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EFFECT OF STARVATION ON SEMEN QUALITY TRAITS AND SOME BLOOD CONSTITUENTS IN TWO TURKEY BREEDS AND THEIR RECIPROCAL CROSSES

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Abstract

The aim of this work was to study the genetic differences for the semen quality traits for Black Bronze and White Holland turkey breeds and their crosses which were reared under some nutritional regiment and Egyptian environmental conditions. Sixty Black Bronze (BB) and sixty White Holland (HH) females were mated with ten toms from the same breeds. Each tom was artificially inseminated with three females from the two mentioned breeds to obtain three successive hatches. The results obtained showed that purebred Bronze Holland revealed the highest reduction for sperm concentration as compared with crossbreeds (BH & HB) at seven days of the end of starvation. The effect of starvation stress was more pronounced for sperm concentration fourteen days as compared with seven days after the end of starvation. The BH crossbred had the lowest GOT level, highest abnormal sperm and higher semen volume when fed 12 or 17% protein before start of starvation, while HB crossbred had the lowest either dead sperm or abnormal sperm per 200 sperm. Generally a reduction in the level of GPT due to starvation was noted. The reduction due to starvation was 1.12 U/L regardless of the genotype. With respect to total protein level, total serum protein for toms fed on 17% protein were significantly higher ($P<0.05$) than those fed on 12% or 14% protein level either before or after starvation.

INTRODUCTION

Turkey is considered as one of the principal birds for poultry meat production. In Egypt, meat production of turkey represented 2% of the total poultry production. For many years, there had been research thinking to evaluate the fertility parameters for some turkey breeds under the Egyptian environmental conditions. There were enormous reasons for this limited production in turkey. The important factor was the relatively high price of turkey meat compared with the personal income of Egyptian consumers. In addition, the seasonal demands of turkey played a great role in the systematic production throughout the different months of the year. For these reasons and others, there were no significantly different turkey males fed either 12 or 16% dietary protein level (Tawfeek *et al.*, 1991). Mohan *et al.*, (1993) studied the effect of starvation on semen production in adult healthy broilers weighing about 4.6 kg each in 14-week of age, breeder cockerels fed on breeders ration and water. They reported that semen

volume, sperm concentration decreased ($P<0.05$) on seventh day followed by cessation of semen ejaculation on 15th day of starvation. Renema *et al.* (1994) studied the effect of feed restriction on growth of Large White Turkey hens during 28-40 weeks of age. They reported that restricted feeding resulted in reduction in body weight 10 to 20% than the full feeding siblings. Cason and Teeter (1994) observed the effect of feed access on serum metabolite concentrations in hybrid Large White Turkey males at 6 weeks of age. They found that the level of total protein in serum was not significantly affected by 16-h starvation.

The object of this research was to perform and evaluate the semen of some turkey breeds reared under our Egyptian conditions. The differences between the turkey males of different strains and their crosses when they were exposed to some environment stresses in the traits associated with semen quality traits.

MATERIALS AND METHODS

The present study was conducted during the period from Septembre 1995 to March 1997 at Mahallet Mousa, Turkey Breeding Research Station, Kafr El-Shickh Governorate, Animal Production Research Institute, Agricultural Research Centre, Ministry of Agriculture. The objectives of this work were to evaluate the effect of dietary protein levels on semen physical quality traits of different genotypes and the differences in response on semen quality and blood constituents when the turkey genotypes were exposed to starvation stress in two breeds of turkey and their reciprocals crosses. At this stage, 60 Black Bronze (BB) and 60 White Holland (HH) female turkeys aged 36 weeks were mated with 10 toms from the same breeds in diallel crosses manner. Each tom was artificially inseminated with 3 females from the two mentioned breed. According to this arrangement of mating, four different genotypes were obtained: Black Bronze (BB); White Holland (HH); and the crossbreed (BH; HB). All chicks were given a starter ration containing 27% crude protein and 2800 K.cal.ME./kg during the first 4 weeks of age, and fed a grower ration containing 20% crude protein and 2900 K.cal. ME./kg for a period from 5-8 weeks of age. After that, they were fed a ration containing 18% crude protein and 3000 K.cal. ME./kg to 20 weeks of age. The birds were fed turkey breeder diet containing about 17% crude protein and 2850 K.cal. ME./kg up to 41 weeks of age. At 42 weeks of age, 30 toms from each of the four genotypes (BB, HH, BH and HB) were randomly assigned into three experimentally protein levels of 12, 14 and 17% (each protein level having 10 toms from all four genotypes). The ingredients and calculated analysis of experimental diets was presented in Table 1 .

Table 1. Composition of experimental diets utilized for offspring toms.

Ingredients	L*	M*	H*
Corn yellow	73.8	70.1	65.98
Wheat Bran	16.06	13.77	21.34
Soybean meal	5.99	12.17	8.64
Bone meal	2.74	2.66	2.97
CaCO3	0.46	0.78	0.4
Vitamins and Mineral mixture	0.4	0.4	0.3
Salt	0.34	0.34	0.19
Lysine 98%	0.16	0.02	0.11
DL-Methionine	0.05	0.02	0.02
Calculated analysis			
Crude protein	12	14	17
ME Kcal/kg	2825	2825	2825
Methionine	0.28	0.28	0.32
Lysine	0.6	0.6	0.9
Calcium	1.05	1.05	1.05
Available phosphorus	0.45	0.45	0.5
Sodium	0.16	0.16	0.14
Threonine	0.48	0.56	0.69

L = Low Protein level 12%

M = Medium Protein level 14%

H = High Protein level 17%

At 48 weeks of age, semen evaluation was carried out for 3 toms from each genotype within dietary protein level. Toms were kept on litter in floor pens. At 52 weeks of age, the toms were depreviated only for feed for three days. These toms were weighed before and after the deprivation. Blood samples were withdrawn from brachial vein at 30, 36, 42, 48 weeks of age and after the third day of fasting period. GOT, GPT and total serum protein was determined using commercial kits by enzymo-immunoassay. Semen was collected either for parent or offspring stocks by manual massage technique and the insemination was made as soon as possible after semen collection. The artificial insemination was done once a week. All hens were inseminated intra-vaginally. Row semen was diluted at the rate of 1:1 with 0.9 Nacl. The insemination was performed by depositing 0.1 ml of the diluted semen with one millimeter tuberculin syringe into the vagina. Semen samples were artificially collected before starvation at 48 weeks of age, at 7 and 14 days after the end of starvation to evaluate

some seminal parameters. Feed and water were supplied *ad-Libitum* for entire experimental period. Mass motility was assesed using a score range from 0 to 4. The percentage of dead spermatozoa in semen was examined by nigrosin-eosin stain technique as well as the percentage of abnormal spermatozoa. Data were statistically analyzed by analysis of variance using SAS (1994). Means were compared ($P<0.05$) using Duncan's multiple range test, (Duncan, 1955).

RESULTS AND DISCUSSION

Body weight before starvation

Table 2 showed means for different studied traits for Bronze, Holland, BH turkey toms, while, the analysis of variance was presented in Table 3, and the highest mean value for body weight was recorded for HB (12141.38 g). White Holland showed the lowest value (11134.6 g) which means that genotype significantly affected this trait ($P<0.01$). Such result was mainly attributed to the high differences between HH males and the other genetic groups. It is notably that Bronze toms exhibited the highest body weight loss 1359.26 g, while Holland toms recorded the lowest value 1107.69 g. However, there were highly significant differences between genotypes ($P<0.01$). On the contrary, Lilburn and Nestor (1993) in different turkey breeds, studied the effect of feed and water withdrawal on body weight of turkey breeder females. They did not find genetic differences in the body weight loss. According to the above mentioned results from Table 2 , Bronze toms were the most affected genotype by starvation followed by the crossbred BH and HB genotypes. The data in Table 2, indicated that the genotype was significantly affected by the percentage of body weight losses due to starvation treatment, Bronze toms had a higher body weight loss % than the other genotypes. According to the aforementioned results, BH toms were selected as the most tolerant genotype, because it showed the lowest mean value (9.46%), while, Bronze toms were the most sensitive genotype. Our results tended to confirm the results of Renema *et al.* (1994) who studied the effect of feed restriction on growth of White turkey females during 28-40 weeks of age. They postulated that, body weight reduction due to fed restriction treatment ranged from 10 to 20 %.

Semen physical quality traits

a- Before start of starvation

Table 4 showed the means of semen physical quality traits for Bronze and Holland and their reciprocal crosses BH and HB (12%, 14% and 17% dietary protein levels) at the 48th week of age (before start of starvation). The analysis of variance of the mentioned traits were presented at Table, 7. There were no significant differences between genetic groups for semen volume either in those fed on 12 or 17% dietary por-

tion levels. BH toms produced higher semen volume when fed on 12 or 17% dietary protein levels than the other genotypes. Within the 14% dietary protein level, Bronze toms exhibited the highest mean value for semen volume (0.31 mL), where HB crossbred recorded the lowest mean value (0.25 mL). There were significant differences ($P<0.05$) between genotypes for semen volume in those fed on 14% dietary protein levels. Data in Table 4, demonstrated a lack of significance for semen volume due to dietary protein level. Our results confirmed the results of Tawfeek *et al.* (1991)who found that ejaculate volume was not significantly different between turkey males fed diet containing either 12 or 16% crude protein. Holland toms showed higher sperm concentration when fed on 12% protein than other genotypes (5.43 vs. 5.21, 5.16, 4.84 106/mm3), while, Bronze toms revealed higher sperm concentration than other genotypes when fed on 14% or 17% dietary protein levels. There were no significant differences ($P<0.05$) among genotypes for sperm concentration, regardless of the dietary protein levels. However, the genotype X dietary protein level interaction had not significantly affected the sperm concentration. Sperm mass motility of HB crossbred greatly exceeded that of BH crossbred, while, it slightly differed as compared with sperm mass motility of purebreds (Bronze and Holland). In HB crossbred toms sperm mass motility was maintained at the same level regardless the dietary protein level. Table 4, revealed that the genotype significantly ($P<0.05$) affected the sperm mass motility, while, protein level had no significant effect on sperm mass motility. In a comparison between Bronze and Nicholas turkey breeds, El-Sawy (1996) reported that sperm mass motilities were 2.86 and 3.14 from 5 grades at 30 weeks of age for the two breeds, respectively. HB crossbred exhibited the lowest mean value for dead sperm per 200 sperm (17.67), while, BH crossbred recorded the highest mean value (18.63). Slight differences were observed between the purebreds for such trait; 18.56 vs. 18.44 for Bronze and Holland, respectively. Generally, either genotype or dietary protein level had no significant effect on dead sperm/200 sperm. In a comparison between Bronze and Nicholas turkeys, EL-Sawy (1996) pointed that live spermatozoa % were 77.0 and 83.60 at 30 weeks of ages for the two breeds, respectively. It is notably that BH showed the highest mean value for abnormal sperm/200 sperm (30.18), while, HB crossbred recorded the lowest value (27.56) (Table 4). However, there were no marked differences among the tested genotypes. Our results demonstrated that the protein level had no significant effect on abnormal sperm.

b- Seven days after the end of starvation

Table 5 showed the means of semen physical quality traits for Bronze, Holland and their reciprocal crosses BH and HB seven days after the end of starvation treatment (12%, 14% and 17% dietary protein levels). The analysis of variance of the mentioned traits were presented in Table 7. Generally, the semen volume decreased dramatically on the seventh day after the end of starvation as compared with figures

before the start of starvation. Such reduction ranged from 0.04 to 0.07 mL. Bronze and BH crossbred exhibited the highest mean values for semen volume, 0.25 and 0.24 mL, respectively. White Holland recorded the lowest mean value (0.19 mL). There were significant differences between genotypes ($P<0.05$). Mohan *et al.* (1993) studied the effect of starvation on semen in adult healthy broilers aged 14 weeks and reported that semen volume decreased ($P<0.05$) on the seventh day after start of starvation. Toms fed on 12% dietary protein level produced a higher semen volume per ejaculate than those fed on 14% or 17% (0.25 vs. 0.19, 0.23), respectively. Our results are in contrast to studies of Hulet and Brody (1986), who reported that low protein diet (120 to 140 g crude protein CP/kg) had a little effect on semen volume in Large White Turkey aged 34 weeks. The sperm concentration generally decreased seven days after the end of starvation treatment. Purebreds (Bronze and Holland) revealed the highest reduction for sperm concentration which was 0.94x106 sperm, whereas, BH and HB crossbred showed the lowest reduction; these were 0.66 and 0.80x106 sperm, respectively, as compared with the same trait before starvation. Genetic differences only obtained for toms fed on 14% dietary protein level had no significant effect on sperm concentration. Etches *et al.* (1993), pointed out that the reproduction function was not affected by controlling feed intake after 18 weeks of age, as sperm cell morphology, number of sperm cell per ejaculate were identical in toms given *ad- Libitum* and restricted access to fed. Slight differences were observed between purebreds and their reciprocal crosses for sperm mass motility. Generally, the sperm mass motility seven days after the end of starvation treatment was decreased, as compared with the same trait measured before the starvation. The reductions were 0.72, 0.51, 0.51 and 0.92 grades for Bronze, Holland BH, HB crossbreeds, respectively. Genotype and dietary protein level interacted ($P<0.05$) to influence sperm mass motility. The dietary protein level had no significant effect on sperm mass motility in different turkey breeds, (El-Sawy 1996). Slight differences were observed between purebreds and their reciprocal crosses for dead sperms/200 sperm. Genotype and dietary protein level had no significance on the percentage of dead sperm/200 sperm. The starvation treatment significantly ($P<0.01$) increased the percentage of dead sperm. Such increments were 2.44, 2.0, and 2.44 dead sperm for Bronze, Holland and HB genotype, respectively, while, BH showed a slight decrease in percentage of dead sperm (0.07). BH toms exhibited the highest percentage of abnormal sperm/200 sperm mean value (36.67%), where, HB recorded the lowest mean value (34.44%). Table 5 demonstrate that starvation treatment markedly increased the percentage of abnormal sperm/200 sperm. The increments for such treatment due to starvation were 5.67, 6.54, 5.45 and 6.88% for Bronze, BH, Holland and HB genotypes, respectively. The results indicated that Holland toms were the less affected genotype when exposed to starvation stress. There were no significant differences between either genotypes or dietary protein levels ($P<0.05$).

c- Fourteen days after the end of starvation

Table 6 showed the means of semen-physical quality traits for Bronze, Holland and their reciprocal crosses BH and HB genotypes 14 days after the end of starvation treatment (12%, 14% and 17% dietary protein levels). The analysis of variance of the mentioned traits were presented in Table 7. It appeared from Table 6 that the effect of starvation stress extended more than two weeks after the end of treatment. The deterioration in semen quality traits after 14 days of the end of starvation seemed to be much higher than that existed after 7 days of the termination of starvation treatment. The reduction in semen volume obtained on 14^{th} day after the end of starvation as compared with such trait before starvation ranged from 0.05 to 0.09 mL. Although the genotype did not significantly affect semen volume, the Bronze toms exhibited the highest mean value (0.23 mL), while, Holland showed the lowest mean value (0.18 mL). Comparable results were reported by Mohan *et al.* (1993)who reported that semen volume decreased ($P<0.05$) 15 days after fasting in adult broiler aged 14 weeks. The reductions in sperm concentration 14 days after the end of starvation as compared with such trait before starvation were 1.31, 1.04, 1.08 and 1.28x106/mm3 for Bronze, BH, Holland and HB genotype, respectively. It seemed that the effect of starvation stress was more pronounced for sperm concentration 14 days as compared with 7 days after the end of starvation. Etches *et al.* (1993) pointed out that the improvement in reproductive function associated with reduced feed intake would only be evident if full fed birds were very obese and their obesity interfered with semen collection. Slight differences were observed between the pure breeds and their reciprocal crosses for sperm concentration where there were no significant differences between genotypes. Genotype and dietary protein level interacted to influence sperm concentration ($P<0.05$). The reduction of sperm mass motility due to starvation stress was extended to 14 days after the end of starvation. The magnitudes of these reductions were 0.90, 0.64, 0.64 and 1.1 grades for Bronze, BH, Holland and HB genotype, respectively. There were no significant differences either between genotypes or dietary protein levels. Our results confirmed the results of El-Sawy (1996). It appeared that the effect of starvation stress extended to 14 days after the end of starvation, and such effect led to increase percentage of dead sperm/200 sperm. Such increment varied between genotypes; they were 4.88, 3.59, 2.89 and 5.33% sperm for Bronze, BH, Holland and HB genotype, respectively. Bronze toms exhibited the highest mean value for percentage of dead sperm (23.44%), where, Holland recorded the lowest mean value (21.33). However, either genotype or dietary protein level had significantly affected percentage of dead sperm/200 sperm. It is notably that the effect of starvation stress extended to 14 days after the end of starvation and produced a marked elevation in abnormal sperms. Such increment varied between genotypes; there were 17.89, 14.43, 17.45 and 17.69% sperm for Bronze, BH, Holland and HB genotype, respectively.

Blood constituents

Before starvation and dietary protein treatment

Blood constituents were evaluated twice: the first at 30 and the second at 36 weeks of age .This evaluation was done for toms before the start of starvation and dietary protein treatment. Means of blood constituent were Glutamate Oxulacetic Transaminase (GOT), Glutamate Pyruvic Transaminase (GPT), and Total Serum Protein (TP) presented in Table 8. At 30 weeks of age, it could be observed that there were no significant differences between genetic groups in all studied blood constituents. The Bronze toms seemed to have relatively a higher GOT as compared with Holland or the two crossbred BH and HB. The BH hybrid revealed the lowest mean values for GPT which were 34 U/L, whereas, HB hybrid showed the highest mean 41.29U/L in such trait at 30 weeks of age. HB toms exhibited the lowest mean value for total serum protein (3.51 g/100 mL) where, the other three genotypes recorded about the same mean values. At 36 weeks of age,they demonstrated a lack of significance due to genotype for each of blood constituents. The purebred BB and HH revealed the highest mean values for GOT which were 61.75 and 58.50 U/L, respectively. Total serum protein for purebreds at 36 weeks of age exceeded that of both BH and HB hybrids. In different turkey breeds, AL Heeti *et al.* (1985) found that total serum protein was significantly influenced by strain, and also, sex affected the mentioned trait (6.02 and 6.26 g/100 mL) for males and females, respectively. When the data for the two ages were combined, GOT level significantly was affected by genotype. Bronze toms exhibited the higher GOT level ($P<0.05$) while, the BH crossbred had the lowest mean value. It appeared from Table 8, that there was a slight difference between genetic group for GPT. The data clearly indicated that Holland toms had a significantly higher total serum protein than the crossbreds turkey BH or HB. The significant differences due to age was obtained. The previous result indicated that the 30 weeks toms revealed a lower total serum protein than that aged 36 weeks. Table 9, demonstrated a lack of significance for each of blood constituent traits due to age x genotype interaction. El Awady (1991), observed that the addition of choline alone to the basal diet increased the GOT level in Turkey serum from 176.0 to 213.6 Unit/mL and the GPT level from 21.1 to 31.5 Unit/mL. Table 10, showed the means of blood constituents measured before and after starvation for Bronze, Holland and their reciprocal crosses BH and HB genotypes. The analysis of variance for the mentioned traits were presented in Table 11.

Glutamic Oxulacetate Transaminase (GOT)

Table 11, demonstrated a lack of significance for the level of GOT either due to genotype or dietary protein level. Before starvation, HB crossbred exhibited the highest mean value for GOT (59.33 U/L), while, Holland recorded the highest mean value for GOT after starvation (59.33 U/L). Generally, a reduction in the level of GOT due to

starvation was obtained. These reductions were 4.33, 3.84 and 1 U/L for Bronze, BH and HB genotype, respectively. On the other hand, a slight increase was recorded for GOT of Holland 0.33 U/L) due to starvation. A slight decrease in GOT can be noted as the dietary protein level increased either before or after starvation treatment regardless of the genotype. Abdel Malak *et al.* (1995) pointed out that the serum GOT activity was decreased at higher level of biotein when compared with the non- supplemented diet.

Glutamate Pyruvic Transaminase (GPT)

Before starvation, HB crossbred exhibited the highest mean value for GPT (42.50 U/L) (Table ,10), while, Holland recorded the highest mean value for GPT after starvation (44.67 U/L). Generally, a reduction in the level of GPT due to starvation was noted. The reduction due to starvation was 1.12 U/L. regardless of the genotype. After starvation, Holland showed significantly higher level for GPT ($P<0.05$) than Bronze. On the other hand, analysis of variance did not show significant effect due to genotype, dietary protein level and starvation treatment. Abdel- Samee (1995), pointed out that GPT decreased as the age advanced in Muscovy ducks.

Total Serum Protein (TP)

Before starvation, it could be seen that HB had the highest mean value (5.44 g/100 mL for total serum protein. Significant differences between genotypes for (TP) were obtained after starvation ($P<0.05$). Starvation treatment significantly ($P<0.01$) increased the total serum protein, such increment was 0.85 g/100 mL. Total serum protein for toms fed on 17% dietary protein level were significantly higher ($P<0.05$) than those fed on 12 or 14% dietary protein level either before or after starvation treatment. The increment in total serum protein for toms fed on 14% due to starvation treatment was higher than that observed either when fed on 12 or 17% dietary protein level regardless of the genotypes (1.75 vs. 0.06 and 0.5 g/100mL), respectively. Starvation treatment and dietary protein level interacted to influence total serum protein. A significant interaction ($P<0.05$) (Starvation treatment x Genotype) affected total serum protein. However, there were marked differences among the tested genotypes for the increment in total serum protein due to starvation treatment. It appeared from Table 10, that the highest increase for total serum protein due to starvation stress was observed for Holland toms. In contrast to our results, Cason and Teeter (1994) observed the effect of feed access on serum metabolite concentration in hybrid of Large White Turkey males aged 6 weeks, and postulated that the level of total serum protein was not significantly affected by 16 hours starvation.

Table 2. Means ±SE for body weight measurements during starvation in the 52th weeks for Bronze (BB), Holland (HH) and their recpirocal crosses (BH & HB).

Characters	Genotype				Prob.
	BB N=30	BH N=30	HH N=30	HB N=30	
Body weight before starvation	11855.6ab±193.3	11960.7a±210.6	11134.6b±208.1	12141.4a±217.1	0.001
Body weight after starvation	10496.3ab±186.8	10850.0a±236.6	10026.9b±220.0	10927.6a±218.5	0.003
Body weight losses	1359.3a±96.0	1110.7b±42.8	1107.7b±47.4	1213.8ab±57.2	5E-04
Body weight losses (%)	11.5a±0.8	9.5b±0.5	10.1a±0.5	10.0ab±0.5	0.003

a,b Means with no common superscripts differ significantly.

N = Number of experimental males.

Table 3. Analysis of variance for body weight measurements duting starvation in the 52th weeks for Bronze (BB), Holland (HH) and their recpirocal crosses (BH & HB).

Character	Error		Genotypes (G)
	d.f	M.S	F. value
Body weight be for starvatior	106	1190304.7	**
Body weight after sturvation	106	1292849.51	**
Body weight loss	106	112909.09	**
Body weight loss (%)	106	8.93	**

**significant at 0.01 level

Table. 4. Means ± SE of Semen physical quality traits for Bronze, Holland and their reciprocal crosses BxH and HxB genotypes at 48 weeks age (Before start of stravation).

Character	Protien level	Genotypes					
		Bronze	BxH	Holland	HxB	Protien	Prob.
		X±SE N=9	X±SE N=9	X±SE N=9	X±SE N=9	level mean	
Semen volume (mL)	12%	0.29±0.05	0.32±0.02	0.25±0.03	0.25±0.03	**0.27**	N.S
	14%	0.31a±0.01	0.30ab±0.01	0.29ab±0.01	0.25b±0.02	**0.29**	0.08
	17%	0.30±0.04	0.31±0.01	0.24±0.03	0.26±0.02	**0.28**	N.S
	Overall mian	**0.29ab**	**0.31a**	**0.26b**	**0.25b**		
Sperm concentration (10^6/mm^3)	12%	5.21±0.71a	5.16±0.16a	5.43±0.40a	4.84±0.14a	**5.16**	N.S
	14%	5.42±0.27	5.28±0.64	4.81±0.33	4.88±0.14	**5.11**	N.S
	17%	5.37±0.42	4.73±0.21	4.97±0.12	5.36±0.46	**5.08**	N.S
	Overall mian	**5.33**	**5.03**	**5.07**	**5.03**		
Sperm mass motility	12%	3.03±0.24	3.20±0.40	3.33±0.28	3.47±0.26	**3.26**	N.S
	14%	2.73a±0.12	2.75b±0.15	3.27ab±0.12	3.47a±0.27	**3.08**	0.06
	17%	3.57a±0.38	2.43b±0.18	2.70ab±0.15	3.50a±0.29	**3.05**	0.03
	Overall mian	**3.11ab**	**2.80b**	**3.10ab**	**3.48a**		
Dead sperm/200 seperm %	12%	17.67±1.45	19.67±1.67	18.67±1.76	18.33±1.20	**18.58**	N.S
	14%	19.33±1.20	18.00±2.00	17.67±2.03	16.33±1.20	**17.82**	N.S
	17%	18.67±1.76	18.00±1.15	19.00±1.00	18.33±1.45	**18.5**	N.S
	Overall mian	**18.56**	**18.63**	**. 18.44**	**17.67**		
Abnormal sperm/200 sperm %	12%	28.67±3.67	32.00±2.08	30.33±2.60	27.00±1.53	**29.5**	N.S
	14%	30.33±0.33	27.50±4.50	30.00±1.15	26.00±2.08	**28.55**	N.S
	17%	29.33±0.67	30.00±4.16	28.00±2.31	29.67±2.73	**29.25**	N.S
	Overall mian	**29.44ab**	**30.18a**	**29.44ab**	**27.56b**		

a, b Means with no common superscripts differ significantly.

N = Number of experimental males.

Table 5 . Means ± SE of Semen physical quality traits for Bronze, Holland and their reciprocal crosses BxH and HxB genotypes on 7th day after the end of stravation.

Character	Protien level	Genotypes				Protein level mean	Prob.
		Bronze X±SE N=9	BxH X±SE N=9	Holland X±SE N=9	HxB X±SE N=9		
Semen volume (mL)	12%	0.24±0.03	0.27±0.03	0.27±0.01	0.23±0.04	**0.25a**	N.S
	14%	0.21±0.02	0.21±0.02	0.16±0.03	0.19±0.01	**0.19b**	N.S
	17%	0.29a±0.00	0.25a±0.04	0.14b±0.02	0.21ab±0.02	**0.23ab**	0.02
	Overall mean	0.25a	0.24a	0.19b	0.21ab		
Sperm concentration (106/mm3)	12%	4.13±0.23	4.33±0.25	4.31±0.12	4.12±0.18	**4.22**	N.S
	14%	4.60a±0.16	4.60a±0.25	3.66b±0.39	4.11ab±0.06	**4.24**	0.07
	17%	4.43±0.09	4.19±0.18	4.42±0.12	4.43±0.33	**4.37**	N.S
	Overall mean	**4.39**	**4.37**	**4.13**	**4.23**		
Sperm mass motility	12%	2.33ab±0.20	2.20b±0.10	2.70ab±0.15	2.03b±0.03	**2.32**	0.05
	14%	2.47±0.15	2.17±0.09	2.70±0.15	2.63±0.03	**2.49**	N.S
	17%	2.37±0.07	2.50±0.26	2.37±0.12	3.00±0.29	**2.56**	N.S
	Overall mean	**2.39**	**2.29**	**2.59**	**2.56**		
Dead sperm/200 seperm %	12%	21.33±1.76	20.33±1.45	21.00±2.89	20.00±1.00	**20.67**	N.S
	14%	21.67±1.45	18.67±2.40	22.67±1.20	19.00±2.08	**20.5**	N.S
	17%	21.67±3.38	18.00±3.51	20.00±2.00	21.00±1.53	**19.17**	N.S
	Overall mean	**21.33**	**18.56**	**20.44**	**20.11**		
Abnormal sperm/200 sperm %	12%	39.00±4.16	40.67±2.91	33.33±2.60	36.33±1.45	**37.33**	N.S
	14%	32.67±2.03	30.33±2.60	41.33±1.76	34.00±5.69	**34.58**	N.S
	17%	33.67±3.38	39.00±3.51	30.00±2.00	33.00±1.53	**33.92**	N.S
	Overall mean	**35.11**	**36.67**	**34.89**	**34.44**		

a, b Means with no common superscripts differ significantly.

N = Number of experimental males.

Table 6. Means ± SE of Semen physical quality traits for Bronze, Holland and their reciprocal crosses BxH and HxB genotypes on 14th day after the end of stravation.

Character	Protien level	Genotypes				Protein level mean	Prob.
		Bronze X±SE N=9	BxH X±SE N=9	Holland X±SE N=9	HxB X±SE N=9		
Semen volume (mL)	12%	0.23±0.03	0.25±0.03	0.25±0.01	0.21±0.04	**0.24^{a}**	N.S
	14%	0.18±0.02	0.19±0.03	0.15±0.03	0.18±0.03	**0.18^{c}**	N.S
	17%	0.27^{a}±0.01	0.22^{a}±0.04	0.14^{b}±0.02	0.19^{ab}±0.02	**0.21^{b}**	0.02
	Overall mean	**0.23**	**0.22**	**0.18**	**0.2**		
Sperm concentration (106/mm3)	12%	3.87±0.42	4.17±0.18	4.40±0.14	3.94±0.04	**4.09^{a}**	N.S
	14%	4.36^{a}±0.18	3.91^{ab}±0.24	3.44^{b}±0.25	3.29^{b}±0.13	**3.79^{b}**	0.04
	17%	3.82±0.09	3.90±0.25	4.13±0.16	3.86±0.19	**3.93^{ab}**	N.S
	Overall mean	**4.02**	**3.99**	**3.99**	**3.75**		
Sperm mass motility	12%	2.27ab±0.18	2.07^{b}±0.03	2.53^{a}±0.13	2.00^{b}±0.00	**2.22**	0.03
	14%	2.23±0.15	2.03±0.03	2.50±0.15	2.40±0.40	**2.28**	N.S
	17%	2.13±0.09	2.37±0.23	2.33±0.09	2.73±0.23	**2.39**	N.S
	Overall mean	**2.21**	**2.16**	**2.46**	**2.38**		
Dead sperm/200 seperm %	12%	27.67±4.26	22.00±0.58	20.67±1.45	23.00±1.73	**23.33^{a}**	N.S
	14%	22.67^{ab}±1.33	21.67^{b}±0.89	21.00±1.00	26.00^{a}±0.00	**22.55^{ab}**	0.07
	17%	20.00±1.00	23.00±0.58	22.33±1.45	21.00±0.58	**21.58^{b}**	N.S
	Overall mean	**23.44^{a}**	**22.22^{ab}**	**21.33^{b}**	**23.00^{a}**		

a, b, c Means with no common superscripts differ significantly. N=Number of experimental males.

Table 7. Analysis of variance for semen physical quality traits for Bronze, Holland and their reciprocal crosses BH and HB genotype Before start of starvation, 7th day after the end of starvation and 14th day after the end of starvation.

Character	S.O.V								
	Before starvation			After 7 days			After 14 days		
	Genotypes (G)	Treatment	G x T	Genotypes (G)	Treatment	G x T	Genotypes (G)	Treatment	G x T
Semen volume (mL)	*	NS	*	*	* *	*	NS	* *	*
Sperm concentration (106/mm3)	NS	NS	NS	NS	Ns	Ns	NS	*	*
Sperm mass motility	*	NS	*	NS	NS	NS	NS	NS	NS
Dead sperm/200 sperm %	NS	NS	NS	NS	NS	NS	*	*	*
Abnormal sperm/200 sperm %	NS	NS	*	NS	NS	NS	*	NS	*

* Significant at 0.05 level.

** Significant at 0.01 level.

Table 8. Means ± SE for blood constituents measured at 30 and 36 weeks of age for Bronze and Holland toms and their resprocal genotypes (BH & HB).

Character	Age (weeks)	Genotypes				Age mean
		BB	BH	HH	HB	X
GOT U/L	30	58.50±6.33	46.33±4.52	46.33±2.91	56.57±2.10	**52.35**
	36	61.75±3.56	52.50±2.47	58.50±3.26	52.50±2.47	**58.15**
	Overall mean	**60.94a**	**48.80b**	**54.44ab**	**55.09ab**	
GPT U/L	30	37.50±2.18	34.00±1.83	35.67±1.67	41.29±2.58	**37.5**
	36	40.58±1.16	38.75±1.80	38.67±2.72	41.00±4.04	**39.92**
	Overall mean	**39.81**	**35.9**	**37.76**	**41.29**	
TP g/100 mL	30	4.30±0.37	4.33±0.45	4.46±0.62	3.51±0.37	**4.06b**
	36	5.20±0.36	4.70±0.22	5.87±0.37	4.38±0.27	**5.15a**
	Overal mean	**4.98ab**	**4.48bc**	**5.40a**	**3.82c**	

a, b, c Means with no common superscripts differ significantly.

Table 9. Analysis of variance for blood constituents measured at 30 and 36 weeks of age for Bronze and Holland tomes and their reciprocal crosses (BH & HB).

S.O.V	Character		
	GOT	GPT	TP
	F.value	F.value	F.value
Genotypes (G)	*	NS	**
Age (A)	NS	NS	**
Genotypes*Age	NS	NS	NS
Error			

* Significant at 0.05 level

** Significant at 0.01 level

Table 10. Means ±SE for blood constituents measured before and after starvation at 52 weeks of age for Bronze and Holland tomes and their reciprocal crosses fed different dietary protein levels.

Character	Starvation Treatment	Protein level %	Genotypes BB	BH	HH	HB	O. mean protein	O. mean S. treatment
GOT U/L	Before	12	55.50±3.50	49.50±2.50	55.00±3.00	59.50±7.50	**54.88**	
		14	63.00±4.00	55.50±3.50	57.00±10.00	55.50±3.5	**57.75**	**56.75**
		17	49.50±2.50	53.00±6.00	65.00±24.00	63.00±4.00	**57.62**	
		Overall mean	**56**	**52.67**	**59**	**59.33**		
	After	12	55.50±3.50	44.00±3.00	59.50±7.50	58.00±11.00	**54.25**	
		14	49.50±2.5	49.50±2.50	57.00±10.00	55.50±3.50	**52.88**	**54.54**
		17	50.00±9.00	53.00±6.00	61.50±11.50	61.50±14.50	**56.5**	
		Overall mean	**51.67**	**48.83**	**59.33**	**58.33**		
GPT U/L	Before	12	43.00±9.00	41.00±7.00	43.00±9.00	45.50±2.50	**43.13**	
		14	36.50±2.50	36.50±2.50	41.00±7.00	36.50±2.50	**37.63**	**40.54**
		17	36.50±2.50	38.50±9.50	43.00±9.00	45.50±6.50	**40.88**	
		Overall mean	**38.67**	**38.67**	**42.33**	**42.5**		
	After	12	36.50±2.50	31.50±2.50	45.50±6.50	45.50±6.50	**39.75**	
		14	36.50±2.50	39.00±0.00	43.00±9.00	36.50±2.50	**38.75**	**39.42**
		17	34.00±5.00	38.50±4.50	45.50±6.50	41.00±7.00	**39.75**	
		Overall mean	**35.67b**	**36.33ab**	**44.67a**	**41.00ab**		
TP g/100 mL	Before	12	4.58±0.07	4.00±5.02	4.58±0.07	6.07±0.15	**4.80ab**	
		14	4.69±0.09	3.59±0.22	3.76±0.31	3.84±0.30	**3.97b**	**4.69b**
		17	4.73±0.70	4.55±0.02	5.47±2.15	6.41±.38	**5.29a**	
		Overall mean	**4.66ab**	**4.05b**	**4.60ab**	**5.44a**		
	After	12	3.64±0.37	4.65±0.39	6.30±0.79	4.85±1.82	**4.86b**	
		14	4.21±0.06	5.41±0.15	7.32±0.19	5.93±0.09	**5.72a**	**5.54a**
		17	4.75±0.45	5.59±0.01	6.64±0.49	6.17±0.04	**5.79a**	
		Overall mean	**4.20c**	**5.22b**	**6.75a**	**5.65b**		

a, b Means with no common superscripts differ significantly.

O = Overall S = Starvation

Table 11. Analysis of variance for blood constituents measured before and after starvation at 52 weeks of age for Bronze and Holland toms and their reciprocal crosses fed different dietary protein levels.

S.O.V.	Characters		
	GOT	GPT	TP
	F.value	F.value	F.value
Starvation treatment (ST)	NS	NS	* *
Protein level (P)	NS	NS	*
Genotypes (G)	NS	NS	* *
ST*P	NS	NS	*
ST*G	NS	NS	* *
P*G	NS	NS	NS
ST*P*G	NS	NS	NS
Residual			

* Significant at 0.05 level.

** Significant at 0.01 level.

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تأثير التصويم على صفات السائل المنوى و مكونات الدم فى نوعين من الرومى واخلاطهما

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كانت اعداد الاناث المستخدمة فى هذا البحث ستين انثى من البرونزى الاسود ومثيلاتها من الهولندى الابيض والتى تم تزاوجها مع عشرة ذكور من نفس السلالة بنظام الخلط المتبادل

أوضحت النتائج فى هذة الدراسه ان ديوك البرونزى × الهولندى أكثر التراكيب الوراثية مقاومة لتأثير اجهاد التصويم وذلك لانها اقل نسبة مئوية للفقد فى اوزان الجسم ٩,٤٦٪ بينما كانت ديوك البرونزى هى اكثرها حساسية لهذا الاجهاد حيث فقدت ١١,٤٦٪ من وزن جسمها لتأثير هذا الاجهاد.

أنخفض حجم السائل المنوى انخفاضا حادا بعد سبعة ايام من نهاية التصويم وتراوحت قيمة النقص فى حجم السائل المنوى بين ٠,٠٤-٠,٠٧ مل. يمتد تأثير التصويم لفترة اطول من أسبوعين بعد نهايته. كان الاضمحلال فى صفات جودة السائل المنوى يبدو اكثر من هذا الملاحظ بعد نهاية التصويم بسبعة ايام فقط. سجلت ديوك البرونزى الاسود اعلا حجم قذفة منوية ٠,٢٣ مل بينما كان حجم القذفة لديوك الهولندى هو ادناها ٠,١٨ مل. هناك ارتفاع ملحوظ فى النسبة المئوية للحيوانات المنوية الشاذة وذلك فى السائل المنوى المنتج بعد اربع عشر يوما من نهاية التصويم قبل بدء التصويم. كانت اعلا قيمة لانزيم GOT ترتبط بالخليط الهولندى × البرونزى ٥٩,٣٣ وحدة/ لتر بينما كان الهولندى الابيض اعلا متوسط لهذا الانزيم بعد التصويم٥٩,٣٣ وحدة/لتر. لوحظ انخفاض فى مستوى انزيم GPT نتيجة للتصويم وكان مقدار هذا الانخفاض قيمته ١,١٢ وحدة/ لتر. كان بروتين السيرم الكلى للديوك المغذاه على ١٧٪ بروتين اعلا معنويا من تلك المغذاه على ١٢٪ بروتين سواء قبل او بعد التصويم.