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MATERNAL BODY WEIGHT OF DWARF AND NORMAL BRIOLER BREEDERS AS AFFECTING THE PERFORMANCE OF THEIR NAKED NECK AND NORMAL PROGENY.

BY

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Abstract: *Broiler progeny from dwarf and normal broiler breeder hens mated to normal naked neck males (Dw/Dw Na/na) were compared for growth performance and carcass quality. Both four genotypes were subjected to similar management conditions of conventional open-sided houses during summer, autumn and winter seasons. Broiler progeny from dwarf hens had lower body weight and gain compared to those from normal ones. The depression in body weight and gain which caused by dwarfing gene (maternal effect) was decreasing by age (from 10.73% at hatch to 3.68% at 7 wks). However, feed conversion of broiler progeny from dwarf hens was better than those from normal ones. The heterozygous naked neck broilers gained about 2.12-5.61% more weight than those normally feathered siblings during autumn and summer seasons, and this advantage was also confounded with improving feed conversion. Introducing Na gene to commercial broilers through dwarf hens resulted in lower rectal temperature than na/na broiler progeny from normal hens (2.16, 1.50 and 1.07% during the three seasons, respectively) and Na/na chicks too. Feather% and total fat% of broiler progeny from dwarf hens were higher compared to those from normal ones by about 4.25, 2.94 and 3.29%, feather % and 4.37, 5.93 and 3.6%, total fat% during summer, autumn and winter, respectively. However, insignificant differences were observed between the two genotypes for breast meat and meat yield except during summer season, at which broiler progeny from dwarf hens had lower breast meat (-3.73%). The results revealed that the Na gene reduced feather (15.7-20.1%), which improved heat dissipation through the neck area and leads to a relatively lower rectal temperature and total fat%. However, Introducing Na gene to broiler progeny from dwarf hens reduced total fat% and increased breast meat and meat yield compared to na/na broiler progeny from normal hens. The advantage was associated with reducing the price of chicks at hatch which were produced from dwarf hens. Better feed conversion, resulted in higher economic efficiency, was recorded for the broiler progeny from* *dwarf hens compared to those from normal ones. Moreover, the same trend was noticed for the naked neck chicks during summer and autumn seasons.*

***Generally**, the advantage associated with higher body weight during moderate and higher ambient temperatures (autumn and summer seasons) of Na gene compensated the reduction in body weight of broiler progeny from dwarf breeder hens compared with na/na broiler progeny from normal size hens and increased both feed conversion and economic efficiency as well as reduced rectal temperature. Moreover, the results leads to suggest the introducing of dwarf (mother line) and naked neck (father line) genes in broiler breeder stocks to produce naked neck commercial broilers for tropic and sub-tropic countries especially in Africa.*

INTRODUCTION

One of main problems facing broiler parents industry is the high nutritional requirements for maintenance caused by heavier weight of breeding birds, which is reflected in higher cost of hatching eggs and in turn in high price day-old chicks. The general effects of dw major gene in broiler type were summarized by Mérat, (1990) as an increasing egg number with about 3%, improvement of feed efficiency and resistance to some diseases compared with the normal. He also reported that an average four percent more chicks per dam can be expected probably because of very few abnormal and cracked eggs and the reduction of required space per hen may reach 40%. Kousiakis *et al.,* (1985) reported that the dwarf broiler hens consumed 25.6% less feed per dozen eggs but produced smaller eggs, which was reflected to lower cost per chicks produced from dwarf hens compared to normal hens. However, the dwarf hens mated with normal broiler–type males produced normal broilers that weight less than broilers from normal hens mated to normal broiler-type males (Jaap, 1968). Horst (1990) explained that the dw gene increases the hyper limit of the critical ambient temperature and suggested the use of this gene for heat adaptation.

The body weight of heterozygous normal male broiler progeny from dwarf dams mated to normal sires was depressed by 3.5% at 8 wks of age compared to homozygous normal male progeny (Chambers *et al.,* 1974). Jaap (1968) estimated the maximum eight–week body weight reduction attributable to the dwarf dams to be less than 50 grams per broiler on an-as hatched flock basis. Such a depression is due to the dwarfing gene, dw, which is not completely recessive in the heterozygous males and to a maternal effect resulting from the smaller egg size. However, the effect of egg weight on body weight is not a great handicap since egg weight depression can be reduced by genetic selection.

The various effects of the naked neck allele on poultry have been reviewed comprehensively by Mérat (1986). Particular attention being devoted to responses to high ambient temperatures which is regarded as the most important factor inhibiting poultry production in hot climates (Horst, 1980). Under hot conditions, birds are unable to dissipate rapidly enough the heat they produce after eating, and this leads to reduced feed intake and lower weight gain (Monnet *et al*., 1979; Washburn and Eberhart, 1988; Cahaner and Leenstra, 1992). These findings have led to systematic comparisons between naked neck and normally feathered chickens at different ambient temperatures. With regard to broiler production Mérat (1986; 1990) reported that naked neck chickens have an advantage at ambient temperatures higher than 25°C, and especially above 30°C. This conclusion was based primarily on the increased eviscerated carcass weight of Na/na birds (1-2g/100g live body weight) and the simultaneous reduction in feather weight (Monnet *et al*., 1980; El-Attar and Mérat, 1985).

The present study was designed to compare the performance of naked neck broiler with their fully feathered sibs, which produced from normal and dwarf broiler breeder hens during three seasons under conventional Egyptian conditions.

MATERIALS AND METHODS

This experiment was carried out at the Poultry Research Farm, Poultry Production Department, Faculty of Agriculture, Kafr El-Sheikh University. The parent stocks of experiment broiler breeder stock which included heterozygous naked neck males (Dw/Dw Na/na) mated with dwarf and normal females (dw- na/na and Dw- na/na) to produce two genotypes from dwarf hens and two genotypes from normal hens.

Three hatches of broiler chicks were obtained during summer, autumn and winter seasons (937, 885 and 878 chicks, respectively), distributed to two replicates. In each hatch, all chicks were wing–banded at hatch and reared until they reached 7-weeks of age. These houses were provided with saw dust as litter. The average maximum and minimum ambient temperatures and relative humidity recorded during experimental period under a good circulating air are listed in Table 1.

The chicks were fed on a commercial broiler diets *ad libitum*, including a starter diet containing 21.3% crude protein and 3013 k cal ME/kg (0-3 wks), a grower diet containing 19% crude protein and 3181 k cal ME/kg (4-5 wks) and a finisher diet containing 17.5% crude protein and 3060 k cal ME/kg (6-7 wks).

Body weight were determined at hatch, 3, 5 and 7 wks of age, feed consumption recorded weekly for each replicate then calculated for each genotype and feed conversion was calculated from feed consumption and weight gain. Rectal temperature was measured using Digital Thermometer at 2 o'clock pm one day before slaughter.

Table 1: Average ambient temperature (Min. and Max.) and relative humidity which recorded during the three seasons.

Age /wk	Ambient temperature (°C)						Relative humidity (%)		
	Summer		Autumn		Winter		Summer	Autumn	Winter
	Min.	Max	Min.	Max.	Min.	Max			
3	26.0	31.5	24.5	28.9	24.1	28.5	49.9	52.9	54.3
4	26.3	32.3	24.9	29.3	22.3	26.6	48.3	53.7	59.2
5	26.5	33.6	25.5	28.5	22.3	23.9	50.4	55.8	58.2
6	27.3	34.1	24.6	26.5	21.0	22.6	52.5	56.7	59.9
7	27.2	33.3	23.4	25.4	20.5	22.4	55.7	59.3	62.3
av.	***26.7***	***33.0***	***24.6***	***27.7***	***22.0***	***24.8***	***51.4***	***55.7***	***58.8***

At 7 wks of age after final body weight 20 males and 20 females per genotype were randomly taken and sacrificed by severing the jugular vein, feathers were machinery removed with some hand plucking necessary to insure complete defeathering and weighed to determine fresh feather weight. Total fat which including abdominal fat was removed from around gizzard, proventriculus and cloaca, and skin was removed and weighed from the carcass except wing, neck, head and shank. Breast and thigh meat were dissected and weighed also (meat yield).

Economic efficiency per chick (E.E.)= (Net income / total cost)*100.

Where :

Net income= Total income – Total cost.

Total cost including chick price, feed intake, labour, medical, litter and electric, etc…

Chick price was calculated according to economic implication, based on the performance data of the dwarf and normal broiler breeder hens were obtained before the costs of producing a broiler chick can be computed using the following expressions:

$$C_{Dw} = (X_1 + X_2 + X_3 + X_4 - S_{Dw}) / N_{Dw}$$

$$C_{dw} = (X_1 + X_2 + X_3 + X_4 - S_{dw}) / N_{dw}$$

Where : C = production cost per chick, X_1 = breeder chick cost, X_2 and X_3 = cost of feed consumed per hen from 0-24 and 24-50 wks, respectively, X_4 = overhead costs per hen (building , labour, utilities, hatchability, etc.), S= Salvage value per hen (% livability x final weight x cost / kg live weight) and N= number of broiler chicks produced.

Gene effect was calculated as follows:

Effect of dw gene = [(chicks from dwarf hens-chicks from normal hens)/ chicks from normal hens] x 100.

Effect of Na gene = [(Na/na – na/na)/ na/na] x 100.

Effect of dw* Na = [Na/na chicks from dwarf hens – na/na chicks from normal hens) /na/na chicks from normal hens] x 100.

Statistical analyses were carried out using General Linear Models (GLM) procedure of SAS user's Guide, 2001 according to the following fixed model.

$Y_{ijk} = \mu + dw_i + Na_j + (dw^* Na)_{ij} + e_{ijk}$

Where : Y_{ijk} = an observation, μ= overall mean, dw_i = dwarf gene effect, Na_j = naked neck gene effect, $(dw^*Na)_{ij}$ = interaction between dwarf type and naked neck genes and e_{ijk}= experimental error.

RESULTS AND DISCUSSION

Body weight and weight gain:

Body weight and weight gain as affected by dwarf and normal hens and naked neck gene are summarized in Tables 2, 3 and 4. It could be seen that the broiler progeny from normal and dwarf hens differed significantly in body weight at all ages. The broiler progeny from dwarf hens had less body weight than those from normal hens at hatch (7.43, 10.73 and 9.37%), 3 wks (5.56, 5.02 and 8.33%), 5 wks (5.03, 5.46 and 4.98%) and 7 wks (4.48, 3.99 and 3.68%) during summer, autumn and winter seasons, respectively. Moreover, the difference percent in body weight between broiler progeny from dwarf hens and normal hens decreasing from hatch to 7wks of age by about 7.43 to 4.48% (summer), 10.73 to 3.99% (autumn) and 9.37 to 3.68% (winter). Similar trend was noticed for weight gain calculated from 3-5 and 5-7 wks of age during the three seasons. These results reflected mainly the dwarfing gene effect which was founded in the heterozygous males and to the maternal effect resulting from the smaller egg size. The body weight of heterozygous sires was depressed by 3.5% at 56 days of age compared to homozygous normal male progeny (Chambers *et al.*, 1974). Jaap (1968) estimated the maximum eight-week body weight reduction attributable to the dwarf dams to be less than 50 grams per broiler on an as-hatched flock basis. Also, Khoo and Syed Hussein (1982) reported that broiler progeny from dwarf hens were comparable in their eight-week body weight to those from normal hens (2.028 *vs.* 2.036 kg).

Concerning the effect of Na gene, insignificant differences between Na/na and na/na chicks were observed at hatch and 3 wks of age during the three seasons. However, the Na/na chicks had significantly heavier body weight at 5 and 7 wks of age than na/na chicks (3.76 and 5.61%) and gain 3-5 and 5-7 wks of age (8.41 and 7.48%) in the summer season. Similar trend was noticed for body weight at 5 and 7 wks of age and gain 3-5 and 5-7 wks of age in the autumn season (2.12, 3.36, 1.58 and 4.86%, respectively). In the winter season the na/na chicks achieved greater live body weight and gains than Na/a chicks, while the difference percent was very low and insignificant between the two genotypes. Cahaner *et al.* (1992) reported that heterozygous naked neck broilers gain about 3% more weight than their normally feathered siblings under commercial conditions during the spring and summer months and that this advantage is almost tripled at a constant high temperature of about 32°C. Also, similar results were observed by Cahaner *et al*. (1993) and Younis (2006). Moreover, at 31°C the superiority in growth rate (more than 10%) to 10 wks of age observed by Bordas *et al*. (1978) with males and by Monnet *et al*. (1979) with both sexes.

The effect of Na gene on body weight at 7 wks of age was pronounced during summer and autumn seasons for broiler progeny from dwarf hens compared with na/na from normal hens. For instance, the reduction of body weight at 7 weeks of age during summer season of broiler birds produced by dwarf mothers (1598 *vs.* 1682 g) was compensated through introducing Na gene from the sire line (1696 g). This result means that the Na gene compensated the reduction of growth rate which caused by the dwarf mother. The reduction in body weight and weight gain which due to dwarf hens did not affected by season. However, body weight and weight gain affected by Na gene during the three seasons.

Feed consumption and conversion:

The feed consumption decreased with broiler progeny from dwarf hens than those from normal ones by about 8.0, 6.91 and 7.16% during the three seasons, respectively. Moreover, the same trend was noticed for feed conversion, where was improved by dwarfed mother by about 3.38, 3.08 and 4.35% during the three seasons, respectively. Khoo and Syed Hussein (1982) reported that broiler progeny from dwarf hens mated to normal males gave better feed conversion than those from normal ones. The naked neck chicks consumed more feed than normal ones during the three seasons by about 2.36, 2.21 and 2.9%, respectively. Feed conversion improved by Na gene during summer and autumn seasons especially during summer season by about 2.95%. However, as expected poor feed conversion was recorded by Na gene during winter season. At 24-25°C differences between naked neck and normal chicks were negligible for feed conversion. Near 30°C or higher, however, the naked neck birds had good feed efficiency (Singh *et al.*, 2001).

Naked neck broiler progeny from dwarf hens had better feed conversion than na/na from normal hens by about 5.8 and 3.51% during summer and autumn seasons, respectively. This advantage due to the effect of Na gene and dwarf hens. Higher feed conversion was recorded during autumn and winter seasons compared to summer seasons, in spite of lower feed consumption recorded in the summer season.

Rectal temperature:

The rectal temperature is slightly lower in broiler chicks from dwarf hens than in chicks produced from normal hens, the differences were about 0.42–0.82ºC. However, insignificant difference were found between genotypes, The naked neck gene significantly reduced rectal temperature by about 1.37, 1.10 and 0.67% compared to normal chicks during the three seasons, respectively. The relatively low rectal temperature of naked neck chicks compared with the normal feathered ones indicates an advantage of Na gene in respect of heat tolerance through allowance of loosing the excess amount of heat production and accordingly reducing the heat stress on the body especially in summer seasons. However, from the statistical side of view the interaction effect between mother type and Na gene in the present study was found to be insignificant, while introducing Na gene to commercial broilers through dwarf hens resulted lower rectal temperature than na/na broiler progeny from normal hens (2.16, 1.50 and 1.07% during the three seasons, respectively) which could be considered as an advantage from the biological side of view and Na/na chicks too. Also, rectal temperature of all genotypes increased with increasing ambient temperature. Deeb and Cahaner (2001) reported that the dwarf and normal broiler chicks had similar body temperature at normal ambient temperature (22ºC), but following it increase, body temperature in the normal-sized broilers rose by 1.14ºC, whereas in the dwarf ones it rose by only 0.47ºC. This finding suggested better thermoregulation during acute heat stress, apparently due to the latter's smalls body size. Eberhart and Washburn (1993a,b), Cahaner *et al.* (1994) and Younis (2006) reported that the relatively lower rectal temperature was associated with Na gene in commercial broilers under different natural temperature.

Feather percent:

Data in Tables 5, 6 and 7 revealed that the chicks produced from dwarf hens had insignificantly higher feather% than those from normal hens. The relative increment in feather% was 4.25, 2.94 and 3.29% during the three seasons, respectively, which may be due to maternal effect whereas, the dwarf hens had higher feather% than normal ones. The feather % was relatively heavier for dwarf birds than normal ones by about 19.4 33% at 20 and 24 wks of age (El-Attar and El-Zeiny, 1983). The naked neck chicks had 15.7, 19.64 and 20.08% less feather percent than normal ones during the three seasons , respectively. These results are similar to those reported by Cahaner and Deeb (2004) and Younis (2006). Naked neck broilers from dwarf mother had lower feather% compared to normal ones by about 9.82, 14.29 and 14.12% during the three seasons, respectively. The relative increment in feather% for Na gene only was higher than that acted when introducing Na gene to commercial broilers through dwarf hens.

Carcass quality:

Total fat % (Tables 5, 6 and 7) for broiler birds from dwarf hens were significantly higher than those from normal hens by about 4.37, 5.93 and 3.6% during the three seasons, respectively. Statistical analysis showed insignificant differences between broiler progeny from dwarf and normal hens for breast meat and meat yield during the experiments. The recessive sex-linked gene decreased the metabolic rate in the growing chicks, therefore increased the fat deposition in their bodies (Guillaume, 1974). Moreover, the skin percent was relatively higher for dwarfs than normal at 24 weeks of age (El-Attar and El-Zeiny, 1983).

The Na gene significantly depressed total fat %, whereas the reductions were 7.02, 9.55 and 8.80 during the three seasons, respectively. However, breast meat and yield % for naked neck chicks were significantly higher than that recorded for normal ones. Hanzl and Somes (1983), Cahaner *et al*. (1993) and Younis (2006) reported that higher yield of meat can be achieved from broilers by reducing their feather. At normal temperatures this effect resulted mainly from reduced skin weight and higher breast yield. Introducing Na gene to broiler progeny from dwarf hens resulted reduced total fat% and increased breast meat and meat yield compared to na/na broiler progeny from normal hens during the three seasons.

Body measurements:

Tables 5. 6 and 7 shows that shank length and keel length significantly affected by dwarfing hens, whereas broiler progeny from dwarf hens had less shank length than those from normal ones by about 4.84. 5.79 and 2.9% during summer, autumn and winter seasons, respectively. Similar trend was noticed for keel length during the three seasons. Quisenberry (1971) stated that the ratio of dwarfs *versus* non-dwarfs for shank length was 65-70%. However, the naked neck chicks had insignificantly higher shank length and keel length during the three seasons. Younis (2006) reported that the naked neck birds had insignificantly higher keel length. Moreover, the Na gene reduce the effect of dwarfing hens on shank length and keel length of their progenies when compared with those na/na bird from normal hens.

Economic efficiency:

The aim in broiler production is the efficient gain rather than the maximum live weight. Therefore, it was important to evaluate the economic efficiency of the different genotypes. Tables 5, 6 and 7 show the superiority of broiler progeny from dwarf hens (from the economical side of view) compared with those from normal hens (17.87 vs. 12.42%, summer; 25.49 vs. 20.21%, autumn; and 20.92 vs. 15.77%, winter) were observed. This superiority was mainly due to the low production cost of the baby chick beside the better feed conversion of broiler birds obtained from dwarf mothers those from normal hens. Johnson et al. (1973) and Khoo and Syed Hussein (1982) reported greater economic returns with respect to broiler production from dwarf breeder hens than from normal ones. Moreover, naked neck chicks had higher economic efficiency than the normal feathered ones under summer and autumn seasons.

The results showed that the economic advantage of the broiler progeny from dwarf hens were further demonstrated by the introducing Na gene under summer and autumn seasons compared to na/na chicks from normal hens. This led to the expansion of the dwarf breeder flocks in the poultry industry and mating than to naked neck males in order to get more advantages under several tropical countries.

Generally, the advantage associated with higher body weight during moderate and higher ambient temperatures (autumn and summer seasons) of Na gene compensated the reduction in body weight of broiler progeny from dwarf breeder hens compared with na/na broiler progeny from normal size hens and increased both feed conversion and economic efficiency as well as reduced rectal temperature. Moreover, the results leads to suggest the introducing of dwarf (mother line) and naked neck (father line) genes in broiler breeder stocks to produce naked neck commercial broilers for tropic and sub-tropic countries especially in Africa.

Table 2: Least squares means ±S.E. for growth traits, feed consumption and conversion of normally feathered and their naked neck full sibs produced from dwarf and normal broiler hens raised during summer season.

Trait	Feather type of offspring	Mother Type			Gene effect			Prob.		
		Dwarf	Normal	Overall	dw	Na	dw*Na	dw	Na	dw*Na
Body weight at hatch	**na/na**	35.0±0.22	37.6±0.41	**36.3±0.23**						
	Na/na	34.9±0.38	37.8±0.37	**36.4±0.27**						
	Overall	**34.9±0.22**	**37.7±0.28**		-7.43	+0.28	-7.18	***	Ns	Ns
Body weight at 3 wks	**na/na**	554.7±3.76	584.2±6.98	**569.4±3.96**						
	Na/na	549.7±6.54	585.1±6.39	**567.4±4.57**						
	Overall	**552.1±3.77**	**584.6±4.73**		-5.56	-0.35	-5.91	***	Ns	Ns
Body weight at 5 wks	**na/na**	1042.8±8.30	1100.8±15.42	**1071.8±8.76**						
	Na/na	1084.7±14.43	1139.5±14.29	**1112.1±10.09**						
	Overall	**1063.8±8.33**	**1120.2±10.45**		-5.03	+3.76	-1.46	***	*	Ns
Body weight at 7 wks	**na/na**	1598.8±12.62	1682.3±23.43	**1640.6±13.31**						
	Na/na	1696.9±21.94	1768.3±21.47	**1732.6±15.34**						
	Overall	**1647.9±12.65**	**1725.3±15.89**		-4.48	+5.61	+0.87	***	**	**
Weight gain 3-5 wks	**na/na**	488.1±7.83	516.6±11.64	**502.4±7.21**						
	Na/na	535.0±12.89	554.4±12.69	**544.7±8.31**						
	Overall	**511.6±7.86**	**535.5±8.61**		-4.46	+8.41	-3.56	**	*	**
Weight gain 5-7 wks	**na/na**	556.0±10.26	581.5±19.05	**568.8±10.82**						
	Na/na	612.2±17.83	628.8±17.46	**620.5±12.48**						
	Overall	**484.1±7.86**	**605.1±8.61**		-6.29	+7.48	+2.53	Ns	*	*
Feed consumption	**na/na**	3720.5±45.35	4055.5±50.31	**3888.0±46.32**						
	Na/na	3819.5±48.26	4140.5±52.88	**3980.0±55.50**						
	Overall	**3770.0±43.56**	**40983.0±45.31**		-8.00	+2.36	-5.82	***	**	Ns
Feed conversion	**na/na**	2.33±0.25	2.41±0.28	**2.37±0.24**						
	Na/na	2.25±0.29	2.34±0.21	**2.30±0.25**						
	Overall	**2.29±0.24**	**2.37±0.22**		-3.38	-2.95	-6.63	*	*	Ns

Ns=non significant, * *P*(F)<0.05, ** *P*(F)<0.01 and *** *P*(F)<0.001

Table 3: Least squares means ±S.E. for growth traits, feed consumption and conversion of normally feathered and their naked neck full-sibs produced from dwarf and normal broiler hens raised during autumn season.

Trait	Feather type of offspring	Mother Type			Gene effect			Prob.		
		Dwarf	Normal	Overall	dw	Na	dw*Na	dw	Na	dw*Na
Body weight at hatch	**na/na**	36.6±0.38	41.1±0.47	**38.9±0.30**						
	Na/na	36.5±0.76	40.9±0.35	**38.8±0.41**						
	Overall	**36.6±0.42**	**41.0±0.29**		-10.73	-0.26	-11.19	***	Ns	Ns
Body weight at 3 wks	**na/na**	561.5±5.47	583.6±6.76	**572.6±4.35**						
	Na/na	569.0±10.82	606.6±4.96	**587.8±5.95**						
	Overall	**565.2±6.06**	**595.1±4.19**		-5.02	+2.58	-2.50	***	**	*
Body weight at 5 wks	**na/na**	1178.1±11.51	1241.6±14.27	**1209.8±8.76**						
	Na/na	1198.4±22.84	1272.4±10.47	**1235.4±12.56**						
	Overall	**1188.3±12.79**	**1257.0±8.85**		-5.46	+2.12	-3.38	***	*	*
Body weight at 7 wks	**na/na**	1854.5±19.32	1941.9±23.96	**1895.2±15.39**						
	Na/na	1924.0±38.34	1993.9±17.58	**1958.9±21.11**						
	Overall	**1889.3±21.46**	**1967.9±14.86**		-3.99	+3.36	-0.92	***	*	*
Weight gain 3-5 wks	**na/na**	616.6±8.83	658.3±13.64	**637.5±9.21**						
	Na/na	629.4±13.89	665.8±15.69	**644.6±10.31**						
	Overall	**623.0±9.86**	**662.0±10.81**		-5.89	+1.58	-4.39	**	Ns	**
Weight gain 5-7 wks	**na/na**	676.4±11.26	700.3±21.05	**688.4±13.82**						
	Na/na	725.6±19.83	721.5±19.46	**723.6±15.48**						
	Overall	**701.3±13.29**	**710.9±24.91**		-1.35	+4.86	+3.61	*	*	**
Feed consumption	**na/na**	4103.5±45.31	4427.5±40.35	**4265.5±39.42**						
	Na/na	4213.5±43.25	4506.5±45.61	**4360.0±42.55**						
	Overall	**4158.5±42.35**	**4467.0±41.32**		-6.91	+2.21	-4.83	**	**	Ns
Feed conversion	**na/na**	2.21±0.32	2.28±0.29	**2.25±0.24**						
	Na/na	2.19±0.35	2.26±0.31	**2.22±0.25**						
	Overall	**2.20±0.30**	**2.27±0.25**		-3.08	-1.33	-3.95	Ns	Ns	Ns

Ns=non significant, * *P*(F)<0.05, ** *P*(F)<0.01 and *** *P*(F)<0.001

Table 4: Least squares means ±S.E. for growth traits, feed consumption and conversion of normally feathered and their naked neck full- sibs produced from dwarf and normal broiler hens raised during winter season.

Trait	**Feather type of offspring**	**Mother Type**			**Gene effect**			**Prob.**		
		Dwarf	**Normal**	**Overall**	**dw**	**Na**	**dw*Na**	**dw**	**Na**	**dw*Na**
Body weight at hatch	**na/na**	41.9±0.32	45.9±0.33	**43.9±0.49**						
	Na/na	41.2±0.57	46.0±0.28	**43.6±0.37**						
	Overall	**41.6±0.35**	**45.9±0.22**		-9.37	-0.68	-10.24	***	Ns	Ns
Body weight at 3 wks	**na/na**	550.1±5.44	602.5±5.61	**576.3±8.25**						
	Na/na	554.7±9.63	602.8±4.70	**578.8±6.18**						
	Overall	**552.4±6.00**	**602.6±3.69**		-8.33	+0.49	-7.93	***	Ns	Ns
Body weight at 5 wks	**na/na**	1111.9±16.80	1179.5±17.16	**1145.7±17.87**						
	Na/na	1119.2±25.87	1168.5±15.18	**1143.9±13.39**						
	Overall	**1115.6±18.00**	**1174.0±13.00**		-4.98	-0.16	-5.11	***	Ns	Ns
Body weight at 7 wks	**na/na**	1911.3±22.75	1988.5±23.29	**1949.9±26.88**						
	Na/na	1890.2±36.39	1958.5±20.32	**1924.4±20.14**						
	Overall	**1900.8±24.55**	**1973.5±17.03**		-3.68	-1.30	-2.98	**	Ns	Ns
Weight gain 3-5 wks	**na/na**	561.8±9.79	577.0±10.09	**569.4±14.83**						
	Na/na	566.8±17.31	565.7±8.45	**566.3±11.09**						
	Overall	**564.3±10.78**	**571.4±12.82**		-1.24	-0.55	-1.77	**	Ns	Ns
Weight gain 5-7 wks	**na/na**	799.4±11.64	756.0±12.00	**777.2±17.63**						
	Na/na	771.0±20.59	790.0±10.05	**780.5±13.21**						
	Overall	**785.7±6.64**	**773.0±7.89**		-1.78	+0.36	-0.58	**	**	**
Feed consumption	**na/na**	4104.6±55.61	4432.2±30.31	**4268.4±52.68**						
	Na/na	4259.9±57.86	4524.1±61.98	**4392.0±54.78**						
	Overall	**4157.3±52.23**	**4478.2±45.45**		-7.16	+2.90	-5.02	**	**	Ns
Feed conversion	**na/na**	2.15±0.31	2.29±0.25	**2.22±0.27**						
	Na/na	2.25±0.15	2.31±0.26	**2.28±0.28**						
	Overall	**2.20±0.19**	**2.30±0.16**		-4.35	+2.27	-1.74	Ns	Ns	Ns

Ns=non significant, * *P*(F)<0.05, ** *P*(F)<0.01 and *** *P*(F)<0.001

Table 5: Least squares means ±S.E. for rectal temperature, carcass quality and body measurements of normally feathered and their naked neck full- sibs produced from dwarf and normal broiler hens raised during summer season.

Trait	Feather type of offspring	Mother Type			Gene effect			Prob.		
		Dwarf	Normal	Overall	dw	Na	dw*Na	dw	Na	dw*Na
Rectal Temperature, °C	**na/na**	41.40±0.28	41.74±0.36	**41.57±0.23**						
	Na/na	40.84±0.26	41.18±0.24	**41.01±0.22**						
	Overall	**41.12±0.25**	**41.46±0.23**		-0.82	-1.37	-2.16	Ns	**	Ns
Feather,%	**na/na**	5.22±0.26	5.09±0.29	**5.16±0.19**						
	Na/na	4.59±0.41	4.32±0.41	**4.46±0.29**						
	Overall	**4.91±0.24**	**4.71±0.25**		+4.25	-15.7	-9.82	Ns	*	Ns
Total fat,%	**na/na**	9.88±0.29	9.5±0.32	**9.69±0.22**						
	Na/na	9.22±0.45	8.8±0.45	**9.01±0.32**						
	Overall	**9.55±0.27**	**9.15±0.28**		+4.37	-7.02	-2.95	Ns	*	Ns
Breast meat,%	**na/na**	12.5±0.32	13.1±0.36	**12.8±0.24**						
	Na/na	13.3±0.51	13.7±0.52	**13.5±0.37**						
	Overall	**12.9±0.31**	**13.4±0.32**		-3.73	+5.47	-1.52	*	*	Ns
Meat yield,%	**na/na**	30.8±0.55	31.7±0.61	**31.3±0.41**						
	Na/na	32.4±0.87	32.9±0.87	**32.7±0.61**						
	Overall	**31.6±0.51**	**32.4±0.53**		-2.47	+4.47	+2.21	Ns	*	Ns
Skank length, cm	**na/na**	9.87±0.09	10.17±0.10	**10.02±0.07**						
	Na/na	9.79±0.15	10.50±0.15	**1014±0.10**						
	Overall	**9.83±0.80**	**10.33±0.09**		-4.84	+1.19	-3.74	*	Ns	Ns
Keel length, cm	**na/na**	9.69±0.12	10.15±0.14	**9.91±0.09**						
	Na/na	9.95±0.19	10.24±0.19	**10.09±0.14**						
	Overall	**9.81±0.11**	**10.19±0.11**		-3.73	+1.82	-1.97	*	Ns	Ns
Economic efficiency, %	**na/na**	15.51	10.47	**12.99**						
	Na/na	20.22	14.37	**17.30**						
	Overall	**17.87**	**12.42**							

Ns=non significant, * $P(F)<0.05$ and ** $P(F)<0.01$

Table 6: Least squares means ±S.E. for rectal temperature, carcass quality and body measurements of normally feathered and their naked neck full- sibs produced from dwarf and normal broiler hens raised during autumn season.

Trait	Feather type of offspring	Mother Type			Gene effect			Prob.		
		Dwarf	**Normal**	**Overall**	**dw**	**Na**	**dw*Na**	**dw**	**Na**	**dw*Na**
Rectal Temperature, °C	**na/na**	41.20±0.18	41.25±0.23	**41.23±0.15**						
	Na/na	40.63±0.26	40.94±0.24	**40.78±0.21**						
	Overall	**40.88±0.25**	**41.10±0.21**		-0.54	-1.10	-1.50	Ns	**	Ns
Feather,%	**na/na**	5.7±0.22	5.6±0.22	**5.6±0.15**						
	Na/na	4.8±0.31	4.6±0.25	**4.5±0.19**						
	Overall	**5.25±0.19**	**5.1±0.16**		+2.94	-19.64	-14.29	Ns	*	Ns
Total fat,%	**na/na**	10.7±0.24	9.7±0.24	**10.2±0.17**						
	Na/na	9.3±0.34	8.5±0.28	**8.9±0.22**						
	Overall	**9.64±0.21**	**9.1±0.19**		+5.93	-9.55	-4.12	**	***	Ns
Breast meat,%	**na/na**	14.7±0.3229	14.7±0.29	**14.5±0.21**						
	Na/na	15.4±0.41	15.6±0.34	**15.5±0.27**						
	Overall	**15.1±0.25**	**15.1±0.23**		0.0	+6.89	+4.76	Ns	**	Ns
Meat yield,%	**na/na**	34.2±0.48	34.3±0.47	**34.2±0.33**						
	Na/na	35.1±0.67	35.9±0.54	**35.6±0.43**						
	Overall	**34.7±0.41**	**35.1±0.36**		-1.14	+4.09	+2.33	Ns	**	Ns
Skank length, cm	**na/na**	10.18±0.11	10.76±0.11	**10.47±0.08**						
	Na/na	10.30±0.16	10.98±0.13	**1.64±0.10**						
	Overall	**10.24±0.10**	**10.87±0.08**		-5.79	+1.62	-4.28	*	Ns	*
Keel length, cm	**na/na**	10.06±0.10	10.58±0.10	**10.32±0.07**						
	Na/na	10.16±0.14	10.59±0.12	**10.38±0.09**						
	Overall	**10.11±0.09**	**10.59±0.08**		-4.53	+0.58	-3.97	*	Ns	Ns
Economic efficiency, %	**na/na**	24.45	19.42	**21.60**						
	Na/na	26.53	20.99	**23.43**						
	Overall	**25.49**	**20.21**							

Ns=non significant, * *P*(F)<0.05, ** *P*(F)<0.01 and *** *P*(F)<0.001

Table 7: Least squares means ±S.E. for rectal temperature, carcass quality and body measurements of normally feathered and their naked neck full- sibs produced from dwarf and normal broiler hens raised during winter season.

Trait	Feather type of offspring	Mother Type			Gene effect			Prob.		
		Dwarf	Normal	Overall	dw	Na	dw*Na	dw	Na	dw*Na
Rectal Temperature, °C	na/na	40.65±0.34	40.94±0.39	**40.80±0.32**						
	Na/na	40.50±0.43	40.55±0.47	**40.53±0.40**						
	Overall	**40.58±0.36**	**40.75±0.35**		-0.42	-0.67	-1.07	Ns	*	Ns
Feather,%	na/na	5.45±0.61	5.31±0.89	**5.38±0.71**						
	Na/na	4.56±1.08	4.39±1.18	**4.48±0.03**						
	Overall	**5.01±0.98**	**4.85±0.92**		+3.29	-20.1	-13.12	Ns	*	Ns
Total fat,%	na/na	10.55±1.40	10.11±1.84	**10.39±1.33**						
	Na/na	9.56±1.25	9.28±1.22	**9.42±1.18**						
	Overall	**10.05±1.20**	**9.70±1.38**		+3.60	-8.80	-5.44	Ns	***	Ns
Breast meat,%	na/na	13.3±2.23	13.0±1.09	**13.15±1.71**						
	Na/na	14.1±0.97	14.5±1.33	**14.30±1.78**						
	Overall	**13.7±2.11**	**13.75±1.18**		-0.36	+8.75	+8.46	Ns	*	Ns
Meat yield,%	na/na	34.2±2.23	31.6±1.80	**31.9±1.92**						
	Na/na	33.8±0.94	33.8±2.20	**33.8±1.18**						
	Overall	**32.73±1.93**	**32.52±1.94**		+0.64	+5.96	+6.96	Ns	**	Ns
Skank length, cm	na/na	10.3±0.50	10.5±0.62	**10.4±0.53**						
	Na/na	10.5±0.74	10.9±0.76	**10.7±0.69**						
	Overall	**10.38±0.49**	**10.69±0.59**		-2.90	+2.88	0.00	*	Ns	Ns
Keel length, cm	na/na	9.90±0.73	10.62±0.53	**10.30±0.62**						
	Na/na	10.31±0.54	10.73±0.92	**10.20±0.69**						
	Overall	**10.11±0.54**	**10.68±0.59**		-5.33	+0.97	-2.92	*	Ns	Ns
Economic efficiency, %	na/na	23.31	17.60	**20.46**						
	Na/na	18.52	13.94	**16.23**						
	Overall	**20.92**	**15.77**							

Ns=non significant, * *P*(F)<0.05, ** *P*(F)<0.01 and *** *P*(F)<0.001

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الملخص العربى

تأثير وزن الجسم الأموى لأمهات التسمين القزمية والطبيعية على اداء ابناءها العارية الرقبة والطبيعية

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كتاكيت التسمين الناتجة من امهات اللحم القزمية والطبيعية والتى تزواجت مع ذكور طبيعية عارية الرقبة قورنت بالنسبة لاداء النمو وخواص الذبيحة. كل التراكيب الوراثية الاربعة ربيت تحت ظروف متشابهة فى بيوت مفتوحة اثناء مواسم الصيف، الخريف والشتاء. كانت كتاكيت التسمين الناتجة من امهات قزمية ذات وزن جسم وزيادة فى الوزن اقل من مثيلاتها الناتجة من امهات طبيعية، النقص فى وزن الجسم والذى لوحظ بسبب التأثير الاموى والراجع لعامل القزمية قل بتقدم العمر (من 10.73% عند الفقس الى 3.68% عند 7 أسابيع). من ناحية اخرى ، الكفاءة الغذائية كانت أفضل لكتاكيت التسمين الناتجة من امهات قزمية عندما قورنت بالناتجة من امهات طبيعية . بالأضافة الي ذلك فان، كتاكيت التسمين العارية الرقبة زاد وزن جسمها بحوالى 2.12-5.61% عن الكتاكيت طبيعية التربيش اثناء فصلى الخريف والصيف وهذه الميزة النسبية ايضا كانت موجودة بالنسبة للكفاءة الغذائية. وفضلا عن ذلك فان نسبة الريش والدهن للكتاكيت الناتجة من امهات قزمية كانت اعلى من مثيلاتها الناتجة من امهات طبيعية بحوالى 4.25 ، 2.94 ، 3.29% (نسبة الريش) وكذلك 4.37 ، 5.93 ، 3.6% (نسبة الدهن) اثناء فصول الصيف، الخريف والشتاء على التوالى. ومن ناحية اخرى وجد ان هناك فروق غير معنوية بين التركيبين الوراثيين بالنسبة للحم الصدر ومحصول اللحم عدا فصل الصيف حيث كانت الكتاكيت الناتجة من امهات قزمية عندها لحم صدر اقل من مثيلاتها الناتجة من امهات طبيعية. توضح هذه النتائج ان عامل عرى الرقبة يقلل نسبة الريش من 20.1-15.7% ، وهذا النقص فى نسبة الريش يحسن الفقد الحرارى من خلال الرقبة ويقود الطيور للانخفاض النسبى فى درجة حرارة المستقيم ونسبة الدهن. من ناحية اخرى سجل لحم صدر ومحصول اللحم قيما اعلى للكتاكيت العارية الرقبة مقارنة بمثيلاتها الطبيعية التربيش. ويلاحظ أن الميزة المرتبطة مع نقص سعر الكتكوت عند الفقس والناتجة من امهات قزمية وكذلك تحسن كفاءتها الغذائية نتجت كفاءة اقتصادية عالية سجلت للكتاكيت الناتجة من امهات قزمية عن مثيلاتها الناتجة من امهات طبيعية. علاوة على ذلك، تشابة في هذا المستوى بالنسبة للكتاكيت العارية الرقبة اثناء فصلى الصيف والخريف.

عامة : الميزة المرتبطة مع وزن الجسم العالى والزيادة فى الوزن اثناء درجات الحرارة المحيطة المعتدلة والعالية (الخريف والصيف) لعامل عرى الرقبة عوضت النقص فى وزن الجسم للكتاكيت الناتجة من امهات قزمية مقارنة بمثيلاتها الطبيعية الرقبة الناتجة من امهات طبيعية الجسم وزادت الكفاءة الاقتصادية علاوة على ذلك ، والنتائج ترشدنا لاقتراح أدخال عامل القزمية (خط الام) وعامل عرى الرقبة (خط الاب) فى صناعة قطعان امهات اللحم لانتاج كتاكيت التسمين تحت ظروف البلاد الحارة وشبة الحارة خاصة أفريقيا.