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RELATIONSHIPS BETWEEN SOME BODY MEASUREMENTS AND PRODUCTIVE TRAITS IN GOLDEN MONTAZAH AND MANDARAH CHICKENS

Hassan, A.H.A.
Animal Production Research Instit, Agric. Res. Cent., Giza, Egypt.

ABSTRACT

This study was conducted to investigate the relationships between some body measurements at 20 weeks of age and productive traits in two local strains of chickens. A total of 212 pullets from Golden Montazah and Mandarah strains (106 pullets from each) were individually weighed, conformation measurements at 20 weeks of age. Data on shank, thigh, keel and breast width lengths were classified according to three categories (short, medium and long lengths). All pullets were moved to individual layer cages to 90 days of laying. At 84 days of laying, one egg from each hen yield was broken to determine egg quality traits.

Age at sexual maturity for Golden Montazah was 173.1 days and 171.0 days for Mandarah, it was gradually decreased ($P<0.05$) with the increasing of breast width. Body weight at sexual maturity averaged 1592.1 g and 1508.9 g in Golden Montazah and Mandarah, respectively. Long measurements recorded the heaviest ($P< 0.05$) body weight at sexual maturity except breast width. Egg weight at sexual maturity average 35.4 g and 36.5 g in Golden Montazah and Mandarah, respectively, it was gradually increased ($P< 0.05$) with the increasing of keel length.

Golden Montazah hens exceeded ($P< 0.05$) Mandarah in each of egg number, egg mass and rate of laying in the first 90 days of laying. Egg production traits gradually increased ($P< 0.05$) with decreasing the thigh length and with increasing the keel length. Short thighs and long keels in Golden Montazah were related with higher ($P< 0.05$) egg number, egg mass and rate of laying in the first 90 days of laying. Short shank and long breast width in Mandarah hens were related with higher ($P< 0.05$) egg number and rate of laying in the first 90 days of laying. The medium keels and long breast width were related with the heaviest ($P < 0.05$) egg mass.

Golden Montazah eggs were significantly ($P<0.05$) highest Haugh unit whereas, Mandarah eggs had significantly highest albumen percentage. Shanks in Golden Montazah were significantly ($P< 0.05$) effect on egg shape index, while keels of shanks, thighs (Golden Montazah) and keels (Mandarah) were significant ($P<0.05$) effect on yolk and albumen percentages, however thigh length and breast width in Mandarah were significant ($P<0.05$) effect on Haugh unit and shell percentage, respectively.

Thigh length was negatively significant and keel length was positively significant correlated with most egg production traits for Golden Montazah, while shank length was negatively significant and breast width length was positively correlated with most egg production with Mandarah hens at ($P < 0.05$).

Conclusively, it could be concluded that thigh and keel lengths were greatly related with high egg production traits in Golden Montazah, while the shank and breast width lengths in Mandarah took the same importance.

Keyword: local strain, body measurements, egg production, egg quality.

INTRODUCTION

Egg production depends on many characters such as age at sexual maturity, egg number, body weight, egg weight and others (Muir, 1990 and El-Full *et al.*, 2001). For improving the total economic value of native fowls, Golden Montazah (GM) as a developed strain from mating the Rohde Island Red and Dokki-4, using systems of breeding coupled with selection (Mahmoud *et al.*, 1974) and Mandarah (MM) from mating Alexandria males with Dokki-4 females and selected for egg production characteristics (Abd El-Gawad, 1981). Differences between local breeds in body weight and body measurement were reported by many investigators. Abd El-Gawad *et al.* (1979) and Abd El-Gawad (1980) found differences in body weight and Keel length; Mahmoud *et al.* (1981), Salem (1993) and El-Labban (1999) in body weight, shanks and keel lengths. Leeson and Summers (1990) found that body weight was of importance for maximum egg mass output. Havenstein *et al.* (1988) pointed to the importance of skeletal selection for conformation traits and egg production in chickens. Selection for body weight and body measurements may alter the efficiency of egg production in chickens (Renden and Marble 1986).

El-Wardany (1999 a, b) found that improving body weight, egg number and egg mass can be achieved by keel length selection in Gimmizah strain and shank length selection in Mamourah strain.

The purpose of the present study was to detect the relationships between egg production traits and some body measurements at 20-weeks of age for Golden Montazah and Mandarah strains, under Egyptian environmental conditions.

MATERIALS AND METHODS

This work was carried out during the period from April 2001 to February, 2002 at Inshas Research Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt. Day-old Golden Montazah and Mandarah chicks trains were placed on a starter feed and water were offered *ad libitum* until 8 weeks old and on a grower ration from 8 to 20 weeks of age (Table 1). A total of 212 pullets from Golden Montazah and Mandarah (106 pullets from each) were individually weighed, wing banded and measured body conformation traits (shank, thigh and keel lengths and breast width) at 20 weeks of age. Data on those 4 measurements mentioned before classified into three categories according to the overall mean ± standard deviation therefore the first category included observations below the overall mean minus standard deviation the third category included observations above the overall mean plus standard deviation while the second category included observations which were in-between the first and the third categories (Table 2). All pullets were moved to individual layer cages and placed on a layer ration (Table 1) and water offered *ad libitium* to 90 days of laying.

Table 1: Composition of starter, grower and layer rations.

Items	Starter	Grower	Layer
		%	
Ingredients			
Yellow corn	65.00	63.00	66.00
Soybean meal 44%	30.45	15.50	21.30
Wheat bran	00.65	17.78	2.94
Di-calcium phosphate	1.80	1.25	1.50
Lime stone	1.40	1.80	7.60
Salt, iodized	0.30	0.30	0.30
Premix*	0.30	0.30	0.30
DL-Methionine	0.10	0.07	0.06
Calculated analysis**			
Crude protein %	19.28	15.20	15.68
ME Kcal / kg	2868.66	2689.87	2726.42

*Each kg of vit. & min. mixture contains: vit A 100000.000 IU, Vit D_3 300000.000 IU, Vit E 10 mg, Vit B_1 1 mg, Vit B_2 5 mg, vit B_6 1.5 mg, vit B_{12} 10 mg, Niacin 30 mg, Pantothenic acid 10mg, Choline 250 mg, capper 4 mg, iodine 3 mg, iron 30 mg Manganese 60 mg, zinc 50 mg Selenium 0.1 mg and Cobalt 0.1 mg

** According to NRC (1984).

Table 2: Means (cm) and standard deviation (S.D) for each body measurement at 20 weeks of age in Golden Montazah and Mandarah strains.

Classification	Golden Montazah				Mandarah			
	N	Categories	%	Mean ± S.D	N	Categories	%	Mean ±S.D
Shank length:								
Short	12	<7.7	11.3	7.5 ± 0.06 ^{c}	17	<7.7	16.0	7.3 ± 0.14 ^{c}
Medium	82	7.7 – 8.9	77.4	8.3 ± 0.10 ^{b}	72	7.7 - 8.7	68.0	8.2 ± 0.12 ^{b}
Long	12	>8.9	11.3	9.2 ± 0.18 ^{a}	17	>8.7	16.0	9.1 ± 0.14 ^{a}
Thigh length:								
Short	16	< 10.7	15.1	10.6 ± 0.09 ^{c}	13	<10.8	12.3	10.5 ± 0.10 ^{c}
Medium	74	10.7 - 12.3	69.8	11.5 ± 0.08 ^{b}	80	10.8 -12.0	75.4	11.4 ± 0.09 ^{b}
Long	16	>12.3	15.1	12.5 ± 0.22 ^{a}	13	> 12.0	12.3	12.3 ± 0.15 ^{a}
Keel length								
Short	14	< 7.8	13.2	7.5 ± 0.06 ^{c}	11	< 8.0	10.4	7.6 ± 0.20 ^{c}
Medium	78	7.8 - 9.4	73.6	8.6 ± 0.09 ^{b}	82	8.0 - 9.4	77.3	8.7 ± 0.20 ^{b}
Long	14	>9.4	13.2	9.7 ± 0.12 ^{a}	13	>9.4	12.3	9.7 ± 0.30 ^{a}
Breast width								
Short	14	< 8.0	13.2	7.7 ± 0.10 ^{c}	15	< 8.4	14.2	8.0 ± 0.14 ^{c}
Medium	76	8.0 - 9.4	71.7	8.7 ± 0.11 ^{b}	74	8.4 - 9.6	69.8	9.0 ± 0.12 ^{b}
Long	16	>9.4	15.1	9.6 ± 0.10 ^{a}	17	> 9.6	16.0	9.9 ± 0.15 ^{a}

Means within each classification, which followed by the different letters differ significantly ($P < 0.01$)

Age at sexual maturity was estimated as days at the age at laying the first egg, where body weight was also immediately taken. Egg weight and number were daily recorded per hen from sexual maturity up to 90 days of laying. Egg mass (egg number x egg weight) was calculated per hen. At 84 days of laying, one egg from each hen was broken to determine egg quality traits at the same day.

Data were analyzed according to General Linear Models (GLM) procedures by using SAS (1996) Computer Program System using the following model.

$Y_{ijk} = \mu \pm S_i \pm T_j \pm ST_{ij} \pm e_{ijk}$

Where: Y_{ijk} = An observation, μ = Overall means, S_i = The effect of i^{th} strains (i = 1 and 2), T_j = the effect of j^{th} categories (j = 1, 2, 3 and 4) ST_{ij} = the effect of ij^{th} interaction between strain x categories (ij = 1, 2, ...and 8) and e_{ijk} = Random error.

Percentages were transformed to arcsine before being analyzed to approximate normal distribution, thereafter it was returned to Duncan, multiple range tests were used to determine significance of the differences between all means according to Duncan (l955). The correlation coefficient values were calculated among the parameters studied according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

1-Egg production traits:

Data in Table 3 showed that Mandarah pullets were sexually matured slightly earlier by 2.1 days than Golden Montazah. On the other hand, the opposite situation was found in respect of body weight at sexual maturity without significant differences. Similarly the strains were no effects on the weight of first age. The obtained figures agreed with those obtained by Afifi (l994) and El Full (2001).were the age at sexual maturity was 170 days in Mandarah and 173 days in Golden Montazah, respectively.

The categories of all body measurements were no significant effects on the age at sexual maturity except for breast width, where the age at sexual maturity gradually decreased ($P<0.05$) with increasing the breast width (Table 3). On the other hand, the body weight at sexual maturity was effected ($P<0.05$) by category of all studied measurements except for breast width. However the egg weight at sexual maturity gradually increased ($P<0.05$) with increasing keel length, while the other length of body measurements were no obvious effects. Similar results were obtained by Tawfeek (1981) who found relationships between the growth rate and the lengths of the shank, thigh and keel.

During the first 90 days of laying the Golden Montazah pullets exceeded (P0.05) Mandarah in respect of egg number, egg mass and rate of laying (Table 3). These results agreed with those obtained by Mahmoud *et al* (1974), Abd El-Gawad (1981), Salim (1994) and Selim (1994) who found that Golden Montaza were the highest significant ($p<0.05$) rate of laying compared to Mandarah. The pullets of short thighs were higher significant ($p< 0.05$) egg number and rate of laying than in the long, while long keels were higher ($P<0.05$) egg number, egg mass and rate of laying than the shorts. The other body measurements categories did not show any significant effects

Table 3: Least square means (± SE) of egg production traits as affected by strain and body measurement categories at 20 weeks of age.

Classification	Sexual maturity			First 90 days of laying			
	Age (day)	Body weight (g)	Egg weight (g)	Egg number	Egg weight (g)	Egg mass (g)	Rate of laying (%)
Strains:	NS	NS	NS	*	NS	*	*
Golden Montazah	173.1±2.1	1592.1±29.9	35.4±0.9	48.8±2.2^{a}	44.0±0.9	2147.4±100.2^{a}	54.2±2.4^{a}
Mandarah	171.0±2.1	1508.9±30.6	36.5±0.9	47.1±2.2^{b}	44.1±0.9	2083.7±102.7^{b}	52.5±2.5^{b}
Shank length:	NS	*	NS	NS	NS	NS	NS
Short	170.8±3.5	1481.3±49.2^{b}	34.9±1.4	48.7±3.6	44.2±1.5	2148.7±165.2	54.1±4.0
Medium	172.9±2.3	1531.1±32.7^{b}	35.7±0.9	47.9±2.4	44.0±1.0	2114.4±109.7	53.3±2.6
Long	172.3±3.5	1639.1±50.3^{a}	37.3±1.7	47.3±3.7	44.0±1.5	2083.6±168.9	52.7±4.0
Thigh length:	NS	*	NS	*	NS	NS	*
Short	170.9±3.3	1458.8±47.3^{b}	36.4±1.4	51.0±3.4^{a}	44.1±1.4	2260.1±158.9	56.7±3.8^{a}
Medium	173.1±2.2	1526.5±32.1^{b}	36.6±0.9	48.2±2.3^{b}	43.8±0.9	2114.9±107.6	53.6±2.6^{ab}
Long	172.4±3.5	1666.3±49.2^{a}	34.9±1.4	44.7±3.6^{b}	44.2±1.5	1971.6±165.2	49.8±4.0^{b}
Keel length:	NS	*	*	*	NS	*	*
Short	171.8±3.5	1438.0±50.7^{b}	33.7±1.5^{b}	41.2±3.7^{b}	43.2±1.5	1779.5±169.9^{b}	46.0±4.1b
Medium	170.7±2.0	1566.3±28.7^{a}	35.8±0.8^{ab}	48.6±2.1^{ab}	44.1±0.9	2134.7±96.3^{ab}	54.0±2.3ab
Long	173.8±3.3	1647.4±47.4^{a}	38.3±1.4^{a}	54.2±3.4^{a}	44.9±1.4	2432.6±159.0^{a}	60.1±3.8a
Breast width	*	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.
Short	176.5±3.3^{a}	1517.4±47.4	37.4±1.4	46.7±3.4	44.5±1.4	2086.2±159.2	52.0±3.8
Medium	171.4±2.1^{ab}	1547.4±30.6	35.6±0.9	47.3±2.2	43.6±0.9	2066.5±102.7	52.6±2.5
Long	168.4±3.3^{b}	1586.7±46.4	34.8±1.3	49.9±3.4	44.1±1.4	2194.1±155.7	55.5±3.7

Means in each column within each classification bearing the same superscripts are not significantly different (P < 0.05).
NS = Not significant and * = (P < 0.05).

on the studied egg production traits (Table 3). This results indicated that the egg production traits gradually increased (P<0.05) with decreasing the thigh length and with increasing the keel length. Similar results were obtained by Renden and Marble (1986) and Havenstein *et al.* (1988).

It is evident from Table 4 that the categories of all body measurements were no significant effects on the age at sexual maturity in the two strains, except the effect of breast width in Mandarah, where the age at sexual maturity gradually decreased (P<0.05) with increasing the breast width. On the other hand, the body weight at sexual maturity in the two strains was effected by category of all studied measurements except for breast width in Golden Montazah. The long keels of Golden Montazah produced heavier (P<0.05) the egg weight at sexual maturity than those of short once, while the other length of body measurements were no obvious effects. Similar results were obtained by Verma *et al.* (1979) and Kosba *et al.* (1985)

It seems that short thigh and long keel in Golden Montazah hens were related with higher (P<0.05) egg number, egg mass and rate of laying in the first 90 days of laying, while the other body measurements did not show significant (Table 5). Short shanks and long breast in Mandarah hens were related with the highest (P <0.05) egg number and rate of laying in the first 90 days of laying The medium keels and long breast hens were the heaviest (P<0.05) egg mass. The other body measurements did not show any significant relation ships in Mandarah hens (Table 5).

The obtained results indicated that thigh and keel lengths were greatly related with high egg production traits in Golden Montazah while the shank length and breast width lengths in Mandarah took the same importance. El-Weardany (1999 a, b). found the same results.

2. Egg quality traits:

Data presented in Table 6 showed that the Golden Montazah eggs were higher (P<0.05) Haugh unit than Mandarah eggs, while the other references between strains were not significant. These results agreed with those obtained by Selim (1994) who found that no significant differences were detected between Golden Montazah and Mandarah strains in both yolk, shell and albumen percentages. El-Labban (2000) and Hassan (2001) found that Golden Montazah have higher (P < 0.01) score of Haugh unit than Mandarah eggs. The category of all body measerments in the two strains were no clear effects on the majority of egg quality traits (table 6). It was observed that the short and medium shanks had the highest values of yolk and albumin percentages, respectively.

Table 7 showed that shank length in Golden Montazah had significantly (P<0.05) effect on egg shape index only. However, the keel length for Golden Montazah and shank, thigh and keel lengths in Mandarah had significantly (P<0.05) effect on yolk percentage. Either keel length (Golden Montazah) or shank length (Mandarah) had significantly (P<0.05)

Table 4: Least square means (± SE) of sexsual maturity traits in Golden Montazah and Mandarah laying hens according to body measurement categories at 20 weeks of age.

Classification	Golden Montazah			Mandarah		
	Age (day)	Body weight (g)	Egg weight (g)	Age (day)	Body weight (g)	Egg weight (g)
Shank length:	N. S.	*	N. S.	N. S.	*	N. S.
Short	170.5±5.3	1543.1±62.1^{b}	34.6±2.0	171.1±5.0	1419.5±74.1^{b}	35.1±2.2
Medium	173.0±3.0	1544.4±35.3^{b}	35.3±1.1	172.9±3.9	1517.8±57.8^{ab}	36.1±1.7
Long	175.7±5.6	1688.7±65.1^{a}	36.3±2.1	169.0±5.2	1589.5±76.7^{a}	38.3±2.3
Thigh length:	N. S.	*	N. S.	N. S.	*	N. S.
Short	173.3±5.1	1513.5±59.5^{b}	36.5±1.9	167.7±5.3	1404.1±79.2^{b}	36.2±2.4
Medium	175.5±3.7	1545.9±41.4^{b}	35.8±1.3	170.8±3.1	1507.0±46.3^{ab}	37.4±1.4
Long	170.4±5.1	1716.9±59.4^{a}	33.8±1.9	174.6±5.6	1615.7±82.7^{a}	35.9±2.5
Keel length:	N. S.	*	*	N. S.	**	N. S.
Short	172.5±5.0	1515.0±58.6^{b}	31.4±1.9^{b}	171.0±5.5	1360.9±82.1^{b}	36.0±2.4
Medium	172.2±3.2	1544.0±36.9^{b}	35.3±1.2^{ab}	169.2±2.9	1588.6±42.6^{a}	36.2±1.3
Long	174.6±5.3	1717.6±61.3^{a}	39.4±2.0^{a}	172.9±4.9	1577.1±73.0^{a}	37.2±2.2
Breast width	N. S.	N. S.	N. S.	*	*	N. S.
Short	175.9±5.3	1627.5±61.3	36.7±2.0	177.0±5.0^{a}	1407.3±74.1^{b}	38.2±2.2
Medium	172.8±3.6	1629.9±41.9	35.8±1.4	169.9±3.0^{b}	1464.8±44.8^{ab}	35.4±1.3
Long	170.6±4.8	1518.7±55.7	33.7±1.8	166.2±4.9^{b}	1654.7±72.4^{a}	35.9±2.2

Means in each column within each classification bearing the same superscripts are not significantly different (P<0.05).
NS = Not significant and * = (P < 0.05).

Table 5: Least square means (± SE) of egg production traits at the first 90 days of laying in Golden Montazah and Mandarah laying hens according to body measurement categories at 20 weeks of age.

Classification	Golden Montazah				Mandarah			
	Egg number	Egg weight (g)	Egg mass (g)	Rate of laying (%)	Egg number	Egg weight (g)	Egg mass (g)	Rate of laying (%)
Shank length:	N. S.	N.S.	N. S.	N. S.	*	N. S.	N. S.	*
Short	43.8±4.8	45.1±3.0	1980.7±239.4	48.5±5.3	53.5±5.0^{a}	43.3±1.1	2316.7±214.2	59.6±5.5^{a}
Medium	48.9±2.7	43.6±1.7	2139.9±135.9	54.3±3.0	47.0±3.9^{ab}	44.4±0.9	2088.9±167.2	52.3±4.3^{ab}
Long	53.7±5.0	43.4±3.1	2321.6±251.0	59.8±5.5	40.9±5.2^{b}	44.5±1.2	1845.6±221.6	45.6±5.7^{b}
Thigh length:	*	N.S.	*	*	N.S.	N. S.	N. S.	N. S.
Short	55.5±4.6^{a}	44.6±2.9	2469.2±229.4^{a}	61.6±5.1^{a}	46.4±5.3	43.6±1.2	2051.0±229.1	51.8±5.9
Medium	52.0±3.2^{ab}	43.6±2.0	2267.9±159.8^{ab}	57.8±3.5^{ab}	44.4±3.1	44.1±0.7	1961.9±133.8	49.4±3.4
Long	38.9±4.6^{b}	43.9±2.8	1705.0±229.0^{b}	43.2±5.1^{b}	50.5±5.6	44.5±1.2	2238.2±239.2	56.4±6.2
Keel length:	*	N.S.	*	*	N.S.	N. S.	*	N. S.
Short	40.9±4.5^{b}	43.1±2.8	1754.3±225.9^{b}	45.4±5.0^{b}	41.5±5.5	43.3±1.2	1804.7±237.5^{b}	46.5±6.1
Medium	44.5±2.8^{b}	43.7±1.8	1933.1±142.4^{b}	49.5±3.1^{b}	52.6±2.9	44.4±0.6	2336.2±123.2^{a}	58.4±3.2
Long	61.0±4.7^{a}	45.3±2.9	2754.8±236.3^{a}	67.6±5.2^{a}	47.3±4.9	44.4±1.1	2110.3±211.2^{ab}	52.6±5.4
Breast width	N.S	N.S.	N.S.	N.S.	*	N. S.	*	*
Short	55.0±4.7	44.2±2.9	2426.4±236.4	61.2±5.2	38.4±5.0^{b}	44.7±1.1	1745.9±214.4^{b}	42.7±5.5^{b}
Medium	45.6±3.2	43.9±2.0	2008.5±161.5	50.6±3.6	49.0±3.0^{ab}	43.3±0.7	2124.3±129.4^{ab}	54.6±3.3^{ab}
Long	45.7±4.3	44.0±2.7	2007.2±214.7	50.7±4.7	54.0±4.9^{a}	44.1±1.1	2380.9±209.3^{a}	60.2±5.4^{a}

Means in each column within each classification bearing the same superscripts are not significantly different (P < 0.05).
NS = Not significant and * = (P < 0.05).

effect on albumen percentage. Breast width and thigh lengths for Mandarah had significantly (P<0.05) effect on shell percentage and Haugh unit, respectively, while the other studied body measurements did not show any significant in the two strains.

Association aspects:

It is evident from Table 8 that shank length positively correlated (P<0.05) with each of body weight at sexual maturity in both strains, shell percentage in Golden Montazah and egg weight and Haugh unit in Mandarah. Negatively correlation coefficient (P<0.05) between shank length and each of, egg number, egg weight, egg mass and rate of laying in Mandarah which indicated that short shank length is a good indicator for egg production and quality traits studied in this strain. There were a positive and significantly (P<0.05) correlation coefficients between thigh length and each of body weight at sexual maturity (in both strain) and egg weight in the first 90 days of laying (in Golden Montazah), while it was negatively correlated (P<0.05) with each of egg number, rate of laying, egg shape index, albumen and shell percentages in Golden Montazah, yolk percentage and Haugh unit in Mandarah. These results indicated that short thigh length effect was more evident for high egg production traits studied in Golden Montazah. Similar results are agreement with those reported by Verma *et al.* (1979) and Tawfeek (1981).

Table 6: Least square means (± SE) of egg quality traits as affected by strain and body measurements categories at 20 weeks of age.

Classification	Egg shape index	Yolk (%)	Albumin (%)	Shell (%)	Haugh unit
Strains:	NS	NS	NS	NS	*
Golden Montazah	77.2±0.8	31.0±0.7	55.9±0.8	13.1± 0.4	90.0±2.2[a]
Mandarah	75.6±0.8	30.5±0.7	56.9±0.8	12.6±0.4	75.7±2.3[b]
Shank length:	N. S.	*	*	N. S.	N. S.
Short	75.6±1.3	32.4±1.1[a]	54.7±1.3[b]	12.9±0.6	80.7±3.7
Medium	75.5±0.9	29.5±0.8[b]	57.6±0.9[a]	12.9±0.4	81.9±2.6
Long	78.1±1.3	30.4±1.1[b]	56.8±1.3[ab]	12.8±0.6	85.9±3.6
Thigh length:	N. S.	N. S.	N. S.	N. S.	N. S.
Short	77.4±1.2	31.1±1.0	56.2±1.2	12.7±0.6	83.6±3.4
Medium	76.1±0.9	31.0±0.8	56.2±0.9	12.8±0.4	85.0±2.5
Long	75.6±1.3	30.2±1.1	56.8±1.3	13.0±0.7	80.0±3.8
Keel length:	N. S.	N. S.	N. S.	N. S.	N. S.
Short	76.3±1.3	31.4±1.1	55.9±1.3	12.7±0.6	85.4±3.6
Medium	77.0±0.7	31.0±0.6	56.0±0.7	130±0.3	80.0±1.9
Long	75.9±1.5	29.9±1.3	57.3±1.5	12.8±0.07	83.1±4.3
Breast width	N. S.	N. S.	N. S.	N. S.	N. S.
Short	77.0±1.2	30.2±1.0	57.1±1.2	12.7±0.6	85.3±3.5
Medium	77.2±0.8	31.0±0.7	56.2±0.8	12.8±0.4	83.2±2.3
Long	75.0±1.0	31.0±0.8	56.0±1.0	13.0±0.5	80.1±2.8

Means in each column within each classification bearing the same superscripts are not significantly different (P < 0.05).
NS = Not significant and * = (P < 0.05).
Egg shape index = (width / length x 100).
Haugh unit calculating using the calculator chart for rapid conversion of egg weight and albumen height to HU according to (Haugh, 1937).

Table 7: Least square means (± SE) of egg quality traits in Golden Montazah and Mandarah laying hens according to body measurement categories at 20 weeks of age.

Classification	Golden Montazah					Mandarah				
	Egg shape index	Yolk (%)	Albumen(%)	Shell (%)	Haugh unit	Egg shape index	Yolk (%)	Albumen (%)	Shell (%)	Haugh Unit
Shank length:	*	N. S.	N. S.	N. S.	N. S.	N. S.	*	*	N. S.	N. S.
Short	77.2±1.6^{ab}	32.7±1.8	54.8±2.1	12.5±1.1	87.9±5.1	74.0±2.3	32.1±1.4^{a}	54.6±1.7^{b}	13.3±0.8	73.5±6.0
Medium	75.0±1.0^{b}	29.9±1.1	56.5±1.4	13.6±0.7	90.2±3.3	75.9±2.0	29.1±1.2^{b}	58.8±1.5^{a}	12.1±0.7	73.6±5.2
Long	79.3±1.3^{a}	30.5±1.5	56.4±1.8	13.1±1.0	91.9±4.3	76.9±2.6	30.3±1.6^{ab}	57.3±1.9^{ab}	12.4±0.9	79.9±6.8
Thigh length:	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	*	N. S.	N. S.	*
Short	78.2±1.5	30.2±1.8	56.7±2.1	13.1±1.1	90.3±5.0	76.7±2.1	32.0±1.3^{a}	55.7±1.5	12.3±0.7	76.8±5.4^{ab}
Medium	76.9±1.0	31.2±1.1	56.0±1.3	12.8±0.7	88.6±3.2	75.2±1.7	30.8±1.0^{ab}	56.5±1.3	12.7±0.6	81.3±4.4^{a}
Long	76.4±1.2	31.6±1.4	55.1±1.7	13.3±0.9	91.1±3.9	74.9±3.4	28.7±2.1^{b}	58.5±2.5	12.8±1.2	68.8±8.8^{b}
Keel length:	N. S.	*	*	N. S.	N. S.	N. S.	*	N. S.	N. S.	N. S.
Short	78.4±1.4	34.0±1.6^{a}	53.1±2.0^{b}	12.9±1.1	92.3±4.7	74.2±2.4	28.9±1.5^{b}	58.7±1.8	12.4±0.8	78.5±6.2
Medium	77.8±0.7	29.7±0.8^{b}	57.0±1.0^{a}	13.3±0.5	87.8±2.4	76.2±1.2	32.2±0.7^{a}	54.9±0.9	12.9±0.4	72.2±3.2
Long	75.3±1.9	29.4±2.2^{b}	57.6±2.7^{a}	13.0±1.4	90.0±6.3	76.4±2.9	30.3±1.8^{ab}	57.2±2.1	12.5±1.0	76.2±7.5
Breast width	N.S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	*	N. S.
Short	77.3±1.3	29.8±1.5	56.7±1.8	13.5±1.0	88.7±4.3	76.7±2.4	30.7±1.5	57.4±1.8	11.9±0.9^{b}	81.8±6.3
Medium	78.4±1.1	31.7±1.2	55.9±1.4	12.4±0.8	90.8±3.4	75.9±1.5	30.2±0.9	56.5±1.1	13.3±0.5^{a}	75.5±4.0
Long	75.8±1.3	31.6±1.4	55.1±1.7	13.3±0.9	90.5±4.1	74.1±1.8	30.6±1.1	56.8±1.3	12.6±0.6^{ab}	69.7±4.7

Means in each column within each classification bearing the same superscripts are not significantly different ($P < 0.05$).
NS = Not significant and * = ($P < 0.05$).

Egg shape index = (width / length) x 100.

Haugh unit calculating using the calculator chart for rapid conversion of egg weight and albumen height to HU according to (Haugh, 1937).

Table 8 also, shows that keel length significantly correlated (P<0.05) with each of body weight and egg weight at sexual maturity, egg number, egg mass, rate of laying and shell percentage in Golden Montazah as well as body weight at sexual maturity in Mandarah, while it negatively associated (P<0.05) with each of egg shape index and yolk percentage in the first one and each of yolk percentage and Haugh unit in the second one. These results revealed that keel length with a good evident relationship for egg production traits studied in Golden Montazah. These results agree with those obtained by Rendan and Marble (1986) and Leeson and Summers (1990)

Table 8: Correlation coefficients (r) between body measurements and all studied traits.

Body measurements	Golden Montazah				Mandarah			
	Shank length	Thigh length	Keel length	Breast width	Shank length	Thigh length	Keel length	Breast width
At sexual maturity :								
Age	0.082	-0.113	0.193	-0.081	-0.095	-0.026	-0.015	-0.257*
Body weight	0.287**	0.494**	0.367**	0.208*	0.315**	0.242*	0.321**	0.288**
Egg weight	0.181	0.085	0.242*	0.160	0.146	0.099	0.092	-0.112
At first 90 days of laying:								
Egg number	0.077	-0.225*	0.244*	-0.049	-0.278**	0.184	0.089	0.254*
Egg weight	0.123	0.218*	0.126	0.144	0.303**	0.117	0.143	-0.004
Egg mass	0.128	-0.005	0.195*	-0.113	-0.251*	0.118	0.131	0.246*
Rate of laying	0.076	-0.227*	0.241*	-0.047	-0.196*	0.184	0.087	0.253*
Egg quality traits:								
Egg shape index	-0.101	-0.273**	-0.215*	-0.343**	0.126	-0.132	-0.097	-0.124
Yolk (%)	-0.142	0.044	-0.206*	0.119	-0.197*	-0.195*	-0.227*	-0.033
Albumen (%)	-0.001	-0.234*	0.025	0.008	0.143	0.147	-0.074	-0.089
Shell (%)	0.217*	-0.359**	0.240*	0.135	0.013	0.039	0.233**	0.233*
Haugh unit	0.130	0.107	-0.111	-0.124	0.351**	-0.329**	-0.433**	-0.424**

* = P < 0.05 and ** = P< 0.01

Breast width positively associated (P<0.05) only with body weight at sexual maturity in Golden Montazah and with each of body weight at sexual maturity, egg number, egg mass, rate of laying and shell percentage in Mandarah, while the negative association (P<0.05) were with egg shape index in Golden Montazah and age at sexual maturity and Haugh unit in Mandarah. Therefore breast widths in Mandarah hens were significantly associated with most of egg production traits studied. These results agree with those obtained by El-Weardany (1999 a, b).

Conclusively, it could be concluded that thigh and keel lengths were greatly related with high egg production traits in Golden Montazah, while the shank and breast width lengths in Mandarah took the same importance. Further future studies for these points mast be investigated.

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العلاقة بين بعض مقاييس الجسم والأداء الإنتاجي لدجاج المنتزه الدهبى و المندرة

عبدالهادي حسن عبد القادر حسن
معهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية –الجيزة – مصر.

اجري البحث لدراسة العلاقة بين بعض مقاييس الجسم عند عمر ٢٠ أسبوعا علي الأداء الإنتاجي لسلالتين محليتين من الدجاج في مصر، حيث تم وزن ٢١٢ انثى بداري من سلالة المنتزة الدهبي والمندرة (١٠٦ انثى بداري من كل سلالة) فرديا وتم أخذ طول الساق وطول الفخذ وطول عظمة القص وعرض الصدر عند عمر ٢٠ أسبوعا وتم تقسيم الأطوال لكل منها إلي قصير ومتوسط وطويل واسكنت البدارى فى أقفاص التسجيل الفردي وتم تسجيل البيض (عدد ووزن) فرديا حتى الـ٩٠ يوما الاولى من الانتاج وأخذت بيضة واحدة لكل أم و خلال الأسبوع الاخير من الانتاج لتقدير صفات جودة البيض، وكانت النتائج كما يلى:

١- متوسط عمر النضج الجنسي للمنتزة الدهبي ١٧٣,١ يوما وللمندرة ١٧١ يوما، و يقل عمر النضج الجنسى معنويا (عند مستوى ٠,٠٥) بزيادة طول عرض الصدر.
٢- كان متوسط وزن النضج الجنسي للمنتزة الدهبي ١٥٩٢,١ جراما وللمندرة ١٥٠٨,٩ جراما. وسجلت البداري ذات مقاييس الجسم الطويلة وزنا أثقل للنضج الجنسي (عند مستوى ٠,٠٥) ما عدا طول عرض الصدر.
٣- كان متوسط وزن البيض عند النضج الجنسي للمنتزة الدهبي ٣٥,٤ جراما وللمندرة ٣٦,٥ جراما. ويزيد وزن البيضة عند النضج الجنسي معنويا (عند مستوى ٠,٠٥) بزيادة طول القص.
٤- تفوق دجاج المنتزة الدهبي معنويا (عند مستوى ٠,٠٥) في عدد البيض وكتلته ومعدل الإنتاج على دجاج المندرة. بينما لا يوجد اختلافا معنويا في وزن البيض للسلالتين خلال الـ ٩٠ يوم الأولي من الإنتاج. يزيد انتاج البيض تدريجيا بزيادة طول القص و قصر طول الفخذ، و تفوق دجاج المنزة الدهبي قصير الفخذ وطويل القص معنويا (عند مستوى ٠,٠٥) لعدد البيض وكتلته و معدل الإنتاج خلال الـ ٩٠ يوم الأولي من الإنتاج بينما تفوق دجاج المندرة قصير الساق وعريض الصدر معنويا (عند مستوى ٠,٠٥) للصفات سابقة الذكر.
٥- تفوق بيض المنتزة الدهبي معنويا (عند مستوى ٠,٠٥) لمعامل وحدات الهو على بيض المندرة ولا يوجد اختلافا معنويا بين مكونات بيض السلالتين.
٦- كان طول الساق للمنتزة الدهبي له تأثيرا معنويا (عند مستوى ٠,٠٥) علي دليل شكل البيضة فقط بينما طول القص للمنتزة الدهبي وطول كل من الساق والفخذ والقص للمندرة لهم تأثيرا معنويا (عند مستوى ٠,٠٥) علي نسبتي الصفار و البياض المئوية بينما طول الفخذ وعرض الصدر للمندرة كان تأثيرهم معنويا علي معامل وحدات الهو ونسبة القشرة المئوية.
٧- الارتباط المظهري لبداري المنتزه الدهبي معنوي (عند مستوى ٠,٠٥) وسالب بين طول الفخذ ومعظم صفات إنتاج البيض بينما كان معنويا (عند مستوى ٠,٠٥) وموجبا بين طول القص ومعظم هذه الصفات.
٨- الارتباط المظهري لبداري المندرة معنويا (عند مستوى ٠,٠٥) وسالبا بين طول الساق ومعظم صفات إنتاج البيض بينما كان معنويا (عند مستوى ٠,٠٥) وموجبا بين طول عرض الصدر ومعظم هذه الصفات.

توجد علاقة قوية بين إنتاج البيض و طول الفخذ و القص فى المنتزة الدهبي، ومع طول الساق وعرض الصدر فى المندرة.خلال الـ٩٠ يوما الاولى من الانتاج عند عمر ٢٠ أسبوعا.