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IMPACT OF INTERACTION BETWEEN GENOTYPE AND SEX ON PRODUCTIVE PERFORMANCE AND CARCASS CHARACTERISTICS OF CHICKEN

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ABSTRACT

An experiment was conducted to evaluate the impact of naked neck gene, sex and their interaction on productive parameters and carcass characteristics of chicken. Naked neck (Nana) females were artificially inseminated with naked neck (Nana) males. According to the pervious mating, three genotypes (NaNa, Nana and nana) were produced. All chicks were reared under the same environmental, managerial and hygienic conditions from hatching time to 16 weeks of age. At 16 weeks of age 60 birds (10 bird /sex /genotype) were randomly chosen for carcass evaluation. The present results revealed that the presence of naked neck gene in a single state significantly increased body weight of chicken compared to nana genotype. With respect to body measurements, it could be noticed that the NaNa and Nana genotypes were significantly higher lengths of keel and shank compared to normally feathered genotype. Similar trend was obtained for head appendages. As expected the presence of naked neck in a single or double manner significantly reduced feather percentage by about 20.7 and 37.5% respectively. Percentages of dressing and breast muscles of NaNa and Nana genotypes were significantly higher than that of nana ones. Inversely, the abdominal fat percentage was significantly reduced in birds carrying naked neck gene. The naked neck gene in both cases associated with significantly increased hematocrit level and significantly decreased plasma cholesterol. Body weights, comb length, dressing percentage and blood parameters were significantly affected by sex. With respect to interaction between genotype and sex, it could be observed that the body weights, comb length, edible meat parts, abdominal fat and blood parameters were significantly affected by interaction between naked neck gene and sex. In conclusion, under summer season of Egypt, productive performance and carcass measurements could be improved by incorporating naked neck (Na) gene for increasing relative breast muscles and relative meat yield and decreased relative abdominal fat weight.
Keywords: naked neck gene, sex, productive performance, carcass traits

INTRODUCTION

In developing countries, poultry production is facing many challenges. Diseases, unfavorable circumstances and bad management are major factors resulting in economic loss either in egg production or broiler sectors. As expected poor results would be obtained when birds raising in open-houses under high ambient temperatures. It appears that broiler stocks bred for high growth rate and meat yield in optimal environments, are not able to fully express their genetic potential when reared in hot climates, unless their selection programs include breeding for heat tolerance. Whereas studies on alleviation of heat stress have focused on costly management adjustments, however, genetic improvement of heat tolerance may provide a

low-cost solution, particularly attractive to developing countries with hot climates. Under normal temperature, Cahaner *et al.* (1993) reported that the naked neck broiler chicks had relatively higher growth rate and meat yield than normally feathered counterparts. Moreover, the gene effect is more pronounced at high enviromintal temperature. The presence of Na gene in a single or double state resulted in heavier body weight, higher feed efficiency and lower body temperature (Patra *et al.,* 2002; Adeyinka *et al.*, 2006; Galal *et al.*, 2007). Moreover, the Na allele can increase breast meat production (Deeb and Cahaner, 1999). The fat deposit in breast muscle is also decreased in naked neck chickens compared to normal type (Raju *et al.*, 2004). As generally known, broiler meat quality is a very complex issue that can be looked at from several aspects. In terms of the meat processing industry and consumers' interests, fattened chicks should be characterized by good dressing percentage, desired conformation, as much meat on the carcass as possible, optimal distribution of fat tissues, appropriate skin color and least damage possible occurring during fattening, loading and unloading. With respect to that, the proportions of major basic carcass parts (breast, drumstick and thigh) as well as the presence of certain tissues in them are regarded as vital parameters determining broiler meat quality (Holcman *et al.*, 2003; Ristic, 2003). The above-mentioned quality traits depend on a number of factors. Of the biological ones, the greatest impact is produced by genotype, sex and age (Bokkers and Koene, 2003; Hellmeister *et al.*, 2003). Therefore, the aim of this work was to study the effect of naked neck gene, sex and their interaction on performance and carcass composition of chicken under summer season of Egypt

MATERIALS AND METHODS

Genetic groups and Husbandry

This experiment was carried out at Poultry Breeding Farm, Poultry Production Department, Faculty of Agriculture, Ain Shams University. Naked neck (Nana) females were artificially inseminated with naked neck (Nana) males. According to the previous mating, three genetic groups were obtained; normally feathered (nana), heterozygous naked neck (Nana) and homozygous naked neck (NaNa). All chicks were wing-banded and brooded in electrical brooding batteries from hatching to 4 weeks of age. Then, they were transferred to floor pens. All genetic groups were reared under similar environmental, managerial and hygienic conditions. Feed and water were supplied *ad libitum*. They were fed a diet containing 20% CP and 2850 kcal ME/kg diet. Average high and low ambient temperatures recorded during the experimental period were 31.6 and 28.7°C, respectively.

Measurements and observations

Individually body weights were determined at 16 weeks of age. Also, body measurements (keel length and shank length) and head appendages (comb length and wattle length) were measured at 16 weeks of age. At 16 weeks of age, blood samples were taken from the brachial vein into

heparinzed tubes for all birds. A portion of the fresh blood was used for hematocrit determination using capillary tubes and a microhematocrit centrifuge. The hematocrit figures were measured after spinning microhematocrit for 12 min. Plasma was obtained from the blood samples by centrifugation for 10 min. at 4000 rpm and was stored at -20C until the time of analysis. The frozen plasma was allowed to thaw at room temperature prior to analysis. Plasma total protein and cholesterol were determined by enzymatic colorimetric methods using available commercial kits. At 16 weeks of age, 60 chickens representing all genotypes within sex (10 each) were slaughtered for carcass assessment. Birds were individually weighed before slaughtering. They were slaughtered by severing the carotid artery and jugular vein, and reweighed to calculate blood weight by difference. Feathers were manually removed after scalding at 60°C for approximately two min. Then, the birds were reweighed to calculate feathers weight by difference. The birds were processed by removing the head and shank and eviscerated by removing the viscera without disturbing the fat bad along the abdominal wall. The heart, liver, gizzard and spleens were dissected from the viscera and the gizzard was cut open and rinsed of its contents. Then, the carcasses were immersed in cold water. The carcass, breast (minor and major), thigh and drumstick muscles were weighed. Each organ and muscle was expressed as a proportion of the live body weight.

Statistical analysis

Data were subjected to two-way analysis of variance with genotype and sex effect using the General Linear Models (GLM) Procedure of SAS User's Guide, 2001. When significant difference among means is found, means were separated using Duncan's multiple range test.

RESULTS AND DISCUSSION

Body weight and body measurements

Body weight, body measurements and head appendages as affected by naked neck gene, sex and their interaction are presented in Table (1). The present results revealed that the presence of naked neck gene in a single manner significantly increased body weight compared to nana genotype. Similar trend, but not statistically significant, was noticed for NaNa genotype. In accordance to sex effect, it could be noticed that the male chickens have significantly heavier body weight compared to female ones. Moreover, the body weight was significantly affected by interaction between naked neck and sex. The last results could be attributed to the effect of naked neck on body weight which was more pronounced in male rather than female chickens. Singh *et al.* (2001) reported that the heterozygous naked neck had significantly heavier body weight compared to normal type. Under high ambient temperature, Jianxia (2002) speculated that broiler males with frizzle and naked neck genes increased their daily body weight by about 11% compared to normal type ones.

Comb, wattle and shank length are considered as means to heat dissipation or heat release. Our results showed that the lengths of keel and shank were significantly affected by genotype and sex, where the NaNa and Nana genotypes associated with significantly higher lengths of keel and shank compared to nana ones. Also, the male chickens had significantly higher keel and shank lengths compared to female ones. The higher keel length associated with naked neck gene might be interprets the fact that this gene cause more thoracic muscles (Galal, 1999). The present results indicate that the presence of naked neck gene in a single or double state significantly increased both comb and wattle lengths. Also, the male chicken recorded higher lengths of comb and wattle compared to female ones. The higher length of legs enhanced the releasing of additional heat along with main pathway through comb and wattles. Zongo and Petitjean (1990) found that the presence of naked neck gene resulted in increased comb size under moderate temperature. Galal and Fathi (2002) reported that the Nana genotype has significantly longer comb and wattle lengths compared to normally feathered sibs. Therefore, the naked neck birds had more bare area and this assist to tolerate more heat stress than fully feathered sibs. Under moderate or high ambient temperatures, Galal and Fathi (2002) reported that the Nana genotype had significantly taller comb and wider wattle lengths compared to normally feathered counterparts. There was no significant difference among genotypes for body depth.

Table 1: Body weight, body measurements and head appendages of chicken as affected by naked neck gene, sex and their interaction

Item	Sex	Genotype			Pooled SEM	Overall	Prob.		
		NaNa	Nana	nana			G	S	G*S
Body weight, g	Male	1487.5	1515.2	1420.7	15.80	**1474.5a**	0.05	0.001	0.02
	Female	1180.8	1270.1	1115.7	20.13	**1188.9b**			
	Overall	**1334.2ab**	**1392.7a**	**1268.2b**					
Keel length, cm	Male	9.57	9.62	9.03	0.92	**9.41a**	0.01	0.001	NS
	Female	7.73	7.85	7.48	0.73	**7.69b**			
	Overall	**8.65a**	**8.74a**	**8.26b**					
Shank length, cm	Male	10.81	10.58	10.14	0.58	**10.51a**	0.05	0.001	NS
	Female	8.82	8.89	8.21	0.62	**8.64b**			
	Overall	**9.82a**	**9.74a**	**9.18b**					
Comb length, cm	Male	4.85	4.82	4.17	0.39	**4.61a**	0.04	0.001	0.01
	Female	2.89	2.91	2.67	0.43	**2.82b**			
	Overall	**3.87a**	**3.87a**	**3.42b**					
Wattle length, cm	Male	3.97	4.05	3.80	0.15	**3.94a**	0.05	0.001	NS
	Female	3.15	3.10	2.92	0.17	**2.89b**			
	Overall	**3.56a**	**3.58a**	**3.11b**					

N = 10 bird/ sex/ genotype
NS = non-significant

Inedible meat parts percentage

Effect of naked neck gene, sex and their interaction on inedible meat parts of chicken are summarized in Table (2). Relative blood weight of chicken did not significantly affected by naked neck gene, sex and their interaction. Conversely, the presence of naked neck gene in a single or double state significantly reduced feather coverage by about 20.7 and 37.5%, respectively compared to normally feathered genotype. Also, the feather coverage of female chicken was significantly lower than that of male one.

Table 2: Inedible meat parts of chicken as affected by naked neck gene, sex and their interaction

Item	Sex	Genotype			Pooled SEM	Overall	Prob.		
		NaNa	Nana	nana			G	S	G*S
Blood, %	Male	3.67	4.20	3.52	0.15	**3.46**	NS	NS	NS
	Female	3.71	3.82	3.45	0.13	**3.66**			
	Overall	**3.69**	**3.51**	**3.49**					
Feather, %	Male	5.40	6.53	8.12	0.70	**6.68a**	0.001	0.001	NS
	Female	4.58	6.14	7.86	0.66	**6.19b**			
	Overall	**4.99c**	**6.34b**	**7.99a**					
Legs, %	Male	4.21	4.35	4.12	0.30	**4.23a**	0.02	0.05	0.03
	Female	3.87	3.90	3.86	0.22	**3.87b**			
	Overall	**4.04ab**	**4.13a**	**3.99b**					
Head, %	Male	4.37	4.51	4.00	0.31	**4.28**	0.01	NS	NS
	Female	4.10	4.11	3.95	0.28	**4.02**			
	Overall	**4.24a**	**4.31a**	**3.99b**					
Inedible parts, %	Male	17.65	19.59	19.76	2.15	**19.00a**	0.01	0.02	0.05
	Female	16.26	17.97	19.12	1.64	**17.78b**			
	Overall	**16.96c**	**18.78b**	**19.44a**					

N = 10 bird/ sex/ genotype
Inedible parts = blood+ feather+ legs+ head
NS = non-significant

The naked neck gene, Na, is a genetic mutant with approximately 40% reduced feather covering in homozygous (NaNa) and approximately 30% reduced covering in heterozygous (Nana) as reported by Bordas *et al.* (1978). They also suggested that reduced feathering associated with Na gene (40% in NaNa and 30% in Nana) results in increased flexibility in regulating body temperature (BT) at high ambient temperature. The main effect of naked neck gene is the reduction of the whole feather percentage especially in neck and breast areas by about 30-40% as compared with the normal chickens (Mérat, 1986 and Horst and Rauen, 1986). Accordingly, naked neck chickens can tolerate low dietary protein level more than normal chickens (Monnet *et al.*, 1979). Relative legs weight of NaNa and Nana genotypes was significantly higher than that of nana ones. Similar trend was noticed for male chicken when compared with female ones. Moreover, the relative leg weight was significantly affected by interaction between genotype and sex. That is meant the effect of naked neck gene on relative leg weight was more pronounced in male rather than female chicken. With respect to

relative head weight, it could be noticed that the NaNa and Nana genotypes had significantly higher relative head weight compared to nana ones. This result may be due to the bigger comb and wattle associated with birds carrying the Na gene in both cases. Finally, the inedible meat parts were significantly affected by genotype, sex and their interaction; whereas the presence of naked neck gene in double state significantly reduced the relative inedible meat parts compared to nana genotype. The same trend was observed in Nana genotype.

Edible meat parts percentages

Relative edible meat parts weight of chicken as affected by genotype, sex and their interaction are presented in Table (3). The NaNa and Nana genotypes were significantly higher dressing percentage compared to nana ones. Also, the dressing percentage of male chicken was significantly higher than that of female ones. Fathi and Galal (2001) reported that the Na gene significantly improved dressing percentage and breast meat muscles compared to normally feathered genotype. Regardless ambient temperature, Mahrous (2003) observed that the Na allele improved dressing percentage and breast muscles percentage compared to fully feathered birds. Under summer season of India, Raju *et al.* (2004) reported that the relative weights of feathers and skin were lower in Nana birds than in their normal counterparts. Also, the Nana chickens had more skin protein and less fat in breast muscle and skin than their normal sibs. The interaction between genotype and sex was significantly effect on dressing percentage of chicken. With respect to giblets percentage, it could be noticed that the presence of Na gene in a single or double manner slightly increased the relative giblets weight compared to nana genotype, but the difference did not statistically significant. The last observation is of great importance from the point of slaughtering yield; because of an addition percentage will be added to sellable parts, especially in developing countries (Galal, 1999). In accordance to edible meat parts percentage, our results showed that the genotype, sex and their interaction were significantly effect on relative edible meat parts percentage, where the higher edible peat parts were recorded in Nana genotype followed by Nana ones. Yalcin *et al.* (1998); Singh *et al.* (2000); Galal and Fathi (2001) reported that the naked neck gene increased meat weight and percentage of edible meat parts. Several mechanisms appear to be responsible for higher meat production in chicken with reduced plumage. Merat (1986) summarized three of them as follows: 1) less feather production leaves more protein for the synthesis of their tissue, mainly muscles (meat); 2) the more rapid dissipation of heat results in less appetite depression and consequently better growth of high ambient temperatures; and 3) lower carcass fat content resulting from a higher proportion of lipids being used for thermoregulation.

Table 3: Edible meat parts of chicken as affected by naked neck gene, sex and their interaction

Item	Sex	Genotype			Pooled SEM	Overall	Prob.		
		NaNa	Nana	nana			G	S	G*S
Dressing, %	Male	66.4	65.6	64.2	1.27	**65.40a**	0.01	0.05	0.02
	Female	64.1	64.2	63.6	0.88	**63.97b**			
	Overall	**65.25a**	**64.90b**	**63.90c**					
Liver, %	Male	2.51	2.44	2.25	0.10	**2.40**	0.01	NS	NS
	Female	2.36	2.30	2.12	0.13	**2.26**			
	Overall	**2.44a**	**2.37a**	**2.19b**					
Gizzard, %	Male	1.80	1.75	1.72	0.04	**1.76**	NS	NS	NS
	Female	1.73	1.70	1.67	0.05	**1.70**			
	Overall	**1.77**	**1.73**	**1.70**					
Heart,	Male	0.65	0.63	0.57	0.06	**0.62**	0.05	NS	NS
	Female	0.67	0.62	0.54	0.04	**0.61**			
	Overall	**0.66a**	**0.63a**	**0.56b**					
Giblets, %	Male	4.96	4.82	4.72	0.25	**4.83**	NS	NS	NS
	Female	4.76	4.62	4.33	0.29	**4.57**			
	Overall	**4.86**	**4.72**	**4.53**					
Edible parts, %	Male	71.36	70.42	68.92	0.83	**70.23a**	0.01	0.01	0.03
	Female	68.86	68.82	67.93	0.88	**68.54b**			
	Overall	**70.11a**	**69.62a**	**68.43b**					

N= 10 bird/ sex/ genotype
Edible parts = dressing + giblets
NS = non-significant

Breast muscles, drumstick and thigh

Data summarized in Table (4) showed that the effect of naked neck gene, sex and their interaction on breast muscle, drumstick and thigh of chicken. Our results observed that the NaNa and Nana genotypes were significantly higher relative breast muscle weight compared to nana ones. However, the relative breast muscle weight did not significantly affected by sex and interaction between genotype and sex. The naked neck chicken had higher breast muscle percentage compared to normally feather native lines in South Africa (Van Marle-Koster and Webb, 2000) and Egypt (Galal *et al.*, 2007). The increased percentage of muscles in pectorals region associated with naked neck gene may be due to save more dietary protein available for muscle development and lower protein requirement for plumage growth (Merat, 1986). El-Attar and Fathi (1995) found that the absolute and relative weights of pectorals minor and residual breast meat were higher in naked neck birds than in normal plumage ones. With respect to drumstick and thigh, it could be noticed that the relative both drumstick and thigh weight did not significantly affected by genotype and interaction between genotype and sex. Conversely, the female chickens were significantly higher relative both drumstick and thigh weight compared to male ones. Similar results were obtained by Bogosavljevic-Boskovic *et al.* (2006). They found that an average muscle proportion in the drumsticks and thighs of the female broilers was statistically highly significantly higher compared to the male broilers.

Table 4: Breast muscles, drumstick and thigh of chicken as affected by naked neck gene, sex and their interaction

Item	Sex	Genotype			Pooled SEM	Overall	Prob.		
		NaNa	Nana	nana			G	S	G*S
Breast muscle, %	Male	10.35	10.12	9.54	0.66	**10.00**	0.01	NS	NS
	Female	10.21	10.00	9.62	0.58	**9.94**			
	Overall	**10.28a**	**10.06a**	**9.58b**					
Drumstick, %	Male	4.80	4.85	4.92	0.52	**4.86b**	NS	0.04	NS
	Female	4.92	4.98	5.00	0.57	**4.97a**			
	Overall	**4.86**	**4.92**	**4.96**					
Thigh, %	Male	5.50	5.32	5.12	0.38	**5.31b**	NS	0.02	NS
	Female	5.68	5.59	5.61	0.40	**5.63a**			
	Overall	**5.59**	**5.46**	**5.35**					

N= 10 bird/ sex/ genotype
NS = non-significant

Abdominal fat

Data presented in Figure (1) indicated that the presence of Na gene in a single or double state significantly reduced relative abdominal fat weight compared to normally feathered genotype. With respect to sex effect, it could be observed that the abdominal fat percentage of female chicken was significantly higher than that of male ones. Moreover, the relative abdominal fat was significantly affected by interaction between genotype and sex. The last result could be attributed to the reduction effect associated naked neck gene on abdominal fat percentage was more pronounced in females rather than males. The decrease of abdominal fat weight may be due to the varied insulation effects due to less plumage cover, chickens carrying Na gene appear to spend a higher proportion of the ingested energy on thermoregulation, thus lessening their fat deposition (Mérat, 1986). Also, this result is in agreement with Mahrous, 2003; El-Attar and Mérat, 1985. They found that the presence of Na gene in a single state significantly reduced abdominal fat percentage compared to normally feathered genotype.

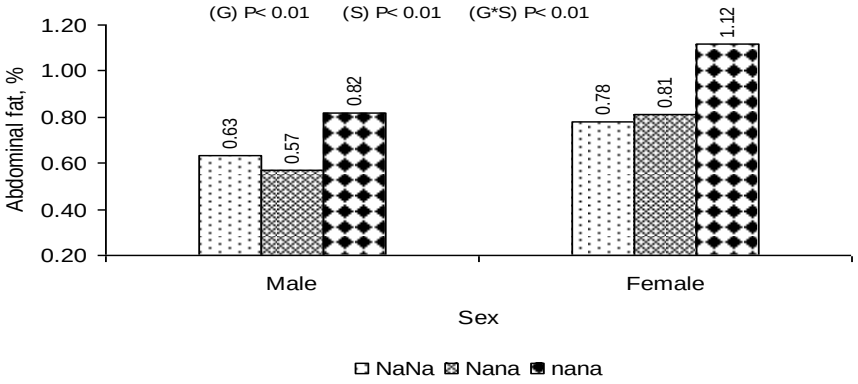

Figure 1: Abdominal fat percentage as affected by naked neck gene, sex and their interaction

Hematological parameters

Data presented in Table (5) showed that the effect of genotype, sex and their interaction on some blood parameters of chicken. Our results showed that the NaNa and Nana genotypes have significantly higher hematocrit level compared to nana ones. Similar trend was noticed when compared between sexes, where the female chicken had significantly higher hematocrit level compared to male ones. Hematocrit level was significantly affected by interaction between genotype and sex. This result could be attributed that the effect of Na gene on hematocrit level was more pronounced in male rather than females. The higher hematocrit level associated with Na allele contributed to increasing oxygen needs of organs. Yahav *et al.* (1998) reported that both hematocrit and hemoglobin concentrations and size of heart muscle were higher in naked neck chickens compared to normally feathered counterparts. Also, Alvarez *et al.* (2002) showed that Nana genotype gave the best hemoglobin levels and hematocrit percent. Plasma total protein and cholesterol were significantly affected by genotype, sex and their interaction. The NaNa and Nana genotypes were significantly higher plasma total protein and significantly lower plasma cholesterol compared to nana ones. With respect to sex effect, it could notice that the male chickens were significantly higher total plasma protein compared to female ones. Opposite trend was noticed for plasma cholesterol, whereas the female chickens were significantly higher plasma cholesterol compared to male ones.

Table 5: Hematological parameters of chicken as affected by naked neck gene, sex and their interaction

Item	Sex	Genotype			Pooled SEM	Overall	Prob.		
		NaNa	Nana	nana			G	S	G*S
Hematocrit, %	Male	30.12	29.65	28.70	1.09	**29.49b**	0.01	0.01	0.04
	Female	31.20	31.17	30.20	1.15	**30.86a**			
	Overall	**30.66a**	**30.41a**	**29.45b**					
Total protein, g/dl	Male	8.50	8.22	7.51	0.60	**8.08a**	0.01	0.05	0.02
	Female	8.10	7.85	7.13	0.71	**7.69b**			
	Overall	**8.30a**	**8.04a**	**7.32b**					
Cholesterol, mg/dl	Male	113.5	120.1	135.1	4.62	**122.9b**	0.001	0.001	0.01
	Female	125.2	135.1	143.1	5.93	**134.7a**			
	Overall	**119.4c**	**127.9b**	**139.1a**					

N= 10 bird/ sex/ genotype **NS = non-significant**

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تأثير التداخل بين التركيب الوراثي والجنس على الأداء الإنتاجي وصفات الذبيحة فى الدجاج

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صممت هذه التجربة لتقييم تأثير العامل الوراثي عرى الرقبة والجنس والتداخل بينهم على الأداء الإنتاجي وصفات الذبيحة وبعض مقاييس الدم فى الدجاج. تم تزاوج ديوك عارية الرقبة خليطه مع إناث عارية الرقبة خليطه. طبقا للتزاوج السابق، تم الحصول على ثلاث تراكيب وراثية وهى: عاري الرقبة أصيل، عاري الرقبة خليط، طبيعي التريبش. تم رعاية التراكيب الوراثية تحت نفس الظروف البيئية والصحية من الفقس وحتى ١٦ أسبوع من العمر. أجريت تجربة تقييم الذبيحة عند ١٦ أسبوع من العمر، حيث تم اختيار عدد ٦٠ طائر (١٠ طائر/جنس/تركيب وراثي). أوضحت النتائج أن العامل الوراثي فى صورته الخليطة أدى إلى زيادة معنوية فى وزن الجسم مقارنة بالتركيب طبيعي التريبش. كما لوحظ أن التراكيب الوراثية عارية الرقبة الخليطة والاصيلة تصاحبها زيادة معنوية فى طول عظمتي الساق والصدر، كما شوهد نفس الاتجاه بالنسبة لطول العرف والداليات. أدى وجود العامل الوراثي عارى الرقبة فى صورته الخليطه أو الأصيلة إلى انحسار فى نسبة الريش بمقدار ٢٠,٧ و ٣٧,٥% على التوالي مقارنة بالتركيب طبيعى التريبش. سجلت الطيور عارية الرقبة الخليطة والأصيلة نسبة تصافى وكمية لحم مأكول أعلى معنويا من الطيور طبيعية التريبش. وعلى العكس من ذلك فقد سجلت الطيور عارية الرقبة فى كلا الحالتين نسبة دهن بطن اقل معنويا من الطيور طبيعية الرقبة. تزداد حجم المكونات الخلوية بصورة معنوية فى الطيور عارية الرقبة الأصيلة والخليطة، بينما يقل مستوى الكولسترول فى البلازما بصورة معنوية وذلك مقارنة بالطيور طبيعية التريبش. يؤثر الجنس بصورة معنوية على الصفات الإنتاجية وصفات الذبيحة. كما أوضحت النتائج أن التداخل بين التركيب الوراثي والجنس يؤثر بصورة معنوية على وزن الجسم ونسبة التصافي ومقاييس الدم. والخلاصة، فقد أوضحت النتائج أن العامل الوراثي عرى الرقبة يحسن من الأداء الإنتاجي ومقاييس الذبيحة تحت ظروف فصل الصيف فى مصر.