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INFLUENCE OF NAKED NECK, FRIZZLE, CREST GENES AND THEIR TRIPLE SEGREGATION ON PRODUCTIVITY OF LAYER CHICKENS UNDER HOT ENVIRONMENTAL CONDITIONS

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Abstract: *This experiment was conducted to compare the effects of naked neck (Na), frizzle (F) and crest (Cr) genes in a single manner or in a triple segregation case on laying performance and egg quality traits under summer season conditions of Egypt. Five genotypes including; normal (nanaffcrcr), naked neck (Nanaffcrcr), frizzle (nanaFfcrcr), crest (nanaffCrcr) and naked neck frizzle crest (NanaFfCrcr) were evaluated in this trial. The main results can be summarized as follows:*

- *According to the lower ambient temperature during the growing period. Hens carrying crest gene had a heavier body weight at sexual maturity as compared to the other genotypes.*
- *It is noteworthy that both crested and triple segregation hens reached sexual maturity later than the other genotypes and the differences among all genotypes were highly significant.*
- *The existence of Na, F and Cr genes in a triple state increased egg weight compared to the others. This increment may attribute to additive gene effect or complementary gene effect.*
- *Both naked neck and frizzle genotypes had a heavier egg mass, higher egg number and higher intensity of laying as compared to other genetic groups. The triple segregation genotype recorded the lowest values of such traits.*
- *From economical point of view , all hens carrying Na, F and Cr genes in a single or combined manner not only decreased the broken eggs compared to the normal type hens but also increased the breaking strength of eggshells.*
- *Introducing Na, F and Cr genes into birds (triple segregation genes) significantly increased albumen %, albumen height and Haugh units*

when compared with other genotypes. Also, the triple segregation hens recorded the heaviest shell weight as compared to the remaining genotypes.

- *In all genotypes, there was a significantly positive and strong correlation between egg weight and either long or short axes of eggs. The previous relationship was more pronounced in case of triple segregation genotype rather than single genes.*

In conclusion, incorporating either Na or F gene in a single manner increased some productive traits such as egg mass, egg number, shell thickness and breaking strength. Hens carrying the three alleles had a benefit effect on egg weight, albumen %, albumen height and Haugh units, but deterioration effect was observed on egg number, egg mass and age at sexual maturity.

INTRODUCTION

Feathers are probably the most complex derivatives of the integument to be found in any vertebrate and they are certainly one of the most striking anatomical features of birds. Also, the feathers are useful indicator of the growth rate and sex of the bird (Stevens, 1991). As known, major and marker genes play an important role in the structure of the feathers, their pattern, apteria width, growth rate and ultimate size beside that improving productive performance in poultry flocks. A favorable impact of both naked neck and frizzle genes on productive performance and egg quality traits of layers under hot environmental conditions as compared with the normally feathered ones was reported (Zein El-Dein, 1981; Haaren-Kiso et al., 1988; Haaren-Kiso et al., 1994; Mérat, 1986; Mérat et al., 1994; Galal, 1995; Barua et al., 1998; Galal et al., 2000; El-Safty et al., 2003 and Mahrous et al., 2003). The presence of crest gene can lead not only to change in skull morphology but also to increase feather mass (Hussen, 2000; Frahm et al., 2001; Fathi and Galal, 2001; Galal and Fathi, 2002 and Galal, 2003). The introduction of Cr gene into naked neck birds reared under moderate ambient temperatures resulted in improving laying performance compared to their counterparts bearing Na gene only (Galal and Fathi, 2002). In accordance with the previous result, the interaction between genes might be taken into consideration in crossing and breeding programs. The current trial was designed to compare the effect of naked neck, frizzle and crest genes in a single manner or in triple segregation state on laying performance and egg quality measurements under hot climate.

MATERIALS AND METHODS

Birds and management

The current study was conducted at Poultry Farm, Poultry Production Department, Faculty of Agriculture, Ain Shams University. Heterozygous naked neck frizzle cocks (NanaFfcrcr) were artificially inseminated with heterozygous crest females (nanaffCrcr). According to the previous procedure of mating scheme, five genetic groups (normal, nanaffcrcr; naked neck, Nanaffcrcr; frizzle, nanaFfcrcr; crest, nanaffCrcr and naked neck frizzle crest, NanaFfCrcr) were considered in this study. Hatched chicks were wing-banded and brooded in electrical brooding batteries. Then, at 4 weeks of age, all chicks were transferred to floor pens. At 16 weeks of age, a total of 92 (24 nanaffcrcr, 22 Nanaffcrcr, 16 nanaFfcrcr, 15 nanaffCrcr and 15 NanaFfCrcr) were assigned and transferred to individual wire cages located in open-side house until the end of the experiment. All hens were reared under similar managerial, environmental and hygienic conditions. During the laying period, they were fed a laying diet containing 16% crude protein, 2924 kcal ME/kg, 3.4% calcium and 1.0% available phosphorus. The birds were supplied with water from a low pressure nipple-drinking water system *ad libitum* throughout the study. The mean of indoor high and low ambient temperatures recorded during the trial period were 32±1 and 21±1 °C, respectively.

Measurements

Phenotypic and productive parameters at maturation including body weight, keel length, shank length, body depth and length of head appendages (comb and wattle) were measured. Also age at sexual maturity was determined in days from hatching up to the onset of laying. Egg production was recorded daily for the first 90 days of laying period (egg number and intensity of laying) likewise, the broken eggs were determined. Eggs laid were individually weighed for each hen throughout the considered laying period. At 32 weeks of age, egg quality evaluation was assisted for all genotypes. 125 eggs were randomly collected from all genotypes (25 each). Short axe and long axe of eggs were measured using a digital caliper to calculate egg shape. Each egg was first weighed to the nearest 0.1g. Eggs were used to measure egg components by separating albumen, yolk and eggshell. Thick albumen, yolk height and yolk diameter were measured. Shell plus membranes were washed to remove adhering albumen. After drying, shells were weighed upon cooling to the nearest 0.01g. Average shell thickness was calculated from two measurements taken with a dial gauge micrometer of the shell from middle section. The shell percentage

was calculated as the ratio of shell weight to egg weight multiplied by 100. The strength of eggshell was determined according to Fathi and El-Sahar (1996) using eggshell strength apparatus. Haugh units were calculated according to Stadelman et al. (1988).

Statistical analysis

Data were subjected to one-way analysis of variance with genotype effect using the General Linear Model (GLM) procedure of SAS User's Guide, 1998 according to the following model;

$Y_{ij} = \mu + G_i + e_{ij}$

Where;

μ = overall mean,

G_i= genotype effect (i =1, 2),

e_{ij} = experimental error.

RESULTS AND DISCUSSION

The results of measurements taken at sexual maturity as affected by naked neck, frizzle, crest genes and their triple segregation are presented in Table (1). The presence of Cr gene in a single manner significantly increased body weight at sexual maturity as compared to the other genotypes. The reduction in body weight associated with Na and F genes may be due to the lower ambient temperature which prevailing during its growing period. As known, the expression of either Na or F genes under low ambient temperature is reduced, especially for body weight trait. On the other hand, the increasing of body weight which associated with Cr gene may be attributed to the higher feather coverage (11%) associated with Cr gene compared to non-crested birds (Hussen, 2000 and Galal and Fathi, 2002), consequently the birds carrying Cr gene may be need less energy for maintenance of body temperature compared to non-crested birds under low ambient temperatures. In case of triple segregation genes (NanaFfCrcr), it could be noticed that the negative effect of Na and F genes on body weight during growing stage was more pronounced rather than the positive effect of Cr gene on the previous trait throughout this study. Furthermore, the combination between F and Cr genes (double segregation) under low ambient temperature was significantly decreased body weight of males chicken up to 16 weeks of age as compared to normally feathered genotype, however introducing Cr gene into frizzling birds lead to diminish feather covering by about 13 % but the F gene in a single state reduced feather density by about 6.3 % (El-Safty and Fathi, 2004). The same trend was

observed for keel length, shank length and body depth, where birds carrying Cr gene in a single manner had higher values compared to the others. Regarding comb and wattles lengths, the presence of crest allele in a single status decreased length of comb and wattles compared to the others. The previous result sustained by Hussen (2000) and Galal and Fathi (2002). In birds bearing triple segregation genes, the length of comb and wattles was intermediate within the all genetic groups. The frizzled females (nanaFfcrcr) attained sexual maturity earlier than that of normally feathered ones (nanaffcrcr) by around 5.5 days. Birds carrying Na gene in a single manner reached the age at first egg almost with the normal birds. Both birds carrying Cr gene in a single status and birds carrying triple segregation genes reached sexual maturity later than the other genotypes, especially than NanaFfCrcr females. The differences among all groups were highly significant. From the previous result, it could be seen that the Cr gene may be play a negative role in maturation age under the prevailing situations of this study, particularly when the interaction was done among the three major genes (Na*F*Cr).

Egg production parameters of laying hens as affected by naked neck, frizzle, crest and triple segregation genes are shown in Table (2). It could be observed that hens bearing triple segregation genes had a heavier egg weight compared to other genetic groups. As known, there is an increase in egg weight associated with Na gene in a single manner or in a combined with F gene due to the increase in albumen weight (Bordas et al., 1980; Fathi, 1987 and Galal et al., 2000). In the light of the previous result, it could be observed that the positive additive effect or complementary gene effect existed also among the three genes in egg weight trait. In respect of egg mass trait, it could be noticed that both frizzled and naked neck hens had heavier egg mass compared to the others and the differences were significant. Similar trend was noticed for egg number and intensity of laying traits, where the presence of either Na or F gene in a single state significantly produced higher egg number compared to other genotypes, especially triple segregation hens. Regarding the broken eggs, the normal hens had significantly higher percentage of this trait (3.2%) compared to others, while crest hens recorded the lowest percentage (1.2%), the triple segregation hens were intermediate figures.

Internal egg quality traits for all genotypes are summarized in Table (3). As aforementioned, the triple segregation hens had also heavier egg weight compared to other genetic groups. There was a significant difference among genotypes in yolk%, where the normal hens recorded the highest value, while the triple segregation hens recorded the lowest value. In

contrast trend was observed for albumen %, where the triple segregation hens had the highest figure, whereas the normal type female had the lowest figure. From the previous results, it could be illustrated that, in general the heavier egg weight associated with lower yolk % and higher albumen %. Likewise, the lighter egg weight associated with higher yolk % and lower albumen %. With respect to yolk height, there was no significant difference among groups in such trait. Whereas, the significant differences were observed among groups for albumen height, where the triple segregation hens had the highest value compared to the others. There were no significant differences among all genotypes for yolk diameter trait. According to the previous results of egg weight and thick albumen height, hens bearing the three genes had a higher Haugh units compared to the all other groups, especially the females carrying crest gene in a single state. Galal et al. (2000) may be supported this finding, who found that the Na Ff genotype had a higher Haugh units compared to normal type hens.

The measurements of eggshell quality for the five genotypes undertaken in this study are presented in Table (4). The triple segregation genotype had a higher eggshell weight as compared to the others, while the crest genotype had a lower value for the trait and the difference was significant. No significant differences in shell % and shell thickness with membranes were observed among genotypes. Concerning the term of shape index, it could be noticed that both naked neck and normal hens recorded the highest values as compared to the other genotypes and the differences were significant. As expected, the naked neck, frizzled and also triple segregation genotypes significantly increased breaking strength of eggshell when compared with both normal and crest genotypes. From the previous results, it could be observed that, both Na and F genes were modify the negative effect of Cr gene on shell thickness, shape index and breaking strength to positive in the triple segregation genotype. In this context, Zulkifili et al. (1992) stated that the combination between Na and F genes in non-dwarfed genotype background appeared to have a positive interactive effect on several egg quality traits.

Table (5) gives the phenotypic correlations between egg weight and some traits of egg production and quality. In all genotypes, there was a significant positive and strong correlation between egg weight and either long or short axes of egg. This relationship was more pronounced in triple segregation genotype (r_p=0.89 and 0.97, respectively). The previous result meant that both long and short axes of egg had a positive effect on egg weight at all situations. Therefore, direct selection to egg size is consequently increasing egg weight at the same time. With respect to

albumen height and albumen % and its relationship with egg weight, it could be noticed that both naked neck and frizzled genotypes recorded the highest values (r_p= 0.81 and 0.63, respectively) followed by triple segregation genotype, but in normal and crest genotypes, the phenotypic correlation between the previous traits was low and weak. The same trend was realized for yolk height and diameter, where both naked neck and frizzled genotypes had positive correlation coefficients, whereas in normal type hens, there was a negative and very low correlation for such trait. Also, the negative correlation was observed in crest genotype. The current results revealed that there was a positive correlation between egg weight and yolk weight, especially in naked neck and frizzled genotypes (significant correlation). Regarding yolk %, both normal and crest hens recorded the highest values for r_p measure (r_p=0.73 and 0.85, respectively) followed by triple segregation genotype (r_p= 0.70). The phenotypic correlation between egg weight and shell weight in all genotypes was positive and high except in normal type hens (r_p= 0.16). As an expected result, there was a negative correlation between egg weight and shell thickness in all genotypes, this trend was more pronounced in both crest and triple segregation genotypes (r_p= -0.63 and -0.77, respectively). The previous result could be attributed to the heavier egg weight always accompaniment with less shell thickness, especially with increasing age. The same trend was observed in breaking strength trait, where the negative relationship between egg weight and breaking strength was established in all genotypes. Concerning the phenotypic correlation between egg weight and some egg production traits, it could be noticed that the negative relationship between egg weight and either egg number or intensity of laying was observed in all genotypes, except in naked neck hens, there was a positive and weak correlation between such trait was observed. Likewise, the phenotypic correlation between egg weight and broken eggs was negatively high and significant in all genotypes, except naked neck hens, the r_p measure was negatively moderate (-0.40).

Finally, it could be concluded that, under summer season conditions of Egypt, both Na and F alleles had a positive effect on some laying performance and egg quality traits such as egg mass, egg number, intensity of laying, shell %, breaking strength. On the other hand, combining the three alleles (triple segregation genotype) resulted in a better performance of some traits compared to the other genotypes, particularly egg weight, albumen %, albumen height and Haugh units measurements.

Table (1): Measurements taken at sexual maturity of females as affected by naked neck, frizzle, crest and triple segregation genes.

	Genotype					
Trait	**nanaffcrcr**	**Nanaffcrcr**	**nanaFfcrcr**	**nanaffCrcr**	**NanaFfCrcr**	**Prob.**
Body weight (g)	1510.2^{b}±32.8	1490.9^{b} ±45.4	1503.5^{b} ±42.0	1681.1^{a}±64.0	1406.1^{b} ±53.6	0.02
Keel length, cm	10.2$^{a\,b}$ ±0.13	10.0$^{a\,b}$ ±0.20	10.3$^{a\,b}$ ±0.15	10.6^{a} ±0.28	9.8^{b} ±0.17	0.05
Shank length, cm	8.8±0.06	8.7±0.12	8.8±0.17	9.1±0.19	8.7±0.17	NS
Body depth, cm	11.2±0.19	11.1±0.14	11.1±0.16	11.5±0.28	11.1±0.33	NS
Comb length, cm	2.5±0.15	2.6±0.14	2.4±0.14	2.2±0.23	2.4±0.18	NS
Wattle length, cm	2.3±0.11	2.5±0.11	2.2±0.13	2.1±0.18	2.5±0.21	NS
Age at sexual maturity, day	171.6^{d} ±2.7	171.5^{d}±2.7	166.1^{c}±3.7	177.0^{b} ±4.3	187.9^{a} ±5.1	0.004

	Gene effect %			
	Na	F	Cr	Na*F*Cr
Body weight (g)	-1.28^{ns}	-0.44^{ns}	+11.3*	-6.9^{ns}
Keel length, cm	-1.9^{ns}	+0.98^{ns}	+3.9^{ns}	-3.9^{ns}
Shank length, cm	-1.1^{ns}	0.00	+3.4^{ns}	-1.1^{ns}
Body depth, cm	-0.9^{ns}	-0.89^{ns}	+2.7^{ns}	-0.9^{ns}
Comb length, cm	+4.0^{ns}	-4.0^{ns}	-12.0^{ns}	-4.0^{ns}
Wattle length, cm	+8.7^{ns}	-4.3^{ns}	-8.7^{ns}	+8.7^{ns}
Age at sexual maturity, day	-0.06^{ns}	-3.2**	+3.1**	+9.5**

^{a,b,c,d} values with different superscripts are statistically different within the same raw.
Gene effect: mean of genotype-nanaffcrcr/ nanaffcrcr*100.
* P≤ 0.05 **P≤ 0.01 ns: not significant.

Table (2): Egg production traits of females as affected by naked neck, frizzle, crest and triple segregation genes.

	Genotype					
Trait	**nanaffcrcr**	**Nanaffcrcr**	**nanaFfcrcr**	**nanaffCrcr**	**NanaFfCrcr**	**Prob.**
Egg weight, g	42.2^{b}±0.81	$42.7^{a\ b}$ ±0.44	$42.6^{a\ b}$ ±0.61	42.0^{b} ±0.75	43.9^{a} ±0.55	0.05
Egg mass, g	$2647.8^{a\ b}$ ±109.4	2879.6^{a} ±133.9	2908.4^{a} ±78.9	2350.7^{bc} ±196.2	2180.0^{c} ±134.1	0.004
Egg number	$62.8^{a\ b}$ ±2.8	67.5^{a} ±2.9	68.2^{a} ±2.3	56.0^{bc} ±4.3	49.6^{c}±3.0	0.002
Intensity of laying %	$69.7^{a\ b}$ ±3.1	74.9^{a} ±3.3	75.7^{a} ±2.6	62.2^{bc} ±4.8	55.1^{c}±3.4	0.002
Broken eggs %	3.18^{a} ±0.49	$2.1^{a\ b}$ ±0.27	$1.88^{a\ b}$ ±0.45	1.20^{b} ±0.10	$1.9^{a\ b}$ ±0.15	0.05

	Gene effect %			
	Na	F	Cr	Na*F*Cr
Egg weight, g	$+1.2^{ns}$	$+0.95^{ns}$	-0.47^{ns}	+4.02*
Egg mass, g	$+8.8^{ns}$	$+9.8^{ns}$	$-11..2^{ns}$	-17.6**
Egg number	$+7.5^{ns}$	$+8.6^{ns}$	-10.8^{ns}	-21.01**
Intensity of laying %	$+7.5^{ns}$	$+8.6^{ns}$	-10.8^{ns}	-20.9**
Broken eggs %	-34.0^{ns}	-40.9^{ns}	-62.3*	-40.3*

^{a,b,c} values with different superscripts are statistically different within the same raw.

Gene effect: mean of genotype-nanaffcrcr/ nanaffcrcr*100.

* P≤ 0.05 **P≤ 0.01 ns: not significant.

Table (3): Internal egg quality as affected by naked neck, frizzle, crest and triple segregation genes.

	Genotype					
Trait	**nanaffcrcr**	**Nanaffcrcr**	**nanaFfcrcr**	**nanaffCrcr**	**NanaFfCrcr**	**Prob.**
Egg weight, g	44.5^{bc}±0.79	45.3^{ab} ±0.91	44.5^{bc} ±1.26	43.1^{c}±0.72	48.9^{a} ±1.23	0.02
Yolk weight, g	14.9 ±0.44	14.3 ±0.23	14.5 ±0.42	13.9 ±0.49	14.8 ±0.38	NS
Yolk, %	33.7^{a}±0.82	31.6^{ab} ±0.31	32.7^{ab} ±0.57	32.2^{ab} ±0.64	30.4^{b}±0.73	0.01
Albumen weight, g	25.4^{b}±2.3	26.6^{ab} ±1.9	25.6^{ab} ±2.0	25.1^{b} ±2.1	29.4^{a}±2.8	0.05
Albumen, %	56.7^{b}±1.09	58.6^{ab} ±0.37	57.5^{ab} ±0.63	58.1^{ab} ±0.96	60.0^{a}±0.57	0.05
Yolk height, mm	17.7±0.33	17.9±0.31	18.0±0.41	17.8±0.25	18.2±0.32	NS
Albumen height, mm	8.8^{ab}±0.35	8.9^{ab}±0.31	8.9^{ab} ±0.25	8.4^{b} ±0.09	9.8^{a} ±0.18	0.05
Yolk diameter, mm	3.9±0.03	3.8 ±0.04	3.9±0.05	3.9±0.03	3.8±0.05	NS
Haugh units	$75.5^{a\,b}$ ±2.5	75.3^{ab}±2.4	76.1^{ab} ±1.6	72.6^{b} ±0.4	80.6^{a} ±1.1	0.05

	Gene effect %			
	Na	F	Cr	Na*F*Cr
Egg weight, g	$+1.8^{ns}$	0.00	-3.1^{ns}	+9.9*
Yolk weight, g	-4.0^{ns}	-2.7^{ns}	-6.7^{ns}	-0.67^{ns}
Yolk, %	-6.2^{ns}	-2.9^{ns}	-4.5^{ns}	-9.8**
Albumen weight, g	$+4.7^{ns}$	$+0.79^{ns}$	-1.2^{ns}	+15.7*
Albumen, %	$+3.4^{ns}$	$+1.4^{ns}$	$+2.5^{ns}$	+5.8*
Yolk height, mm	$+1.1^{ns}$	$+1.7^{ns}$	$+0.56^{ns}$	$+2.8^{ns}$
Albumen height, mm	$+1.1^{ns}$	$+1.1^{ns}$	-4.5^{ns}	$+11.4^{ns}$
Yolk diameter, mm	-2.6^{ns}	0.00	0.00	-2.6^{ns}
Haugh units	-0.3^{ns}	$+0.79^{ns}$	-3.8^{ns}	$+6.8^{ns}$

^{a,b,c} values with different superscripts are statistically different within the same raw.

Gene effect: mean of genotype-nanaffcrcr/ nanaffcrcr*100.

* P≤ 0.05 **P≤ 0.01 ns: not significant.

Table (4): Eggshell quality traits as affected by naked neck, frizzle, crest and triple segregation genes.

	Genotype					
Trait	**nanaffcrcr**	**Nanaffcrcr**	**nanaFfcrcr**	**nanaffCrcr**	**NanaFfCrcr**	**Prob.**
Shell weight, g	4.2^{ab}±0.16	4.4^{ab} ±0.07	4.4$^{a\,b}$ ±0.16	4.0^{b} ±0.19	4.7^{a} ±0.23	0.05
Shell, %	9.6 ±0.39	9.8 ±0.16	9.9 ±0.25	9.8 ±0.34	9.6 ±0.30	NS
Shell thickness, mm	0.34 ±0.01	0.36 ±0.01	0.35 ±0.01	0.33 ±0.01	0.35±0.02	NS
Shape index	78.0^{a} ±0.90	78.8^{a} ±0.73	77.1^{ab} ±0.97	74.0^{b} ±1.7	75.7^{ab} ±0.27	0.05
Breaking strength, kg/cm^2	4.6^{b} ±0.37	5.5^{a} ±0.41	5.3^{a} ±0.39	4.7^{b} ±0.47	5.4^{a} ±0.24	0.05

	Gene effect %			
	Na	F	Cr	Na*F*Cr
Shell weight, g	+4.8^{ns}	+4.8^{ns}	-4.8^{ns}	+11.9^{ns}
Shell, %	+2.1^{ns}	+3.1^{ns}	+2.1^{ns}	0.00
Shell thickness, mm	+5.9^{ns}	+2.9^{ns}	-2.9^{ns}	+2.9^{ns}
Shape index	+1.0^{ns}	-1.2^{ns}	-5.1*	-2.9^{ns}
Breaking strength, kg/cm^2	+19.6*	+15.2*	+2.17^{ns}	+17.4*

^{a,b} values with different superscripts are statistically different within the same raw.
Gene effect: mean of genotype-nanaffcrcr/ nanaffcrcr*100.
* P≤ 0.05 **P≤ 0.01 ns: not significant.

Table (5): Phenotypic correlation coefficients between egg weight and egg production and quality measurements**.**

	Genotype				
Trait	**nanaffcrcr**	**Nanaffcrcr**	**nanaFfcrcr**	**nanaffCrcr**	**NanaFfCrcr**
Long axe	0.81**	0.80**	0.77**	0.85**	0.89**
Short axe	0.80**	0.87**	0.87**	0.61	0.97*
Albumen height	0.20	0.81*	0.63*	0.23	0.55
Albumen %	0.08	0.79*	0.75*	0.27	0.67
Yolk height	-0.09	0.74**	0.32	-0.28	0.29
Yolk diameter	0.13	0.42	0.67*	-0.60	0.20
Yolk weight	0.54	0.88**	0.84**	0.77	0.55
Yolk %	0.73**	0.50	0.53	0.85	0.70
Shell weight	0.16	0.62*	0.72**	0.80	0.89
Shell %	0.31	0.21	0.39	0.66	0.91
Shell thickness	-0.36	-0.18	-0.25	-0.63	-0.77*
Breaking strength	-0.46	-0.23	0.53	-0.69*	-0.56
Egg number	-0.39	0.33	-0.09	-0.16	-0.04
Intensity of laying	-0.40	0.32	-0.08	-0.15	-0.03
Broken eggs	-0.94**	-0.40	-0.93*	-0.95*	-0.90*

* P≤ 0.05 **P≤ 0.01

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الملخص العربي

تأثير العوامل الوراثية المسئولة عن عري الرقبة والريش المجعد وخصلة الريش أعلى الرأس والانعزال الثلاثي لهم على إنتاجية الدجاج البياض تحت ظروف الجو الحار

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تم إجراء هذه التجربة لمقارنة تأثيرات العوامل الوراثية المسئولة عن عري الرقبة والريش المجعد وخصلة الريش أعلى الرأس والانعزال الثلاثي لهم على مقاييس إنتاج البيض وجودته تحت ظروف فصل الصيف في مصر. استخدم في هذه الدراسة خمسة تراكيب وراثية وهي: طيور طبيعية التريش، طيور عارية الرقبة، طيور مجعدة الريش، طيور ذات خصلة من الريش أعلى الرأس وأخيرا مجموعة الطيور التي تحمل الثلاث عوامل وراثية مجتمعة وتم تقييم أداء تلك التراكيب الوراثية وكانت أهم النتائج المتحصل عليها هي..

- وفقا لتأثير كل من درجات حرارة البيئة المنخفضة خلال فترة النمو وأيضا التأثير الايجابي لعامل خصلة الريش أعلى الرأس على الكساء الريشي، فإن الطيور الحاملة لعامل خصلة الريش سجلت معدلات أوزان جسم عند النضج الجنسي أعلى مقارنة ببقية التراكيب الوراثية المدروسة.

- وصلت كل من الطيور الحاملة لعامل خصلة الريش أعلى الرأس والطيور الحاملة للثلاث عوامل وراثية مجتمعة إلى النضج الجنسي متأخرا مقارنة ببقية المجاميع الوراثية وكانت الاختلافات بين هذه المجاميع الوراثية عالية المعنوية.

- الطيور الحاملة للثلاث عوامل وراثية مجتمعة سجلت زيادة في أوزان البيض المنتج مقارنة ببقية التراكيب الوراثية، وربما يعزى هذا لتأثير وراثي مضيف أو فعل تكميلي للجينات محل الدراسة في تلك الصفة.

- كما هو متوقع تحت ظروف درجات الحرارة السائدة خلال فترة التجربة فإن كل من الطيور عارية الرقبة والطيور مجعدة التريش سجلت كتلة وأعداد وغزارة بيض أعلى مقارنة بالمجموعات الأخرى من الطيور. وسجلت الطيور الحاملة للثلاث عوامل مجتمعون أقل القيم للصفات سالفة الذكر.

- من النظرة الاقتصادية فأنه وجد أن الطيور الحاملة للعوامل الوراثية عري الرقبة والريش المجعد وخصلة الريش أعلى الرأس سواء في الحالة المفردة أو الثلاثية أدت الى ليس فقط إنخفاض في عدد البيض المكسور ولكن أيضا الى زيادة قوة ومتانة القشرة مقارنة بالطيور طبيعية التريش.

- الطيور الحاملة للثلاث عوامل وراثية مجتمعة سجلت زيادة معنوية لكل من صفات النسبة المئوية للبياض وارتفاعة ووحدات هو مقارنة ببقية التراكيب الوراثية المدروسة. كما لوحظ نفس الاتجاه السابق لصفة وزن القشرة.

- لوحظ في التراكيب الوراثية محل الدراسة ارتباطات مظهرية ايجابية وعالية المعنوية بين كل من وزن البيضة ومقاييس الطول والعرض وكانت تلك العلاقة القوية أكثر وضوحا في الطيور الحاملة للثلاث عوامل وراثية مجتمعة.

خلصت هذه التجربة إلى التأكيد على أنه تحت ظروف الجو الحار فإن الطيور الحاملة لكل من العامل الوراثي عري الرقبة أو الحاملة للعامل الوراثي الريش المجعد ذات تأثير ايجابي علي معظم الصفات الإنتاجية مثل كتلة البيض وعدده وسمك القشرة وقوة ومتانة القشرة. بينما في حالة الطيور الحاملة للثلاث عوامل مجتمعة (الانعزال الثلاثي) فإنه لوحظ لها تأثيرا ايجابيا على بعض الصفات مثل وزن البيض ونسبة وارتفاع البياض ووحدات هو، كما لوحظ لتلك الطيور تأثيرا سلبيا علي صفات كتلة وعدد البيض المنتج والعمر عند النضج الجنسي .