J. Animal and Poultry Prod., Mansoura Univ., Vol. 6 (8): 583 -595 , 2015

REPRODUCTIVE PERFORMANCE OF BUFFALO BULLS TREATED WITH DIFFERENT LEVELS OF THYROGLOBULIN

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ABSTRACT

This study was conducted to investigate the effect of thyroglobulin (TG) treatments on growth rate, some testicular measurements, semen characteristics and blood constituents. Fifteen buffalo bulls aged 21 - 28 months with average initial body weight 305.8 ± 2.5 kg. were divided randomly into three comparable groups (5 animals in each) and subjected to one of the following treatments throughout 24 weeks: The first group (C) : served as a control group without any treatment. Bulls of the second group (TG1), were subjected to ration administration of thyroglobulin treatment (high content of potassium iodide, 1gm. plus 0.25 g iodine) at the rate of 50 ml/head twice a week. Bulls of the third group (TG2), were subjected to ration administration of thyroglobulin treatment (low content of potassium iodide, 0.6 gm. plus 0.25 g iodine) at the rate of 50 ml/head twice a week.

Differences in live body weight (LBW) between treated groups and group C were highly significant ($P < 0.01$). The treated group TG1 attained 17.75% higher LBW than that of group C and showed a significant increase in daily weight gain (DWG) as compared with other groups.

Concentrations of blood total proteins or its fractions (albumin and globulin) were significantly ($P <0.05$) the highest in group TG1 when compared with those of groups C and TG2. Concentrations of glucose and blood urea nitrogen (BUN) were significantly different between groups ($P < 0.05$). Group TG1 had significantly ($P < 0.05$) higher content of cholesterol and creatine in blood as compared with other groups. Group C showed the least content of creatinine whereas TG1 had the highest content among treated groups. Group TG1 showed significantly ($P < 0.05$) greater transaminases activity (ALT and AST) than that of all other groups. Concentrations of T4 increased to 9.87 µg/dl at the 3rd phase of growth in TG1 group. Similar trend was observed for testosterone concentration.

Scrotal circumference was greater in TG treated groups than that of group C by reaching the 3rd stage of growth. Higher testicular volume was observed for the treated TG1 group by 22.97% over that of group C at the 3rd stage of growth. The least values of semen volume were obtained by group C throughout growth stages whereas the maximum volumes were achieved by groups TG1 and TG2. Higher libido (less reaction) was exhibited by groups TG1 as compared with groups TG2 and group C. Group TG1 showed the maximum sperm concentration as compared with other groups.

Groups TG1 and TG2 achieved higher sperm output by 27.43% and 4.36% than group C at the 3rd stage of growth. Differences in sperm abnormality between groups were significant ($P < 0.05$) where the minimum percent was that of TG1 (15.38%). The highest percentage of live sperms was attained by group TG1 (72.1 %) at 3rd stage of growth.

It can be concluded that higher dose of thyroglobulin (1gm.of potassium iodide plus 0.25 g iodine) at the rate of 50 ml/head twice a week, had promoted growth of buffalo bulls, enhanced its metabolic activity hence improved male libido, output of semen and its physical characteristics.

Keywords: *buffalo bulls, thyroglobulin, metabolism, semen characteristics*

INTRODUCTION

The Egyptian buffaloes represent the genetic resource of buffalo animals (*Bubalus Bubalis)* in the north of Africa as well as being a part of the ecosystem in the rural areas of the Nile valley and it's Delta. Potency of semen production from the Egyptian buffalo bulls is implicated by some obstacles such as exhaustion of bulls in natural insemination practices and improper freezability of semen for AI purposes. Therefore, use of growth stimulators and antioxidants to promote reproductive performance of bulls is recommended.

Thyroglobulin as precursor of the thyroid hormones has an important role to accelerate metabolic processes particularly via supply of iodine needed to activate the thyroid gland functions (Roman and Kutsky, 1981). Thus, thyroglobulin may have indirect effects on growth enhancement productivity (Abdel-aziz, 2006 and Youssef *et al.,* 2008). Thyroid hormones are essential for normal growth, sexual development and reproductive function. During puberty, changes in thyroid functions and the increase in thyroid volume occur as an adaptation to body and sexual development (Weber *et al.,* 2003). Thyroid hormones are now being recognized as having important role in spermatogenesis. The identification of thyroid hormone receptors on Sertoli cells has embarked further research to investigate the role of thyroid hormones in male reproduction. Since spermatogenesis occurs in close contact with the Sertoli cells, the thyroid hormones must exert significant regulatory role in sperm production. Therefore, disturbances in the thyroid function may affect spermatogenesis and male fertility (Rajender *et al.,* 2011). Therefore, the main objectives of the present investigation were to study the effects of using different dosages of thyroglobulin preparation on growth performance, metabolic activity and reproductive performance of buffalo bulls.

MATERIALS AND METHODS

Experimental animals and treatments:

This experimental work was carried out at Mehallet Mousa Buffalo Research Station (Kafer El-Shaikh governorate). Data were obtained from fifteen buffalo bulls aged 21- 28 months with average initial body weight 305.8 ± 2.5 kg. Animals were divided randomly into three comparable groups (5 animals in each) and subjected to one of the following treatments throughout 24 weeks.

The first group (C): served as a control group without any treatment. Bulls of the second group (TG1) were subjected to ration supplemented with thyroglobulin (high content of potassium iodide, 1gm. plus 0.25 g iodine) at the rate of 50 ml/head twice a week. Bulls of the third group (TG2) were subjected to ration supplemented with thyroglobulin (low content of potassium iodide, 0.6 gm. plus 0.25 g iodine) at the rate of 50 ml/head /twice a week.

The mixture of iodinated casein (thyroglobulin, TG) composed of 0.25 gm iodine and (1 gm potassium iodide as higher level for group TG1 or 0.6 g

potassium iodide as lower level for group TG2) dissolved in 50 ml water and added to 50 gm milk powder (Sharawy *et al*. 1987). The TG mixture was thoroughly mixed with the concentrated ration and offered to the animal.

Animal feeding and management:

During the experimental period, animals were maintained under uniform feeding (APRI, 1997), and management conditions. Rations were composed of a concentrate feed mixture (CFM), and rice straw (RS)**.** Dietary allowances were offered twice daily at 7 a.m. and 5 p.m., the CFM composed of 33% un-decorticated cotton seed meal, 22% corn, 21% wheat bran, 14% rice bran, 3% molasses, 3% limestone, 1.2% common salt and 2.8% calcium. The experimental animals were kept under semi shed stable on slotted concrete floors, and subjected to the regular managerial practices of the breeding stock. Water was freely available in water troughs. The experimental bulls were generally in good healthy conditions. Fasting body weight of bulls was recorded every 15 day before morning meal. Live body weight (LBW, kg), daily weight gain (DWG, g/day) and relative growth rate (RGR, %) for the experimental groups were estimated.

Testicular measurements:

The testicular measurements were recorded every two weeks intervals including the following traits:

The scrotal circumference was measured with a flexible, according to (Mickkelson *et al.,* 1982).

The testicular volume (ml) was determined by water displacement technique. The testis tone firmer score (TTFS) was determined as described by Wildeus and Hammond (1993).

Sexual activity and semen collection:

The sexual activity of bulls was measured by estimating the reaction time (RT) in seconds as the time elapsed from exposing the bull to the teaser till complete ejaculation. Semen was collected from all bulls every week using an artificial vagina and semen evaluation was recorded weekly along the experimental period. Bulls were sexually stimulated by allowing two false mounts prior to each ejaculate. Ejaculates of each bull were evaluated immediately after collection to determine the following semen characteristics: Semen ejaculate volume (ml), percentage of progressive sperm motility (%), percentage of live sperm (%), percentage of dead sperms (%), percentage of sperm abnormalities (%), sperm cell concentration (x 10^6/ml) and total sperm-output (x10^6/ ejaculate).

Blood sampling and biochemical analysis:

Blood samples were collected every 15 days via the jugular vein from each bull into vacutainer heparinized tubes before morning meal along the experimental period and immediately centrifuged at 3000 rpm for 20 minutes then plasma was separated and stored at -20ºC until analyzed for the different blood parameters. Using readymade kits, blood plasma was analyzed for determination of blood total protein (Weichselbaum, 1964), albumin (Drupt, 1974), (Globulin by subtracting albumin from total protein), glucose (Tietz, 1986), blood urea nitrogen (Fawcett, and Scott,1960), Creatine and Creatinine (Henry, 1965), aminotransferases enzymes (ALT &

AST, Reitman and Frankel, 1957), total cholesterol (Kostner et al. 1979), Direct radioimmunoassay technique was adopted for determination of plasma testosterone, triiodothyronine (T3) and thyroxine (T4), using kits of "Diagnostic Products Corporation, Los Angeles, USA".

Statistical analysis:

Data were analyzed by least squares analysis of variance using the General Linear Model procedure of the Statistical Analysis System SAS, (1988). Differences were subjected to Duncan's Multiple Range Test (Duncan, 1955). Data concerning growth traits of buffalo bulls within each treatment were analyzed into account three age categories namely, ≤ 25mo, 26-35 mo and >35mo throughout the experimental period. On the other hand, data of blood hormones, testis and semen parameters were divided across three growth stages (2 months each) to consider the effect of treatments within each stage for the tested parameters.

RESULTS AND DISCUSSION

Growth traits of buffalo bulls:

Data of growth traits of the experimental groups are shown in table (1). Differences in LBW, in the last two age categories, between treated groups and group C were highly significant ($P < 0.01$). The treated group TG1 attained 17.75% higher LBW than that of group C. Daily weight gain of the experimental groups increased with advance of growth stages, the less dosages of TG2 resulted in higher DWG of bulls than the control group C while, the higher dosages in group TG1 showed a significant increase in DWG in comparison with other groups. At the 3rd stage of growth RGR of group C was the lowest among groups.

Table (1)Least square means of growth traits in buffalo bulls as affected by thyroglobulin treatments.

Age category	Experimental groups			Overall	Significance
(month)	C	TG1	TG2	Mean	
	Live body weight (LBW, kg)				
Less than or equal 25	303.8± 11.44 ^{b}	325.6 ± 7.62 ^{a}	318.5 ± 8.09 ^{ab}	322.4	NS
From 26 to35	346.8± 10.68 ^{b}	419.5 ± 9.94 ^{a}	390.2 ± 11.11 ^{a}	393.2	**
Greater than 35	428.6± 9.44 ^{b}	504.8 ± 13.91 ^{a}	486.5 ± 10.77 ^{a}	474.5	**
	Daily weight gain (DWG, g/day)				
Less than or equal 25	0.77± 0.22 ^{b}	1.32 ± 0.11 ^{a}	1.12 ± 0.12 ^{ab}	1.13	NS
From 26 to35	0.92± 0.08 ^{b}	1.54 ± 0.07 ^{a}	1.32 ± 0.08 ^{a}	1.28	**
Greater than 35	1.13± 0.07 ^{b}	1.52 ± 0.11 ^{a}	1.49 ± 0.08 ^{a}	1.42	**
	Relative growth rate (RGR %)				
Less than or equal 25	0.29± 0.07 ^{b}	0.43 ± 0.04 ^{a}	0.37 ± 0.04 ^{ab}	0.37	NS
From 26 to35	0.28± 0.02 ^{b}	0.39 ± 0.02 ^{a}	0.37 ± 0.02 ^{a}	0.36	**
Greater than 35	0.29± 0.02	0.33 ± 0.02	0.34 ± 0.02	0.33	*

Means bearing different superscripts in the same raw are significantly different ($P < 0.05$). ** = Highly significant ($P < 0.01$), * = significant ($P < 0.05$), NS = Non significant

In agreement with the present findings, Abdel-aziz, (2006) observed that thyroglobulin administration under hot climate improved DWG and RGR of buffalo calves. Also, Youssef *et al.* (2008) concluded that the effect of

thyroglobulin on growth enhancement is closely related with lower temperature during moderate or cold climatic conditions. Also, Barakat (2004) reported that potassium iodide supplement (1.25 mg potassium iodide/head/day) to the Friesian bulls have a beneficial effect on growth.

As shown in table (2) concentrations of blood total proteins (TPR) or its fractions (albumin and globulin) were significantly ($P < 0.05$) the highest in group TG1 when compared with those of groups C and TG2. El-Barody *et al.* (1998) found that plasma content of total protein, globulin and albumin in Friesian calves treated with a single dose of thyroid extract (60 mg/head/week, for 12 weeks) during cold winter conditions were insignificantly higher in the treated group. It was suggested that administration of thyroid hormones affect protein synthesis through increasing RNA polymerase and the rate of cytoplasmic protein synthesis as well as stimulation of the nuclear components transport to the cytoplasm and induce formation of new enzyme (Martin, 1976). Abdel-aziz, (2006) observed that compound administration with TG plus oral vitamin c under hot climate increased slightly plasma proteins in buffalo young bulls.

Youssef *et al.* (2008) observed that concentrations of TPR were greater in TG treated groups of buffalo bulls during moderate climate due to higher proportion of albumin.

Concentrations of blood urea nitrogen (BUN) were significantly different between TG1 and the other groups ($P < 0.05$) and it was beyond the recommended values for optimum reproductive efficiency. Glucose concentrations ranged between 52.00 to 57.97 mg/dl among group with a statistical difference between the treated groups. Group TG1 showed significantly ($P < 0.05$) greater content of cholesterol than that of other groups. Youssef *et al.* (2008) reported that under hot climate, plasma concentration of total lipids, cholesterol and glucose in pubertal buffalo bulls were not affected significantly by TG treatments.

Group TG1 had significantly ($P < 0.05$) higher content of creatine in blood as compared with other groups. Group C showed the lowest content of creatinine whereas TG1 had the highest content among treated groups. These results may indicate positive alteration in animal energetic evoked by TG treatment.

Group TG1 showed significantly ($P < 0.05$) greater transaminases activity (ALT and AST) than that of other groups. Youssef *et al.* (2008) found that TG treatments had no significant effect on ALT and AST activities in pubertal buffalo bulls under hot climate while, TG treatment increased significantly ($P < 0.05$) ALT and insignificantly AST concentrations under moderate climate.

Table (2) Least square means of some blood parameters in buffalo bulls as affected by thyroglobulin treatments.

Trait	Experimental groups			Overall
	C	TG1	TG2	Mean±SE
Total protein (g/dl)	5.27^{c}	6.51^{a}	5.77^{b}	5.91±0.05
Albumin (g/dl)	2.93^{c}	3.40^{a}	3.23^{b}	3.21±0.04
Globulin (g/dl)	2.34^{c}	3.10^{a}	2.54^{b}	2.70±0.05
A/G ratio	1.35^{a}	1.13^{b}	1.37^{a}	1.28±0.04
BUN (mg/dl)	41.52^{b}	47.22^{a}	41.88^{b}	43.90±0.44
Glucose (mg/dl)	52.00^{b}	57.97^{a}	52.78^{b}	54.51±0.43
Cholesterol (mg/dl)	73.24^{c}	81.97^{a}	76.12^{b}	77.11±0.38
Creatine (mg/dl)	6.61^{b}	7.08^{a}	6.84^{ab}	6.81±0.08
Creatinine (mg/dl)	1.12^{b}	1.41^{a}	1.31^{a}	1.28±0.02
ALT(IU / dl)	83.58^{c}	90.69^{a}	85.49^{b}	86.47±0.51
AST (IU / dl)	34.62^{c}	40.53^{a}	36.04^{b}	37.19±0.23

Means bearing different superscripts in the same raw are significantly different (P < 0.05).

As shown in table (3) all groups increased level of the thyroid hormones T_3 and T_4 with advancement of growth stages. Average concentration of T3 increased from 191.3 ng/dl to 230.5 ng/dl by reaching the 3rd phase of growth with no significant differences among groups. Meanwhile, average concentration of T_4 increased to 9.53 µg/dl at the 3rd phase of growth with a superiority of its level (9.87 µg/dl) in TG1 group. From a physiological point of view, the high production state is related to the increase in bioconversion of T_4 to T_3 and the decrease in plasma T_4 without any change in plasma T_3 was good predictor for productive traits and sexual maturity (Khalifa and Shoukry, 1992). These results were in agreement with El-Barody *et al.* (1998) who found that plasma T4 ($P < 0.01$) and T3 ($P < 0.05$) concentrations were significantly higher in Friesian calves treated with a single dose of thyroid extract (60 mg/head/week, for 12 weeks) during cold winter conditions. In contrary, Grace *et al.* (1996) stated that iodine supplementation did not affect blood T_3 concentration. On the other hand, Abdel-aziz, (2006) concluded that TG administration (50 ml/head/2days) was not sufficient to increase plasma T3 and T4 under hot or moderate climates. Abdel-aziz, (2006) and Youssef *et al.* (2008) stated that concentrations of T_3 and T_4 in pubertal buffalo bulls were affected mainly by climate rather than by TG treatments.

Similar trend was observed for testosterone concentration which elevated from 0.95 ng/dl at the 1st stage to 1.80 ng/dl at the 3rd stage of growth. The overall mean of testosterone concentration as well as the final concentration were significantly ($P < 0.05$) higher in group TG1 as compared with group C. The positive impact of TG treatments on levels of concentrations of both T4 and testosterone hormones may partially related to feeding the experimental groups during green fodder season. Abdel-aziz, (2006) found that TG treatment increased testosterone level after 16 months of buffalo calf age under moderate climate.

Table (3) Least square means of thyroid hormones and testosterone in buffalo bulls as affected by sampling stage, thyroglobulin treatments.

Trait	Sampling	Experimental groups			Overall
	Stage	C	TG1	TG2	Mean±SE
T3 (ng/dl)	1	181.7^{c}	200.3^{a}	190.81^{b}	191.32±2.01
	2	208.9^{b}	217.74^{a}	214.28^{ab}	213.45±2.10
	3	230.1	231.69	230.61	230.51±1.36
	Overall±SE	206.89±1.96	216.59±1.44	211.90±1.78	
T4 (ug/dl)	1	6.66^{b}	7.55^{a}	7.14^{a}	7.17±0.14
	2	7.86^{b}	8.68^{a}	8.14^{a}	8.30±0.14
	3	9.21^{b}	9.87^{a}	9.42^{ab}	9.53±0.19
	Overall±SE	7.91±0.15	8.71±0.14	8.24±0.17	
Testosterone (ng/ml)	1	0.87^{b}	1.03^{a}	0.95^{ab}	0.95±0.04
	2	1.32^{ab}	1.45^{a}	1.25^{b}	1.34±0.05
	3	1.71^{b}	2.06^{a}	1.59^{b}	1.80±0.08
	Overall±SE	1.31±0.04	1.52±0.07	1.27±0.05	

Means bearing different superscripts in the same raw are significantly different (P < 0.05).

Considering that scrotal circumference is main denominators for the testicular size and activity, treated groups achieved greater circumference than that of group C (Table 4). Group TG1 maximized its scrotal circumference in comparison with all examined groups (P < 0.05) by reaching the 3rd stage of growth. Such increase in scrotal circumference resulted in higher testicular volume of the treated group TG1, by 23 % over that of group C at the 3rd stage of growth. However, testis tone firmer score showed a conflicted result indicating that group C exhibited a comparable score with all tested groups.

Table (4): Least square means of some testis parameters in buffalo bulls as affected by thyroglobulin treatments.

Trait	Growth	Experimental groups			Overall
	Stage	C	TG1	TG2	Mean±SE
Scrotal circumference (cm)	1	18.84^{b}	24.00^{a}	20.38^{b}	21.37±0.24
	2	22.80^{b}	26.96^{a}	23.87^{b}	24.93±0.27
	3	26.76^{b}	30.08^{a}	27.59^{b}	28.49±0.27
	Overall±SE	22.8±0.3	27.02±0.3	23.94±0.3	
Testicular Volume (ml)	1	401.40^{c}	467.55^{a}	427.65^{b}	435.73±3.46
	2	429.15^{bc}	518.05^{a}	446.90^{b}	469.33±3.5
	3	452.85^{b}	556.80^{a}	465.70^{b}	497.21±3.52
	Overall±SE	427.8±4.47	514.13±4.51	446.75±4.55	
Testis tone firmer score	1	5.63^{a}	5.34^{b}	5.14^{b}	5.41±0.03
	2	5.86^{a}	5.76^{a}	5.36^{b}	5.71±0.04
	3	6.00^{a}	6.03^{a}	5.60^{b}	5.91±0.07
	Overall±SE	5.83±0.04	5.71±0.04	5.36±0.05	

Means bearing different superscripts in the same raw are significantly different (P < 0.05).

Regarding the effect of thyroglobulin on testicular measurements , Wagner *et al.* (2009) stated that, thyroid hormone plays a critical role in testis development, in rats and other vertebrate species, is clearly established. Although the effects of thyroid hormone on sertoli and leydig cells in the

immature testis are well described, its role on the adult organ remains controversial. Meanwhile, Andersson and Alanko, (1992) found that, scrotal circumference had a significant positive correlation with fertility in dairy bulls adding that, testicular palpation was the best basis for predicting bulls with poor semen quality.

Physical characteristics of buffalo bull semen are shown in table (5). The least values of semen volume were obtained by group C throughout growth stages whereas the maximum volumes were achieved by groups TG1and TG2. The overall mean of RT indicated rapid response of the treated groups in comparison with that of non treated group C. In addition, higher libido was exhibited by groups TG1 as compared with groups TG2. Although, sperm concentration of group C showed a remarkable increase with advance of sampling stage, its values were relatively less than of the treated groups. Group TG1 showed the highest sperm concentration as compared with other groups. Comparing total sperm output of the treated groups with that of group C at the 3rd stage of growth, it was abundant that groups TG1 and TG2 achieved higher sperm output by 27.43% and 4.36% than group C. Percentages of sperm motility were almost around 60% among the treated groups compared with 55% for the control group throughout the sampling stages. It was observed that sperm abnormalities (ABN) in all groups were declined relatively with advance of growth period. Differences in sperm ABN among groups were significant ($P < 0.05$) where the minimum percent was that of TG1 (15.38%). Percentage of the live sperm was the minimum in group C along the growth period being less than 60% whereas it varied between the treated groups. The highest percentage of live sperms was attained by groups TG1 (72.1 %) at 3rd stage of growth.

These results were in agreement with Barakat (2004) who found that potassium iodide supplement (1.25 mg potassium iodide/head/day) to the Friesian bulls have a beneficial effect on growth and maturation as well as, semen quality and quantity. It improves the endocrinological output of hormones. Also, the administration of potassium iodine to bulls improved the ejaculate volume (Simirnov, 1972). Furthermore, Darwish *et al.* (1974) cited that feeding iodine (0.5 gm potassium iodine/head/day) during summer improved the ejaculate volume in the Friesian bulls. Likewise, Simirnov (1972) *and* Sanchez (1995) noticed that in regions where iodine deficiency occurs, bulls fertility is affected due to decreased libido, ejaculate volume, sperm motility and sperm cell concentration. Moreover, supplement potassium iodide to these bulls improved the libido, ejaculate volume, sperm motility and sperm cell concentration.

Table (5) Least square means of semen parameters in buffalo bulls as affected by thyroglobulin treatments.

Trait	Sampling Stage	Experimental groups			Overall
		C	TG1	TG2	Mean±SE
Volume (ml)	1	2.07^{b}	2.53^{a}	2.13^{b}	2.36±0.02
	2	2.36^{b}	2.61^{a}	2.41^{b}	2.47±0.02
	3	2.37^{c}	2.81^{a}	2.53^{b}	2.54±0.02
	Overall±SE	2.27±0.02	2.65±0.02	2.36±0.02	
Reaction time (Sec.)	1	78.16^{a}	66.60^{b}	75.10^{a}	72.44±0.98
	2	81.99^{a}	64.83^{c}	74.71^{b}	74.02±0.98
	3	83.39^{a}	65.27^{c}	74.53^{b}	73.27±0.98
	Overall±SE	81.18±1.26	65.57±1.26	74.78±1.26	
Sperm concentration / ml (x 10^{6})	1	487.71^{c}	612.83^{a}	545.36^{b}	565.24±3.56
	2	540.98^{b}	641.55^{a}	563.59^{b}	586.18±3.56
	3	606.68^{b}	661.13^{a}	600.14^{b}	606.28±3.56
	Overall±SE	545.12±4.59	638.51±4.59	569.70±4.59	
Sperm output / ml (x 10^{6})	1	1377.7^{c}	1689.6^{a}	1597.6^{b}	1577.1±13.84
	2	1476.6^{c}	1815.7^{a}	1577.3^{b}	1672.5±13.84
	3	1549.1^{b}	1974.0^{a}	1616.7^{b}	1697.9±13.84
	Overall±SE	1467.8±	1826.4±	1597.2±	
Sperm motility (%)	1	50.00^{b}	60.00^{a}	50.00^{b}	55.00±0.24
	2	55.00^{b}	60.00^{a}	60.00^{a}	60.00±0.24
	3	60.00	60.00	60.00	60.00±0.24
	Overall±SE	55.00±0.31	60.00±0.31	60.00±0.31	
Abnormality (%)	1	22.15^{a}	18.72^{c}	20.78^{b}	20.00±0.16
	2	20.45^{a}	16.45^{c}	19.03^{b}	18.69±0.16
	3	19.05^{a}	15.38^{c}	17.78^{b}	17.86±0.16
	Overall±SE	20.55±0.21	17.00±0.21	19.19±0.21	
Live sperm (%)	1	56.88^{b}	63.99^{a}	56.61^{b}	59.83±0.40
	2	58.26^{b}	69.49^{a}	60.34^{b}	62.66±0.40
	3	59.68^{b}	72.05^{a}	59.59^{b}	63.01±0.40
	Overall±SE	58.27±0.52	68.51±0.52	58.84±0.52	

Means bearing different superscripts in the same raw are significantly different (P < 0.05).

As shown in table (6), the correlation coefficients between studied blood metabolites and metabolic body weight (MBW) of buffalo bulls were highly significant (P <0.001) except being significant (P <0.005) with albumin (0.19) and globulin (0.018) for non treated group.

Despite correlation coefficients between blood total proteins or its fractions (albumin and globulin) and other metabolites were highly significant (P <0.001), the correlation estimates were abundantly greater with TG treatment than the control ones. In other words, increased levels of albumin and globulin in TG treated animals may augment activities of other metabolites.

As shown in table (7), no significant correlation was noticed between MBW and RT of bulls an all studied groups. On the other hand, MBW was significantly correlated (P <0.01) with seminal volume, sperm concentration, sperm output, percent of motile sperms, percent of live sperms while, it was negatively correlated with percent of abnormal sperms.

Table (6):Correlation coefficients between blood metabolites and metabolic body weight of buffalo bulls treated with thyroglobulin.

Items	TRT	MBW	Total protein	Albumin	Globulin	Glucose	Blood urea nitrogen	Creatin	Creatinine	ALT	AST
Total protein	C	0.36 HS									
	TG	0.62 HS									
Albumin	C	0.19 S	0.24HS								
	TG	0.35 HS	0.52HS								
Globulin	C	0.18 S	0.72HS	- 0.51HS							
	TG	0.49 HS	0.80HS	- 0.08 NS							
Glucose	C	0.93 HS	0.36 HS	0.19 NS	0.21 S						
	TG	0.74 HS	0.66 HS	0.35 HS	0.53 HS						
Blood urea nitrogen	C	0.91 HS	0.37 HS	0.15 NS	0.22 HS	0.91 HS					
	TG	0.81 HS	0.70 HS	0.41 HS	0.53 HS	0.85 HS					
Creatin	C	0.88 HS	0.35 HS	0.12 NS	0.23 HS	0.87 HS	0.94 HS				
	TG	0.96 HS	0.63 HS	0.33 HS	0.50 HS	0.75 HS	0.82 HS				
Creatinine	C	0.90 HS	0.37 HS	0.16 NS	0.21 HS	0.90 HS	0.92 HS	0.92 HS			
	TG	0.73 HS	0.50 HS	0.24 HS	0.41 HS	0.53 HS	0.59 HS	0.70 HS			
ALT	C	0.82 HS	0.39 HS	0.13 NS	0.25 HS	0.84 HS	0.88 HS	0.83 HS	0.86 HS		
	TG	0.80 HS	0.70 HS	0.36 HS	0.57 HS	0.67 HS	0.68 HS	0.75 HS	0.55 HS		
AST	C	0.54 HS	0.15 NS	0.02 NS	0.12 NS	0.59 HS	0.59 HS	0.56 HS	0.62 HS	0.57 HS	
	TG	0.62 HS	0.74 HS	0.41 HS	0.58 HS	0.66 HS	0.63 HS	0.64 HS	0.50 HS	0.74 HS	
Cholesterol	C	0.89 HS	0.26 HS	0.13 NS	0.13 NS	0.86 HS	0.89 HS	0.91 HS	0.90 HS	0.80 HS	0.57 HS
	TG	0.83 HS	0.72 HS	0.35 HS	0.59 HS	0.82 HS	0.86 HS	0.85 HS	0.61 HS	0.71 HS	0.70 HS

HS = Highly significant (P < 0.01), S = significant (P < 0.05), NS = Non significant
MBW = LBW $^{0.75}$

Table(7)Correlation coefficients between semen physical characteristics and metabolic body weight of buffalo bulls treated with thyroglobulin.

Items	TRT	MBW	Volume	Reaction time	Sperm concentration	Sperm output	Motility	Abnormality
Volume	C	0.51 HS						
	TG	0.46 HS						
Reaction time	C	0.16 NS	0.10 NS					
	TG	0.01 NS	- 0.14 S					
Sperm concentration	C	0.72 HS	0.57 HS	0.11 NS				
	TG	0.40 HS	0.35 HS	- 0.30 HS				
Sperm output	C	0.26 HS	0.21 S	0.07 NS	0.36 HS			
	TG	0.31 HS	0.41 HS	- 0.15 HS	0.39 HS			
Motility	C	0.68 HS	0.47 HS	0.18 S	0.69 HS	0.18 S		
	TG	0.80 HS	0.52 HS	- 0.08 NS	0.47 HS	0.43 HS		
Abnormality	C	- 0.56 HS	- 0.29 HS	- 0.06 NS	- 0.46 HS	- 0.11 NS	- 0.74 HS	
	TG	- 0.56 HS	- 0.39 HS	0.04 NS	- 0.34 HS	- 0.41 HS	- 0.71 HS	
Live sperm	C	0.21 HS	0.04 NS	0.17 S	0.24 HS	0.25 HS	0.37 HS	- 0.20 S
	TG	0.33 HS	0.46 HS	- 0.24 HS	0.50 HS	0.39 HS	0.41 HS	- 0.43 HS

HS = Highly significant (P < 0.01), S = significant (P < 0.05), NS = Non significant
MBW = LBW $^{0.75}$

CONCLUSION

The present work investigated the role of thyroglobulin in improving reproductive performance of buffalo bulls. Generally, the treated groups showed greater DWG, testicular measurements and sperm output than that of non-treated group. Such performance was evidenced by indices of protein synthesis, energy production and hormonal production of testosterone and thyroxine. Moreover, administration of higher doses of thyroglobulin resulted

in superior potency of reproductive aspects in the treated bulls. It can be concluded that higher doses of thyroglobulin (1gm. potassium iodide plus 0.25 g iodine, at the rate of 50 ml/head twice a week) had promoted growth of buffalo bulls, enhanced its metabolic activity hence improved male libido, output of semen and its physical characteristics.

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الأداء التناسلى لطلائق الجاموس المعاملة بمستويات مختلفة من الثيروجلوبيولين.

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أجرى هذا البحث لدراسة تأثير مستوى المعاملة بمادة الثيروجلوبيولين على معدل نمو طلائق الجاموس وبعض مقاييس الخصية وصفات السائل المنوي ومكونات الدم.

أستخدم فى هذه الدراسة ١٥ عجل جاموسى فى عمر ٢١-٢٨ شهر وكان متوسط الوزن عند بداية التجربة٣٠٥ ± ٢.٥ كجم وتم تقسيم العجول عشوائيا الى ثلاث مجموعات متساوية (خمسة حيوانات فى كل مجموعة) واخضعت لمدة ٢٤ أسبوع الى المعاملات الاتية:

١. المجموعة الاولى (C) : مجموعة للمقارنة لم تخضع لأي معاملة.

٢. المجموعة الثانية(TG1): تم معاملة الطلائق بمستحضر الثيروجلوبيولين (عالى المحتوى من ايوديد البوتاسيوم، ١جم بالاضافة الى٠.٢٥ جم من الايودين) بمعدل ٥٠مل / راس /مرتين اسبوعيا يضاف الى العلف المركز.

٣. المجموعة الثالثة (TG2) : تم معاملة الطلائق بمستحضر الثيروجلوبيولين (منخفض المحتوى من ايوديد البوتاسيوم، ٠.٦ جم بالاضافة الى ٠.٢٥ جم من الايودين) بمعدل ٥٠مل / راس /مرتين اسبوعيا يضاف الى العلف المركز.

وكانت النتائج المتحصل عليها كالتالى:

١. وزن الجسم الحى:

- كانت هناك فروق عالية المعنوية (٠.٠١) في وزن الجسم الحى (LBW) بين المجاميع المعاملة ومجموعة المقارنة. حققت المجموعة TG1 أعلى قيمة فى وزن الجسم الحى بنسبة ١٧.٧٥ % عن المجموعة C كما أظهرت زيادة معنوية فى معدل النمو اليومى (DWG) مقارنة بالمجموعات الاخرى.

٢. مكونات الدم:

- اظهرت تركيزات البروتين الكلى اواحد مشتقاته (الالبيومين والجلوبيولين) اختلافات معنوية (٠.٠٥) حيث كان التركيز الاعلى فى مجموعة TG1 مقارنة بمجموعة C المقارنة.
- اظهرت تركيزات الجلوكوز واليوريا اختلافات معنوية (٠.٠٥) بين المجاميع التجريبية.
- اظهرت المجموعة TG1 أعلى تركيز معنوى فى كلا من الكوليسترول والكريـاتين مقارنة بالمجموعات الاخرى.
- اظهرت مجموعة المقارنة تركيزا اقل من الكرياتينين بينما اظهرت المجموعة TG1 المحتوى الأعلى بين المجاميع المعاملة.
- اظهرت المجموعة TG1 أعلى تركيزات معنوية (٠.٠٥) مقارنة بكل المجاميع الاخرى في نشاط الانزيمات الناقلة لمجموعة الامين (ALT & AST).
- فى المرحلة الثالثة من النمو لوحظ زيادة تركيز هرمون الدرقية رباعى اليود (T4) الى ٩.٨٧ ميكروجرام/١٠ مل فى المجموعة TG1. كما لوحظ ايضا اتجاه مشابه فى هرمون التستوستيرون.

٣. مقاييس الخصية:

- فى المرحلة الثالثة من النمو أظهرت المجموعات المعاملة بال TG قيما أعلى فى محيط كيس الصفن مقارنة بمجموعة المقارنة.
- لوحظ ان اعلى حجم للخصية فى المجموعة TG1 بزيادة قدرها ٢٢.٩٧ % عن المجموعة C فى المرحلة الثالثة للنمو.

٤. صفات السائل المنوى:

- اظهرت المجموعة C أقل قيم فى حجم السائل المنوى خلال مراحل النمو عن مجموعتى المعاملة بالثيرجلوبيولين.
- اظهرت المجموعة TG1رغبة جنسية أعلى (زمن تجاوب جنسى أقل) وأعلى نسبة فى تركيز الحيوانات المنوية مقارنة بالمجموعة TG2 والمجموعة C.
- حققت المجموعة TG1 وTG2 أعلى عدد كلى من الحيوانات المنوية بزيادة قدرها ٢٧.٤٣ و٤.٣٦ % عنها فى المجموعة C .
- اظهرت المجموعات التجريبية اختلافات معنوية (٠.٠٥) فى النسبة المئوية للحيوانات المنوية الشاذة حيث كانت النسبة الاقل فى المجموعة TG1 (١٥.٣٨ %).
- فى المرحلة الثالثة للنمو حققت المجموعة TG1 النسبة المئوية الاعلى للحيوانات المنوية الحية (٧٢.١ %).
- يمكن ان نستنتج أن المعاملة بالثيروجلوبيولين (الجرعة ذات المحتوى العالي من ايوديد البوتاسيوم) حفزت معدل النمو فى طلائق الجاموس من خلال تحسين نشاطها التمثيلي والذى أدى الى تحسين الرغبة الجنسية والناتج الكلى من الحيوانات المنوية و خصائصه الطبيعية.