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EFFECT OF DIETARY GRAPE SEED EXTRACT SUPPLEMENTATION ON PRODUCTIVE PERFORMANCE OF AGED TWO LOCAL STRAINS OF LAYING HENS

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ABSTRACT: The current work aimed to study the effects of dietary grape seed extract (GSE) supplementations at different levels on the productive performance of aged two local strains (Matrouh and Inshas) laying hens. A total number of 120 Inshas and 120 Matrouh strain birds at 48-wks-old were used in this experiment up to 64weeks.of age in a 2 × 4 factorial arrangement. All birds in each strain were individually weighed and randomly divided into four equal experimental groups (thirty laying hens of each) with three replicates (ten laying hens each) with almost similar initial average body weight. Within each strain, the 1st group was fed the basal diet without supplementation while, the 2nd, 3rd, and 4th groups were fed the basal diet supplemented with 600, 1200 and 1800 mg GSE/kg diet, respectively. The obtained results of the present work could be summarized as follows: Hens of Inshas strain had significantly ($P \leq 0.05$) heavier egg weight greatest egg production and egg mass when compared with those of Matrouh at all intervals studied. Hens fed diet supplementation with 1200mg GSE/Kg diet record highest egg production and egg mass. The interaction between strain and dietary GSE supplementation levels was significant ($P \leq 0.01$) on egg weight at all ages studied except during the interval of 56-60 weeks of age. Hens of Inshas had significantly lower values of FCR than those of Matrouh during 48 – 52 weeks of age. Hens received diet contained 1200 mg GSE/ kg diet showed significantly the best FCR at intervals of 52-56, 56-60, 60-64 and 48-64 weeks of age when compared with the control and other treatment groups. The interaction between strain and dietary GSE supplementation levels was significant on FCR at all ages studied. During the whole period (48-64 weeks of age), hens of Inshas fed diet supplemented with 1200 mg GSE/ kg diet showed the best feed conversion ratios in comparison with the control and other treatment groups. Conclusively, it is could be concluded that supplementation of GSE into layer diet caused beneficial effects on their productive performance.

Key words: Laying hens, breed, grape seed extract, performance.

INTRODUCTION

Local chicken breeds contain genetic system with high level of heterozygosity, which may provide the chance for proper genetic selection with enhanced adaptability and productivity **(Wimmers *et al*., 2000)**. A cross reproducing was m ade between White Leghorn × Dokki-4 to give Matrouh strain, while Inshas strain was created by crossing between Sini and white Plymouth Rock breeds.

Plants, plant extracts and derived phytochemicals (botanicals) as components of livestock feedstuffs has increased during the last decade **(Wallace *et al*., 2010)**. Feed additives are considered as being applied in the feed by

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the farmer to healthy animals not only for nutritional purposes but also additional functionality on a Long term basis **(Hassan *et al*., 2016)**.

Research for new bio-efficient antioxidants has particularly focused on natural antioxidants to respect consumer concerns over safety and toxicity. Plant extracts rich in polyphenols are good candidates, because they are easily obtained from natural sources and they efficiently prevent lipid oxidation **(Brenes *et al*., 2010; Nash *et al*., 2018)**.

Grape (*Vitisvinifera*) is one of the world's largest fruit crops and grape seeds are usually by-products of processed grape products such as grape juice, grape molasses and wine production. Grape seed is a complex matrix containing approximately 40% fiber, 16% oil, 11% proteins, and 7% complex phenols including tannins, in addition to sugars, mineral salts **(Kaya *et al.*, 2014).** The residues produced after grape processing is estimated to be about 6-10% by weight of the total grape input **(Hassan *et al.*, 2016).**

Grape seed extract (GSE) provides a concentrated source of polyphenols that have antioxidant capacity **(Brenes *et al.*, 2010; Mewa-Ngongang *et al*., 2019).** GSE contains number of polyphenols, including procyanidins and proanthocyanidins, which are powerful free radical scavengers **(Christaki, 2012; Hassan *et al.*, 2014a)**. Grape seeds are rich source of polyphenols such as phenolic acid, anthocyanins, and flavonoids including monomeric phenolic compounds, such as (+) -catechins, (−) -epicatechin, and (−) -epicatechin-3-O-flattened dimeric, trimeric, and turmeric procyanidins (**Hassan *et al.*, 2014b)**. In addition phenolic compounds from grape seeds have pharmacological and nutraceutical benefits that are closely related to their antioxidant and singlet oxygen quenching ability **(Jayaprakasha *et al*., 2003).**

Kaya *et al.* (2014) reported that feed consumption, damage egg ratio and feed conversion ratio did not differ significantly among the groups, but supplementation of GSE to layer diets affected egg weight quadratically ($P \leq 0.05$) compared to the control group when the laying hens received 0.0, 0.5, 1.0 or 1.5% GSE and 675, 1350 or 2025 mg GSE/kg.

Therefore, the current work aimed to study the effect of dietary GSE supplementations at different levels on the productive performance of two local strains (Matrouh and Inshas) of laying hens under conditions of Sharkia governorate.

MATERIALS AND METHODS

This experiment was executed at Inshas Poultry breeding Station, Animal Production Research Institute, Agricultural Research Center. Preparation of red grape (*Vitisvinifera* L.) seed extract.

Red grape seed is a by-product derived from grape distillery industries. It was separated from grape pomace, which was obtained from El-Ahram Henken for beverages (Ganaklise Company) at Ganaklise, El-Behera Governorate that produces about 525 tons of grapes by-product yearly. The pomace was obtained in a wet condition with moisture content of 65-70% and contains about 30% stalks, 30% seeds and 40% skin and pulp. Humidity of grape pomace was reduced by sun drying for three days to 9-10%, and then the seeds were separated from pomace by rubbing the mixture over a coarse screen and ground by hammer mill to obtain fine powder. 10 g of each dry seeds powder was extracted with 100 ml of ethanol (70%) for 24 hour at room temperature. The extract was centrifuged at 5500 rpm for 10 min and filtered, then GSE was obtained as a lyophilized powder by freeze-dry and stored at 4°C until assay according to **Panovska *et al*. (2005)**.

Experimental Design and Birds

A total number 240 laying hens of Inshas and Matrouh strain (120 laying hens for each strain) of 48-weeks-old were used in this experiment up to 64weeks of age in a 2 × 4 factorial arrangement. All birds in each strain were individually weighed and randomly divided into four equal experimental groups (thirty laying hens of each) with three replicates (ten laying hens each) with almost similar initial average body weight. Within each strain The 1st group was fed the basal diet without supplementation while the 2nd, 3rd, and 4th groups were fed the basal diet supplemented with 600,1200 and 1800 mg grape seed extract / kg diet, respectively.

Management and Feeding

All birds were kept under the same managerial, hygienic and environmental conditions. Birds were exposed to 16 hours light/ day up to the end of experimental period (64wks of age). Birds were fed on layer's diet, according to **NRC (1994).** The composition and chemical analysis of the experimental basal diet are shown in Table 1. Feed and water was provided *ad libitum* consumption during the experimental period.

Measurements

Egg number and egg weight were daily and individually recorded for hens within each replicate during the whole experimental periods. Egg weight was recorded to the nearest gram. Egg number and egg weight averages were then calculated every four weeks for each experimental group.

Egg production rate (%) was calculated for each experimental group as follows:-

$$\text{Egg production rate, (\%)/hen /day} = \frac{\text{Number of eggs produced}}{\text{Number of live hens}} \times 100$$

Egg mass was calculated by multiplying the total egg number by the average egg weight for each group as follows:-

$$\text{Egg mass, g/day} = \text{Egg number/hen/day X avergage egg weight (g).}$$

Egg mass was calculated every four weeks per hen for each experimental group.

Feed intake (g/hen/day) and feed conversion ratio (FCR) (g feed/g egg), egg weight (g) and egg production were measured in replicate basis at the end of each month from (48 up to 64wks) of age.

Statistical Analysis

The data were analyzed by the following model:

$$Yij = U+Si+ Tj+ SIij+ eijk$$

Where, U = the overall mean, Si = effect of strain (2 strains, Inshas and Matrouh), Tj effect of dietary supplementations (4 levels of GSE for 0, 600, 1200 and 1800 mg/kg diet), SIij = effect of the interaction and eijk = residual effect. To test the significant of the used effects in the model, factorial ANOVA was applied using the GLM procedure of **SAS (2004).** The different levels of each effect included in the models were compared by using Duncan´s multiple range test where significance levels were detected as first class error at α=0.05.

RESULTS AND DISCUSSION

Egg Production

The mean values of egg production as affect by strain, grape seed extract (GSE) levels and their interaction are presented in Table 2.

Effect of Strain

Regardless of GSE level, the results in Table 2 show that, there were no significant difference in egg production% between Matrouh and Inshas strains during 52-56, 56-60, 60-64 weeks of age and the whole experimental period (48-64 weeks of age).On the other hand, during 48-52 weeks of age, Matrouh hens were significantly ($P<0.01$) lower in egg production than Inshas ones.

Our results agree with the results obtained **Osman *et al*. (2003), El-Slamony (2005)** and **Habeb (2007)** who found significant strain differences of egg production during the first 90 day of egg production.

Effect of Dietary Grape Seed Extracts Supplementation

Irrespective of strain, it could be observed that, addition of the different levels of GSE in laying hens diet significantly ($P<0.01$) increased egg production throughout all the experimental period studied (52-56, 56-60, 60-64 weeks of age and the whole experimental period, 48 – 64, weeks of age) when compared with un-supplemented diet, except at 48-52 weeks of age, where, no significant variations among treatment groups were found in egg production due to dietary GSE supplementation.

It could be noticed that, hens fed diet supplemented with 1200 mg GSE/kg diet recorded the highest egg production value, while the lowest value was recorded by hens fed diet without GSE supplementation.

Table 1. Feed ingredients and chemical analysis of the basal experimental diets

Ingredient	**(%)**
Yellow corn (8.5%)	57.61
Soybean meal (44%)	23.89
Wheat bran (15.7%)	6.59
Limestone ($CaCO_3$)	7.40
Di-calcium phosphate	2.00
DL-methionine (99%)	0.10
Salt (NaCl)	0.25
Vit.+ Min. premix**	0.30
Cotton seed oil	1.86
Total	**100**
Chemical analysis	
a-Calculated analysis***	
Crude protein,%	16.50
ME Kcal/kg	2714
Calcium,%	3.27
Available phosphorus,%	0.50
Crude fiber%	3.66
Lysine,%	0.82
Methionine,%	0.37
Methionine + cysteine%	0.66
b-Determined analysis****	
Crude protein,%	16.50
Crude fiber,%	4.66
Ash%	4.75

**Vit. Min. premix: Each 2 kg of vitamin and mineral premix (Commercial source AGRIVET Co.) contains Vit. A. 12000000 IU, Vit.D_3 2000000 IU, Vit.E. 10000 mg, Vit.K_3 2000 mg, Vit.B_1 100 mg, Vit.B_2 5000 mg, Vit.B_6 1500 mg, Vit. B_{12} 10 mg, Biotin 50 mg, Choline chloride 250000 mg, Pantothenic acid 10000 mg, Nicotinic acid 3000 mg, Folic acid 1000 mg, Manganese 60000 mg, Zinc 50000 mg, Iron 30000 mg, Copper 10000 mg, Iodine 1000 mg, Selenium 100 mg, Cobalt 100 mg, Carrier(Ca CO_3) add to 2kg.

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

**** Determined according to the methods of **AOAC (2000).**

Table 2 . Egg production rate $\left(\overline{X} \pm SE\right)$ of two local strains of layers as affected by dietary grape seed extract supplementation during 48 to 64 weeks of age

Items		Egg production (%) at weeks				
		48-52	52-56	56-60	60-64	Average 48 - 64
		Effect of strain				
Matrouh		55.14±0.29 ^{b}	54.39±0.48	56.32±0.88	54.13±0.73	54.99±0.53
Inshas		56.96±0.59 ^{a}	54.77±0.55	56.74±1.22	54.86±0.81	55.83±0.65
Sig.		**	NS	NS	NS	NS
		Effect of grape seed extract (gm/kg)				
0.0		54.82±0.34	52.44±0.49 ^{b}	52.13±0.45 ^{b}	51.18±0.29 ^{c}	52.64±0.26 ^{c}
600		56.43±0.60	54.99±0.32 ^{a}	57.27±0.61 ^{a}	55.20±0.44 ^{ab}	55.97±0.28 ^{ab}
1200		57.11±0.87	55.93±0.78 ^{a}	59.28±1.67 ^{a}	57.07±0.87 ^{a}	57.35±0.72 ^{a}
1800		55.83±0.88	54.96±0.22 ^{a}	57.44±1.02 ^{a}	54.53±0.84 ^{b}	55.69±0.46 ^{b}
Sig		NS	**	**	**	**
		Interaction between strains and grape seed extract				
Matrouh	**0.0**	54.19±0.24 ^{c}	52.07±0.97 ^{c}	51.54±0.45 ^{c}	50.77±0.43 ^{c}	52.14±0.26 ^{c}
	600	55.12±0.06 ^{bc}	54.88±0.27 ^{ab}	56.97±0.21 ^{ab}	54.80±0.64 ^{ab}	55.44±0.11 ^{b}
	1200	55.76±0.79 ^{abc}	55.81±0.24 ^{a}	58.73±0.52 ^{a}	56.67±0.48 ^{a}	56.74±0.18 ^{ab}
	1800	55.48±0.72 ^{bc}	54.79±0.19 ^{ab}	58.03±0.85 ^{ab}	54.30±1.39 ^{ab}	55.65±0.27 ^{b}
Inshas	**0.0**	55.45±0.37 ^{bc}	52.81±0.34 ^{bc}	52.71±0.68 ^{bc}	51.60±0.26 ^{bc}	53.14±0.12 ^{c}
	600	57.74±0.31 ^{ab}	55.10±0.66 ^{ab}	57.57±1.33 ^{ab}	55.60±0.65 ^{a}	56.50±0.30 ^{ab}
	1200	58.45±1.17 ^{a}	56.05±1.73 ^{a}	59.83±3.67 ^{a}	57.47±1.84 ^{a}	57.95±1.48 ^{a}
	1800	56.19±1.80 ^{abc}	55.14±0.43 ^{ab}	56.85±2.02 ^{ab}	54.77±1.24 ^{ab}	55.74±1.00 ^{b}
Sig		*	*	*	**	**

Means having different letters at the same column differ significantly ($P \leq 0.05$) * = $P<0.05$; ** = $P<0.01$; NS= Not significant

Findings obtained herein agree with those reported by **Alm El-Dien *et al.* (2017)** who found that adding different levels of grape pomace (except the level of 1%) to laying hens diet significantly ($P<0.05$) increased egg production. Similar results have been obtained **Kara *et al*. (2016)** who demonstrated that supplementation of grape seed and GSE in the layer diets increased egg production linearly ($P<0.01$) compared to the control group.

In contrast, **Kara *et al*. (2016)** found that, grape pomace addition (4 and 6%) to laying hen diet did not change the egg production. This result in further supported by the findings of the study carried out by **Kara and Kocaoglu-Guclu (2012)** who found that supplementing grape pomace at 2% did not show any significant on the average egg production of laying hens, A similar result was reported by **Silici *et al.* (2011)** in which 1.0 and 1.5% grape pomace were added to the diet of breeder quails.

Interaction Effects (Strain X Dietary GSE Supplementation)

Interaction effect between strain and dietary GSE supplementation was significant (P<0.05 or P<0.01) on egg production throughout the interval periods and the whole experimental period (Table2). Results indicated that, either Matrouh or Inshas strain fed diet supplemented with 1200 mg GSE/kg diet recorded the highest egg production compared with other treatment groups.

On the other hand, Matrouh strain fed diet without GSE supplementation occupied the lowest position regarding egg production through all the experimental period studied.

Egg Weight

The average value of egg weight as affected of strain, dietary supplementation of GSE and their interaction are illustrated in Table 3.

Effect of strain

Irrespective of dietary GSE supplementation, for results in Table 3 revealed that, the differences between Inshas and Matrouh strain in egg weight were significant (P<0.05) during all the experimental periods studied, where Inshas hens were significantly heavier egg weight than Matrouh ones.

In agreement with the present results, **El-Soudany (2003), Osman *et al.* (2003) and El-Slamony (2005)** whose found significant differences between some chicken strains in egg weight during the first 90 days of egg production.

Contradicting results with our results were obtained by **El-Soudany (2000) and Habeb (2007)** who found no significant differences in egg weight between Golden-Montaza and Matrouh strains during the first 90 days of egg production.

Effect of dietary grape seed extracts supplementation

Regardless of strain, the results in Table 3 revealed that, egg weight was not significantly affected by dietary GSE supplementation during all the experimental periods studied.

However, egg weights were numerically increased in laying hens fed the diet supplemented with GSE compared to those fed the control diet (un- supplemented) during all the experimental periods studied.

This may be attributed to the augmentative effect of GSE on probiotic bacteria count in the intestines **(Viveros *et al*., 2011)**.

The insignificant effect in egg weight due to dietary GSE supplementation in the present study was similar to the results obtained by **Kara and Kocaoglu–Guclu (2012)** and **Silici *et al.* (2011)** who found that, supplementing grape pomace at 2% did not show any significant effect on the average egg weight.

In contrast, **Kara *et al.* (2016)** found that the egg weight was significantly higher (P<0.001) in the group fed with diet containing 4% grape pomace than in the control group. Also, **Kaya *et al.* (2014)** stated that, the egg weight tended to significantly decrease in GS and GSE groups compared with those birds fed control diet.

Interaction effect (strain X dietary GSE supplementation)

Result in Table 3 revealed that, egg weight was significantly (P<0.01) affected by the interaction between strain and dietary GSE supplementation, during all the experimental period studied except at 56-60 weeks of age, which the interaction between them was not significant.

It was observed that, within each strain, the different levels of GSE supplementation resulted significantly (P<0.01) increased egg weight when compared with un-supplemented one.

Inshas strain fed diet without or with dietary GSE supplementation with any levels were significantly (P<0.01) increased egg weight when compared with Matrouh fed diet with or without GSE supplementation throughout the interval periods studied (Table 3).

It is worth to note that, Inshas hens fed diet supplied with 1200 mg GSE/kg diet had the best egg weight values as compared with other treatment group. On the other hand, Matrouh hens fed diet without GSE supplementation gave the lowest values of egg weight through all the experimental period studid.

Table 3. Egg weight $\left(\bar{X} \pm SE\right)$ of two local strains of layers as affected by dietary grape seed extract supplementation during 48 to 64 weeks of age

Items		Egg weight (g.) at weeks				
		48-52	52-56	56-60	60-64	Average (48-64)
Effect of strain						
Matrouh		50.50±0.05 [b]	50.76±0.03 [b]	51.49±0.10 [b]	51.25±0.04 [b]	51.00±0.04 [b]
Inshas		51.17±0.04 [a]	51.25±0.05 [a]	52.10±0.10 [a]	51.87±0.05 [a]	51.60±0.03 [a]
Sig.		**	**	**	**	**
Effect of grape seed extract (gm/kg)						
0.0		50.77±0.15	50.92±0.11	51.72±0.19	51.51±0.17	51.23±0.15
600		50.83±0.17	51.01±0.12	51.83±0.23	51.57±0.14	51.31±0.14
1200		50.90±0.15	51.09±0.13	51.88±0.22	51.64±0.15	51.38±0.15
1800		50.85±0.17	51.01±0.12	51.74±0.14	51.53±0.15	51.28±0.12
Sig		NS	NS	NS	NS	NS
Interaction between strains and grape seed extract						
Matrouh	**0.0**	50.44±0.08 [a]	50.68±0.05 [b]	51.38±0.19	51.16±0.05 [b]	50.91±0.06 [b]
	600	50.46±0.03 [b]	50.76±0.05 [b]	51.44±0.22	51.31±0.07 [b]	50.99±0.03 [b]
	1200	50.58±0.10 [b]	50.83±0.08 [b]	51.57±0.24	51.33±0.10 [b]	51.08±0.11 [b]
	1800	50.51±0.15 [b]	50.79±0.05 [b]	51.55±0.23	51.22±0.07 [b]	51.02±0.06 [b]
Inshas	**0.0**	51.10±0.07 [a]	51.15±0.07 [a]	52.06±0.20	51.87±0.09 [a]	51.55±0.08 [a]
	600	51.20±0.09 [a]	51.27±0.03 [a]	52.21±0.25	51.83±0.13 [a]	51.63±0.06 [a]
	1200	51.22±0.07 [a]	51.35±0.12 [a]	52.19±0.29	51.95±0.12 [a]	51.68±0.06 [a]
	1800	51.18±0.10 [a]	51.23±0.13 [a]	51.93±0.08	51.84±0.12 [a]	51.54±0.06 [a]
Sig		**	**	NS	**	**

Means having different letters at the same column differ significantly ($P \leq 0.05$) : ** = $P<0.01$; NS= Not significant

Egg Mass

Table 4 shows the effect of strain, dietary GSE supplementation and their interaction in egg mass during different intervals of the experiment.

Effect of strain

Regardless of dietary GSE supplementation, the results indicated that, the difference between Inshas and Matrouh strains were not significant in egg mass during all the experimental periods except at 48-52 weeks of age which the differences between them were significant, where, egg mass was significantly ($P<0.05$) increased in Inshas strain than Matrouh ones.

This could be due to its higher efficient in both egg production and egg weight with no difference between them in egg weight (Tables 2 and 3).

Saleh *et al.* (2006) and **Younis and Abd El-Ghany (2004)**, found a positive genetic and phenotypic between egg number and egg mass.

Table 4. Egg mass $\left(\bar{X} \pm SE\right)$ of two local strains of layers as affected by dietary grape seed extract supplementation during 48 to 64 weeks of age.

Items		Egg mass (g) at weeks				
		48-52	52-56	56-60	60-64	Average (48-64)
Effect of strain						
Matrouh		779.59±4.04^{b}	773.08±7.08	811.98±13.38	776.92±10.80	785.39±7.82
Inshas		816.14±8.54^{a}	786.04±8.19	827.83±18.63	796.75±11.57	806.69±9.70
Sig.		**	NS	NS	NS	NS
Effect of grape seed extract (gm/kg)						
0.0		779.33±6.86	747.65±7.83^{b}	754.98±8.23^{b}	738.30±5.68^{c}	755.06±5.77^{c}
600		803.30±11.23	785.46±5.15^{a}	831.13±10.63^{a}	797.06±6.72^{ab}	804.24±6.00^{b}
1200		813.94±13.67	800.09±11.90^{a}	861.45±26.99^{a}	825.17±12.63^{a}	825.16±11.43^{a}
1800		794.90±13.10	785.04±4.37^{a}	832.07±14.59^{a}	786.81±12.56^{b}	799.71±7.23^{b}
Sig		NS	**	**	**	**
Interaction between strains and grape seed extract						
Matrouh	**0.0**	765.29±4.49^{c}	738.96±14.32^{c}	741.52±5.00^{c}	727.19±5.52^{d}	743.24±4.34^{d}
	600	778.81±1.08^{c}	780.05±4.43^{ab}	820.62±5.70^{abc}	787.26±8.68^{bc}	791.69±2.16^{bc}
	1200	789.66±9.85^{bc}	794.26±4.60^{ab}	848.12±11.33^{ab}	814.51±7.99^{ab}	811.64±4.08^{ab}
	1800	784.61±8.65^{c}	779.04±3.11^{ab}	837.67±15.73^{ab}	778.72±19.90^{bc}	795.01±2.79^{bc}
Inshas	**0.0**	793.36±4.30^{bc}	756.34±5.10^{bc}	768.43±11.53^{bc}	749.41±2.67^{cd}	766.89±2.78^{cd}
	600	827.78±5.49^{ab}	790.87±9.16^{ab}	841.64±20.53^{ab}	806.86±7.39^{ab}	816.79±4.24^{ab}
	1200	838.22±15.73^{a}	805.93±25.56^{a}	874.78±57.75^{a}	835.83±24.89^{a}	838.69±21.29^{a}
	1800	805.20±26.02^{abc}	791.04±7.08^{ab}	826.48±28.04^{ab}	794.90±18.10^{ab}	804.40±15.22^{b}
Sig		**	**	*	**	**

Means having different letters at the same column differ significantly ($P \leq 0.05$) * = $P<0.05$; ** = $P<0.01$; NS= Not significant

Our results agree with **Habeb (2007)** who found significant differences between Inshas and Matrouh strains in egg mass through the first 90 days of egg production Also, **El-Soudany (2000 and 2003) and Osman *et al.* (2003)** found significant difference between strains in egg mass during the first 90 days of age.

Effect of dietary grape seed extracts supplementation

Regardless of strain, the results clearly indicated that egg mass are similar to those of egg production, which dietary GSE supplementation significantly ($P<0.01$) increased egg mass throughout the interval periods and the whole experimental period, except at the first period (48-52 weeks of age) which, the egg mass was insignificantly affected, however it increased insignificantly during this period due to dietary GSE supplementation.

The significant increase in egg mass due to dietary GSE in the present study may be explained by a trend toward an increase in percentage of laying rate and insignificant affect in egg weight (Tables 2 and 3).

It was observed that, laying hens fed the basal diet supplemented with 1200 mg GSE/kg diet recorded the highest egg mass value while the lowest egg mass value was recorded from hens fed diet without supplementation.

The significant increase in egg mass due to dietary GSE supplementation was similar to the results obtained by **Alm El-Dien *et al.* (2017)** who found, adding different levels of grape pomace (except the level of 1%) to laying hen diets increased significantly egg mass value compared to control group.

Interaction effects (strain X dietary GSE supplementation)

The result obtained in Table 4 revealed that, egg mass was significantly ($P<0.05$ or 0.01) affected by the interaction between stain and dietary GSE supplementation during the interval periods and the whole experimental period (Table 4).

It could be observed that Inshas hens fed diet supplemented with 1200 mg GSE/kg diet recorded the highest egg mass value compared with the other treatment groups. On the other hand, Matrouh laying hens fed diet without supplementation resulted in the lowest expression regarding egg mass within all experimental period studied (Table 4).

Feed Intake

Results in Table 5 did not show any significant effect due to strains, dietary GSE supplementation and their interaction during all experimental period studied

Elawa (2004) stated that, total feed consumed is quit equal for both Matrouh and Inshas chicken, and the difference between strains was not statistically significant.

Comparing the effect of dietary GSE supplementation with previous reports, the insignificant effect in feed consumption due to dietary GSE supplementation was similar to the results obtained by **Ozgan*et al.* (2009)**, **Viveros *et al*. (2011)** , **Kaya *et al*. (2014)** , **Kara *et al.* (2016), and Abdalla*et al.* (2017),** in laying hens **Silici *et al.* (2011)** in breeder quail, **Abu Hafsa and Ibrahim (2017)** and in broiler chicks.

However, **Alm El-Dien *et al*. (2017)** found that the slight increase in total feed intake for any level (1, 2, 3 and 4%) of grape pomace compared to control group. This may be because the phenolic compounds in grabepomace like tannins and proanthocyandin etc. had appetite stimulating effect (**Tekeli *et al*., 2014**).

Feed Conversion Ratio

Data displayed in Table 6 revealed the effect of strain, dietary GSE supplementation and their interaction on FCR during the different interval periods.

Effect of strain

Regardless of dietary GSE supplementation, results indicated that, there were no significant effects between Matrouh and Inshas strains in FCR throughout all the interval periods studied and the whole experimental period, except within the period from 48-52 weeks of age, which, the overall mean of FCR for Inshas strain (3.84) was significantly ($P<0.01$) better than Matrouh (4. 01) strain.

This means that, Inshas strain was more efficient in converting the feed to egg during that period of age (Table 6). Generally, the overall mean of FCR for Inshas strain was insignificantly better than Matrouh strain during the whole experimental period.

Effect of dietary grape seed extracts supplementation

Regardless of strain, results showed that, FCR values were positively ($P<0.01$) affected when the basal diet was supplemented by the different levels of GSE (600, 1200 and 1800 mg /kg diet) during all the experimental period studied and the whole experimental period (48-64 weeks of age) except at 48-52 weeks of age which, the effect was not significant (Table 6).

Table 5. Feed intake $(\bar{X} \pm SE)$ of two local strains of layers as affected by dietary grape seed extract supplementation during 48 to 64 weeks of age

Items		Feed intake (g/hen/day) at wks				
		48-52	52-56	56-60	60-64	Average (48-64)
Effect of strain						
Matrouh		111.53±0.24	110.24±0.18	110.49±0.09	110.04±0.11	110.57±0.09
Inshas		111.94±0.28	110.32±0.11	110.31±0.07	110.15±0.08	110.68±0.08
Sig.		**NS**	**NS**	**NS**	**NS**	NS
Effect of grape seed extract (mg/kg) supplementation						
0.0		111.19±0.46	110.34±0.22	110.34±0.11	109.90±0.17	110.45±0.17
600		111.89±0.39	110.15±0.11	110.40±0.10	110.07±0.12	110.63±0.08
1200		112.01±0.34	110.15±0.24	110.52±0.15	110.19±0.13	110.72±0.09
1800		111.84±0.24	110.49±0.25	110.35±0.13	110.21±0.10	110.72±0.12
Sig		NS	NS	NS	NS	NS
Interaction between strains and grape seed extract						
Matrouh	**0.0**	110.69±0.28	110.26±0.40	110.49±0.09	109.64±0.20	110.27±0.15
	600	111.71±0.62	110.13±0.23	110.48±0.16	110.17±0.16	110.62±0.13
	1200	112.04±0.52	110.03±0.46	110.60±0.27	110.29±0.27	110.74±0.18
	1800	111.68±0.13	110.53±0.50	110.40±0.24	110.05±0.14	110.66±0.23
Inshas	**0.0**	111.70±0.85	110.43±0.28	110.19±0.18	110.17±0.20	110.62±0.30
	600	112.07±0.59	110.16±0.11	110.31±0.12	109.96±0.20	110.63±0.11
	1200	111.99±0.57	110.26±0.27	110.44±0.19	110.09±0.07	110.69±0.09
	1800	111.99±0.50	110.45±0.25	110.29±0.14	110.38±0.09	110.78±0.14
Sig		NS	NS	**NS**	NS	NS

NS= Not significant

Table 6. Feed conversion $(\overline{X} \pm SE)$ of two local strains of layers as affected by dietary grape seed extract supplementation during 48 to 64 weeks of age.

Items		Feed conversion (g feed/g egg) at weeks 48-52	52-56	56-60	60-64	Average (48-64)
Effect of strain						
Matrouh		4.01 ± 0.02^{a}	4.00 ± 0.04	3.82 ± 0.07	3.81 ± 0.06	3.91 ± 0.04
Inshas		3.84 ± 0.04^{b}	3.93 ± 0.04	3.75 ± 0.08	3.74 ± 0.08	3.82 ± 0.05
Sig.		**	NS	NS	NS	NS
Effect of grape seed extract (mg/kg) supplementation						
0.0		4.00 ± 0.03	4.13 ± 0.04^{a}	4.09 ± 0.04^{a}	4.08 ± 0.04^{a}	4.08 ± 0.03^{a}
600		3.90 ± 0.05	3.93 ± 0.03^{b}	3.72 ± 0.05^{b}	3.71 ± 0.05^{b}	3.82 ± 0.03^{b}
1200		3.86 ± 0.06	3.86 ± 0.06^{b}	3.61 ± 0.11^{b}	3.60 ± 0.10^{b}	3.73 ± 0.06^{b}
1800		3.94 ± 0.07	3.94 ± 0.02^{b}	3.72 ± 0.06^{b}	3.71 ± 0.07^{b}	3.83 ± 0.05^{b}
Sig		NS	**	**	**	**
Interaction between strains and grape seed extract						
Matrouh	**0.0**	4.05 ± 0.02^{a}	4.18 ± 0.07^{a}	4.17 ± 0.02^{a}	4.14 ± 0.03^{a}	4.14 ± 0.03^{a}
	600	4.02 ± 0.02^{a}	3.95 ± 0.03^{bc}	3.77 ± 0.03^{bc}	3.76 ± 0.03^{bc}	3.87 ± 0.01^{bc}
	1200	3.97 ± 0.05^{ab}	3.88 ± 0.04^{c}	3.65 ± 0.06^{c}	3.64 ± 0.04^{c}	3.79 ± 0.03^{cd}
	1800	3.99 ± 0.04^{ab}	3.97 ± 0.01^{bc}	3.69 ± 0.07^{bc}	3.68 ± 0.07^{c}	3.83 ± 0.03^{bcd}
Inshas	**0.0**	3.94 ± 0.05^{ab}	4.09 ± 0.04^{ab}	4.02 ± 0.06^{ab}	4.02 ± 0.06^{ab}	4.02 ± 0.02^{ab}
	600	3.79 ± 0.01^{bc}	3.90 ± 0.05^{bc}	3.67 ± 0.09^{bc}	3.66 ± 0.08^{c}	3.76 ± 0.03^{cd}
	1200	3.74 ± 0.05^{c}	3.84 ± 0.12^{c}	3.56 ± 0.23^{c}	3.55 ± 0.22^{c}	3.67 ± 0.11^{d}
	1800	3.90 ± 0.14^{abc}	3.91 ± 0.04^{bc}	3.74 ± 0.12^{bc}	3.75 ± 0.12^{bc}	3.83 ± 0.10^{bcd}
Sig		*	**	**	**	**

Means having different letters at the same column differ significantly ($P\leq0.05$) * = $P<0.05$; ** = $P<0.01$ and; NS= Not significant

The improvement of FCR among hens that received diets supplemented with GSE could be explained by increased percentage of laying rate and insignificant effect in egg weight and consequently increased egg mass (Tables 2 and 3).

Results reported herein are in agreement with those obtained by **Alm El-Dein *et al.* (2017)** who found that values of levels 3 and 4% grape pomace were better than values of vit-E for FCR. Also, **Silici *et al.* (2011)** stated that the feed efficiency increased in 1 and 1.5% grape seed supplemented groups (P<0.0.1) compared to the control group.

In contrast, **Kara *et al.* (2016)** found that, the addition of grape pomace to laying hen diet did not significantly affect feed efficiency (P<0.05). **Kaya *et al.* (2014)** stated that, GS and GSE prepared equivalent levels to GS levels supplementation did not change the FCR in laying hens. A similar result was reported by **Kara and Kocaoglu-Guclu (2012)** who found that supplementing grape pomace at 2% did not show any significant effect on the average feed conversion efficiency of laying hens.

Interaction effects (strain X dietary GSE supplementation)

It is clear from Table 6 that, the interaction between strain and dietary GSE supplementation resulted in a significant ($P<0.05$ or $P<0.01$) effect on FCR at all the periods studied (48–52, 52 – 56, 56 – 60, 60 – 64 and 48-64 weeks of age). It was observed that, within each strain diets supplemented with GSE at any level produced the best FCR as compared with diet without supplementation.

Generally, by looking to all the experimental period, the interaction between Inshas strain and dietary supplementation of 1200mg GSE/kg achieved the best FCR, however the worst FCR value resulted from the interaction between Matrouh fed diet without supplementation.

Conclusively, it is could be concluded that supplementation of GSE into layer diet caused beneficial effects on their productive performance.

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تأثيـر إضـافـة مستخلص بـذور العنـب للعليقـة علـى الأداء الإنتـاجـي لسـلالتيـن محليتيـن مـن الـدجـاج البيـاض العجـوز

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تهدف هذه الدراسة إلى دراسة تأثير اضافة مستخلص بذور العنب للعليقة بمستويات مختلفة على الأداء الإنتاجي لسلالتين محليتين (مطروح وانشاص) من الدجاج البياض العجوز. تم اجراء البحث علي عدد 120 دجاجة من سلالة انشاص و 120 دجاجة من سلالة مطروح عمر 48 اسبوع حتى 64 اسبوع. تم وزن جميع الطيور من كل سلالة بشكل فردي وقسمت عشوائياً إلى أربع مجموعات متساوية (ثلاثون دجاجة بياضة/مجموعة) بثلاث مكررات (عشر دجاجات بياضة لكل منها) بمتوسط وزن متساوي تقريبًا لكل مجموعة ، تم تغذية المجموعة الأولى علي عليقة اساسية بدون اضافة مستخلص بذور العنب بينما تم تغذية المجموعات الثانية والثالثة والرابعة على عليقة اساسية مضاف اليها 600 و 1200 و 1800 مجم من مستخلص بذور العنب / كجم علف على التوالي. يمكن تلخيص النتائج المتحصل عليها كالتالي: سجل دجاج سلالة انشاص زيادة معنوية في وزن البيض وانتاج البيض وكتلة البيض مقارنة بسلالة مطروح خلال كل الفترات المدروسة سجلت الدجاجات المغذاة علي عليقة مضاف اليها 1200ملجم من مستخلص بذور العنب /كجم علف اعلي وزن بيضة وكتلة بيض. أثر التداخل بين السلالة ومستويات اضافة مستخلص بذور العنب معنويا ($P<0.01$)علي وزن البيضة في جميع الفترات المدروسة ماعدا الفترة من 56 – 60 اسبوع من العمر. كانت دجاج إنشاص افضل في معامل التحويل الغذائى مقارنة بسلالة بمطروح في فترة 48-52 أسبوعًا من العمر. الدجاج الذي تم تغذيته علي علف يحتوي على 1200 ملجم من (GSE)/ كجم علف كان افضل معنويا في معامل تحويل الغذاء في فترات 52-56 ، 56-60 ، 60-64 و 48-64 أسبوع بالمقارنة مع مجموعة الكنترول ومجموعات المعاملات الأخرى. اثر التداخل بين السلالة ومستويات اضافة مستخلص بذور العنب معنوياً على معامل تحويل الغذاء في جميع الأعمار المدروسة. خلال الفترة (48-64 أسبوعً) ، أظهرت دجاجات إنشاص افضل معامل تحويل للغذاء عند تغذيتها علي عليقة مضاف لها 1200 مجم من مستخلص بذور العنب/كجم علف مقارنة بمجموعة الكنترول والمعاملات الاخرى. يمكن استنتاج ان اضافة مستخلص بذور العنب لعلائق الدجاج البياض كان له تأثير ايجابي علي تحسين الاداء الانتاجي للدجاج.

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