b}	1.8±0.35^{b}
strains	M	61.1± 5.2^{a}		4.9±0.62^{a}		2.1±0.35^{a}	
	D-4	55.8±5.3^{b}		4.6±0.62^{b}		1.8±0.35^{b}	
Av.P levels	0.45	61.2±5.3^{a}		5.0±0.62^{a}		2.2±0.35^{a}	
	0.25	55.9±5.2^{b}		4.7±0.62^{b}		1.7±0.35^{b}	
Ph levels	0	55.1±5.2^{c}		4.7±0.62^{c}		1.8±0.35^{c}	
	500	58.9±5.2^{b}		4.9±0.62^{b}		2.0±0.35^{b}	
	1000	61.5±5.2^{a}		5.0±0.62^{a}		2.2±0.35^{a}	
S.O.V		PROBABILITY					
S		**		**		**	
Av.P		**		**		**	
Ph		**		**		**	
S x Av.P x M.Ph		**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

Table 9-b. Effect of different levels of phytase (Ph) on some internal organs relative weight of two local strains of laying hens at the end of the experimental period.

treatment		Liver %		Oviduct length (cm)		Abdominal fat%	
		M	D-4	M	D-4	M	D-4
0.45% NPP(control)		2.67±0.35	2.49±0.35	42.5±5.2^{b}	38.9±5.2^{b}	2.0±0.38^{b}	1.9 ±0.38^{b}
0.25% NPP(control)		2.15±0.35	2.28±0.35	36.6±5.2^{d}	35.8±5.2^{d}	2.7±0.38^{d}	2.3±0.38^{d}
0.45% NPP +500 u Phytase		2.78±0.35	2.58±0.35	43.4±5.2^{ab}	40.6±5.2^{ab}	1.8±0.38^{ab}	1.7±0.38^{ab}
0.25% NPP +500 u Phytase		2.59±0.35	2.42±0.35	41.2±5.2^{c}	36.9±5.2^{cd}	2.5±0.38^{cd}	2.1±0.38^{cd}
0.45% NPP+1000u Phytase		2.82±0.35	2.61±0.35	45.6±5.2^{a}	42.9±5.2^{a}	1.5±0.38^{a}	1.6±0.38^{a}
0.25% NPP+1000u Phytase		2.67±0.35	2.49±0.35	42.6±5.2^{b}	36.1±5.2^{c}	2.2±0.38^{c}	2.0±0.38^{c}
strains	M	2.6± 0.35^{a}		41.9±5.2^{a}		2.1±0.38^{b}	
	D-4	2.4±0.35^{b}		38.5±5.2^{b}		1.9±0.38^{a}	
Av.P levels	0.45	2.8±035^{a}		42.3±5.2^{a}		1.8±0.38^{a}	
	0.25	2.5±035^{b}		38.2±5.2^{b}		2.3±0.38^{b}	
Ph levels	0	2.4±035^{c}		38.5±5.2^{b}		2.2±0.38^{c}	
	500	2.6±035^{b}		37.5±5.2^{c}		2.0±0.38^{b}	
	1000	2.8±035^{a}		39.3±5.2^{a}		1.8±0.38^{a}	
S.O.V		PROBABILITY					
S		**		**		**	
Av.P		**		**		**	
Ph		**		**		**	
S x Av.P x M.Ph		**		**		**	

a,b and.c=means, within the same column followed by different superscripts differ significantly ($p < 0.05$).
X and Y, means within strain effect with no common superscript differ significantly ($p < 0.05$).
M : Mandarah Strain D-4: Dokki-4 Strain

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الأداء الفسيولوجى والإنتاجي لسلالتين محليتين من دجاج البيض خلال المرحلة المبكرة من الإنتاج وتأثره باضافة انزيم الفيتيز تحت ظروف الصيف فى مصر

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أجريت هذة الدراسة فى محطة بحوث تربية الدواجن بسخا – معهد بحوث الإنتاج الحيوانى بهدف تقييم تأثير استخدام مستويين من انزيم الفيتيز (٥٠٠ -١٠٠٠ وحدة دولية/كجم) على أداء نوعين من الدجاج البياض المحلى هما المندرة ودقى٤ المغذاه على علائق مختلفة فى محتواها من الفوسفور (احداهما مستوى الكنترول وهو ٤٥. % والثانية منخفضة فى محتواها من الفسفور وهى ٢٥. %) بهدف تحسين معدل الاداء وزيادة إنتاج البيض.

استخدم في هذه الدراسة عدد٣٦٠ دجاجة عمر ٢٢ أسبوعاً من السلالتين(١٨٠ دجاجة لكل سلالة) وقسمت الى ثلاث مجموعات بكل سلالة (٦٠ دجاجة / مجموعة) وكل مجموعة ٢ مكرره بكل منها ٣٠ دجاجة.

أ ستمرت التجربة لمدة ١٢ أسبوعاً مع اتباع نظام التغذية الحرة وتم تربية الدجاج فى كل المجموعات تحت نفس ظروف التهوية والإضاءة والحرارة فى عنابر مفتوحة على الأرض وأثناء فترة التجربة تم تقدير بعض الصفات الإنتاجية مثل معدل الزيادة فى وزن الجسم واستهلاك العليقة وكفاءة تحويل الغذاء وعدد ووزن البيض وجودة البيض وكذلك تم قياس بعض التقديرات الفسيولوجية والمناعية بالدم والبيض والكبد.

كما تم ذبح عدد من الدجاج لتقدير بعض مقاييس الذبيحة .وكانت أهم النتائج المتحصل عليها هى:

- سجلت سلالة المندرة أعلى وزن فى الجسم من سلالة دقى٤ وهذا يرجع لاختلاف التركيب الوراثى بين السلالتين ، بينما وجد أن لإضافة الانزيمات الفيتيز بأى مستوى للعليقة تأثير معنوى واضح على زيادة وزن الجسم للسلالتين وكان لانزيم الفيتيز المضاف للعلائق المرتفعة فى محتواها من الفسفور (٤٥.%) تأثيرا أعلى بالمقارنة بالمعاملات المختلفة و الكنترول .
- النسبة المئوية لإنتاج البيض كانت أعلى فى دجاج دقى ٤ عنها فى دجاج المندرة داخل المعاملة الواحدة.
- لم يؤثر مستوى الفسفور أو الفيتيز المضاف على الغذاء المأكول فى كلتا السلالتين .
- الطيور المغذاة على علائق كنترول التى تحتوى على (٤٥. %) فوسفور أدت الى تحسن معدل الاداء فى زيادة وزن وكتلة البيض والكفاءة الغذائية عن الطيور المغذاة على مستوى منخفض من الفسفور(٢٥. %) كما لوحظ زيادة واضحة لكل المجموعات التى تغذت على علائق كنترول (٤٥. %) فوسفوروالمضاف اليها أنزيم الفيتيز(١٠٠٠ او٥٠٠ وحدة

دولية/كجم) من انزيم الفيتيز وكان التأثير واضحاً عند مستوى (١٠٠٠ وحدة/كجم علف) بالمقارنة بالمجموعات الاخرى .

- أدى إضافة انزيم الفيتيز بالمستويين الى تحسن فى صفات جودة البيض وأدى لزيادة واضحة فى قيم كل من معامل الصفاروكذلك وحدات هاو وسمك القشرة فى كل المجموعات التى تغذت على علائق كنترول تحتوى على (٤٥. %) فوسفور فى كلتا السلالتين بالمقارنة بالمجموعات التى تغذت على مستويات منخفضة من الفسفور(٢٥.%) .
- لم يكن هناك تأثير واضح لمستوى الفسفور او الفيتيزعلى الأجسام المناعية الأولية بينما أدى أضافة أنزيم الفيتيز بمستوى (٥٠٠ أو ١٠٠٠ وحدة /كجم) الى العلائق العادية المحتوية على ٤٥.% فوسفور إلى تحسن فى الأجسام المناعية الثانوية وكان التحسن أكثر معنوية فى المستويات المرتفعة من الفيتيز، عن المغذاة على علائق منخفضة الفسفور (٢٥.%).
- كان هناك ارتفاع واضح فى تركيز كل من الكالسيوم والبروتين الكلى والجلوبيولين وانخفاض فى الفوسفور والكوليستيرول والدهون الكلية ببلازما الدم وذلك للطيور التى غذيت على١٠٠٠ وحدة دولية من انزيم الفيتيز المضاف إلى علائق عادية فى الفسفور ٤٥.% عن المستوى المنخفض من الفيتيز (٥٠٠ وحدة /كجم) بالمقارنة بباقى المجموعات فى كلتا السلالتين .
- ازداد الوزن النسبى لكل من الطحال والغدة التيموسية كأعضاء مناعية ثانوية ،كما زادت نسبة تصافى الذبيحة ووزن كل من المبيض وقناة المبيض وطول قناة المبيض . كما انخفض وزن دهن البطن بكل المجموعات التى تغذت على١٠٠٠ وحدة دولية من انزيم الفيتيز المضاف لعلائق عادية فى الفسفور ٤٥.% فى كلتا السلالتين بالمقارنة بباقى المجموعات.

وملخص ما وصلت اليه الدراسة هو أن السلالات المحلية البياضة (المندرة ودقى٤) المغذاة على علائق منخفضة الفسفور سواء بإضافة او بدون إضافة الفيتيز أعطت معدلات أداء اقل بالنسبة لإنتاج البيض و الكفاءة الغذائية بينما أدى إضافة الفيتيز بمعدل (٥٠٠ أو ١٠٠٠ وحدة دولية/كجم) لعلائق عادية فى الفوسفور ٤٥.% إلى تحسين معدلات الأداء الإنتاجى والفسيولوجى والمناعى للدجاج البياض المحلى، وكان التحسن أعلى عند المستوى الأعلى من الفيتيز (١٠٠٠ وحدة/كجم علف) ويمكن استخدام الإنزيم بمستوى ٥٠٠ وحدة دولية من إنزيم الفيتيز أيضا للحصول على نفس التأثير السابق ولكن بشكل أقل بالمقارنة بالدجاج المحلى المغذى على علائق خالية من الإضافات الانزيمية.