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EFFECT OF ALTERNATED DRINKING SALINE WELL WATER ON THE REPRODUCTIVE PERFORMANCE OF RABBITS

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This work aimed to study the influences of drinking saline well water and the alternation with fresh tap water every week as one of the bio-stimulation methods to reduce the harmful effects of continuous drinking saline water on reproductive performance of rabbits.

A total number of 48 V-Line rabbits old 5 months (30 does, body weight of 2955.0 ± 32.6 g and 18 bucks, body weight of 2850.0 ± 31.2 g) were used in this study. Rabbits were randomly divided into three equal groups (10 does and 6 bucks / group). Rabbits of the 1st group (G1) considered as control group drank tap water (301 ppm total dissolved solids, TDS), rabbits of 2nd group (G2) drank well water (5568 ppm TDS), while rabbits of 3rd group (G3) drank well water followed with drank fresh tap water every week until the end of experiment (alternated system).

The results showed that, conception rate was found to be higher (P<0.05) in the does of G3 (+ 21 %) than that in the does of G2. Moreover, does of G3 has insignificant decrease in the number of services per conception by - 10 % compared to the does of G2. Does of G3 had higher (P<0.05) litter traits when compared to the does of G1 and G2. On the other hand, overall mortality rate was significantly increased in the does of G2 (26.5 %) as compared to the does of G1 (10.3 %). Daily water intake was increased (P<0.05) in rabbits of G2 and G3 as compared to the rabbits of G1. Efficiency index and feed conversion were significantly improved in the rabbits of G3 when compared to the rabbits of G1 and G2. Moreover, The cost of feeding for producing one kg live weight was decreased (P<0.05) in does of G3 by 4.08 and 2.40 L.E. as compared to the rabbits of G2 and G1, respectively.

On the other hand, bucks of G2 exhibited a decrease (P<0.05) in ejaculate volume (29.3 %) as compared to the bucks of T3. Sperm concentration, total sperm output, total motile sperm and semen quality were significantly decreased in the bucks of G2 as compared to the bucks of G1. Sperm motility was decreased (P<0.05) in the bucks of G2 as compared to other groups. Also, bucks of G2 showed significantly increased in dead spermatozoa, sperm abnormalities and hydrogen ion (pH) as compared to other two treatments. Bucks drank saline water (G2) had significant increase in reaction time as compared to the bucks of G1 and G3. However, bucks of G2 had insignificantly decreased testosterone hormone by 36.9 and 32.5 % as compared to the bucks of G1 and G3, respectively.

Conclusively, *applying alternating water system as a bio-stimulation method could eliminate the drastic effects of continuous drinking saline well water on reproductive performance of rabbits under new reclaimed lands.*

Key words: Rabbits, saline well water, reproductive performance, semen quality, testosterone hormone.

Water is the most important nutrient for livestock. It is second to oxygen as immediately essential for life. The quality and quantity of drinking water may affect feed consumption and rabbit health (Sandford, 1996). Moreover, he added that water salinity is the major factor determining the suitability of particular water source for livestock. Certain salts and gases in solution make water more palatable, if not present in excess, while various salts may reduce water palatability and may be toxic at high levels Rabbits can lose nearly all the fat and more than half of protein from their bodies and still remain alive, but a loss of one tenth of body water will result in death. Furthermore, rabbits can live for a relatively long time without solid food, but lack of water produces very quick harmful effects.

The highest acceptable concentrations of total soluble salts in rabbit drinking water may be less than 3000 ppm. Using the water containing high levels of soluble salts (more than 3000 ppm) as the sole source of drinking water reduces rabbit performance and such effects become more apparent in summer hot season. Diminishing the high levels of salinity in drinking water could be carried out by dilution with fresh water when it is available or by elimination of the soluble salts from the drinking water (Marai *et al*., 2010).

Several trials have been conducted to study the effect of utilizing natural saline water on different animals (Challies *et al.,* 1987 on cattle; Balnave and Yoselewitz, 1988 on poultry; Ayyat *et al*., 1991; Ahmed, 1996; Ahmed and Abdel-Rahman, 2004; Marai *et al*., 2005 and Morsy *et al*., 2016 on rabbits). However, rabbits received a little attention in this respect although they are considered as a useful contribution to the meat supply in developing countries, which suffer from animal protein shortage. Ahmad and Abdel-Rahman (2004) confirmed that Baladi, Bouscat and California breed rabbits, could tolerate the salinity of normal saline well-water (2980 ppm) without deterioration effects either on reproductive performance. Unfortunately, there are very few researches dealt with how to overcome the problems of drinking high levels of salinity of drinking water in rabbits.

Many factors affect semen quality, genetic, environment, management, and physiological factors aspects normal spermatogenesis, sperm function and male fertility (García-Tomas *et al*., 2008). Exposure of buck rabbits to saline drinking water delayed mating desire/ability and decreased semen quality and leydig cell function (Veeramachaneni *et al*., 2001) in human. Also, El-Darawany and Farghaly (1995) and Abd El- Razik *et al.* (1999) found that *libido* in buck rabbits and all semen characteristics were negatively affected with drinking agriculture drainage water for 3 - 7 months compared to drinking tap water. Few studies were concerned with the effect of drinking saline water on reproduction of male rabbits. Therefore this experiment aimed to study the influences of drinking saline well water and the alternation with fresh tap water every week as one of the bio-stimulation methods to reduce the harmful effects of continuous drinking saline water on reproductive performance of doe and buck rabbits.

MATERIALS AND METHODS

The present study was carried out in a private rabbit's farm at Cairo-Oasis high way, about 60 km South West Cairo from September 2013 up to February 2014. The laboratory work was executed in Lab of Animal Production Research Institute, Ministry of Agriculture, Cairo, Egypt and in in the Labs belonging to Egyptian-Spanish Project titled "Raise the level of low income families and activate the role of woman in community development through the use of modern technologies in the project of Rabbits in Egypt", Faculty of Agriculture, Cairo University in Research Park.

The study aimed to determine the influences of drinking saline well water and the alternation with fresh tap water every week as one of the bio-stimulation methods to reduce the harmful effects of drinking saline water on reproductive performance of rabbits.

A total number of 48 V-Line rabbits old 5 months (30 does, body weight of 2955.0 ± 32.6 g and 18 bucks, body weight of 2850.0 ± 31.2 g) were used in this study. Rabbits were randomly divided into three equal treatments (10 does and 6 bucks / group). Rabbits of the 1st group (G1) considered as control group drank tap water (301 ppm TDS), rabbits of 2nd group (G2) drank well water (5568 ppm TDS), while rabbits of 3rd group (G3) drank well water followed with drank fresh tap water every week until the end of experiment (alternated system as a biostimulation method). Well and tap water were chemically analyzed (Table 1) according to Muller (1995).

Table 1. Chemical analysis of well water and tap water samples.

Chemical analysis	**Well water**	**Tap water**
Total dissolved salts (Dacisamenz / m)	6.9	0.47
Electric conductivity (ds/m)	5568.0	301.0
Hydrogen ion (pH)	7.8	7.6
Dissolved anions (Mellimka / 1L):		
Carbonates	-	-
Bicarbonate	2.0	0.5
Chloride	40.2	3.5
Sulphates	25.1	0.68
Cations dissolved (Mellimkavii / l)		
Calcium	23.0	1.5
Magnesium	16.2	0.5
Sodium	26.1	3.5
Potassium	0.13	0.13
Residual sodium carbonate	-	-
Ratio of sodium adsorbed	5.9	2.5

Rabbits were fed, *ad-libitum*, a commercial concentrate pelleted diet containing 18.0 % crude protein, 16.3 % crude fiber, 2.5 % fat, 0.6 % minerals mixture and 2730 kcal / kg digestible energy according to NRC (1977). Water was made available all day through nipples drinker system.

Blood samples were taken from marginal ear vein into EDETA tubes. The rest of the blood was centrifuged for 15 minutes of 3000 rpm to collect plasma before being stored at -20^{o}C until testosterone hormone analysis by radioimmunoassay (RIA) method.

Reproductive traits were measured as follows:

$$\text{Conception rate (\%)} = \frac{\text{Number of conceived does from the first service}}{\text{Total number of served does}} \times 100$$

$$\text{Number of services per conception} = \frac{\text{Number of services required for conception}}{\text{Number of conceived does}}$$

Gestation period (day) = Period elapsed from conception till parturition.

Litter size = Total number of born bunnies (Born stillbirth + Viable bunnies).

Litter weight = Recorded from birth till weaning (4 weeks age).

$$\text{Stillbirth (\%)} = \frac{\text{Number of stillbirth bunnies}}{\text{Total number of born bunnies}} \times 100$$

$$\text{Pre-weaning mortality (\%)} = \frac{\text{Litter size at birth} - \text{litter size at weaning}}{\text{Litter size at birth}} \times 100$$

Overall of mortality rate (%) = Stillbirth (%) + Pre-weaning mortality (%).

Daily feed intake, daily water intake and total feed intake were measured.

Productive efficiency index (kg, live weight) = Litter size at weaning× Number of parities × Total weaning weight (kg).

Cost of feed for producing 1 Kg live weight of rabbit = Feed conversion × Price of 1 kg feed.

Feed conversion = Total feed intake (g) / Total body gain(g)

Semen was collected (three times during experimental period) from 6 bucks/group using a clean, dried and sterilized standard artificial vagina of rabbits and a teaser doe according to (Mocé *et al*., 2000). Reaction time was calculated in seconds as the time from introducing the doe to the buck and incidence of complete intercourse and ejaculation using stopwatch (Luzi *et al*., 1996). The ejaculate volume was measured using a graduated collection tube after gel mass removal. Sperm concentration was determined by the haemocytometer according to (Smith and Mayer, 1955). Total sperm output was calculated by multiplying ejaculate volume and spermatozoa concentration. Percentage of live and abnormal sperms were determined after staining with eosine and nigrosine (Blom, 1950) and then calculated as a percentage out of randomly chosen 100 sperm counted. Percentage of motile sperm was estimated a phase-contrast microscope according to (Melrose and Laing, 1970). Total number of motile sperm (TMS) was calculated by multiplying percentage of motile sperm and total sperm output.

Semen quality factor (SQF) = (Sperm concentration × Ejaculate volume × Live spermatozoa) /100.

Hydrogen ion concentration (pH) of semen was determined immediately after collection using pH paper.

Data was analyzed by the least square analysis of variance using the General Linear Model Procedure (SAS, 2004). The design was one way analysis and the model was as follows:

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

Where, Y_{ij}= Any observation of j^{th} animal within i^{th} group, μ = Overall mean, Tr_i = Effect of i^{th} group (i: 1-3), e_{ij}= Experimental error.

Duncan Multiple Range Test (Duncan, 1955) was used to test the level of significance among means.

RESULTS AND DISSCUTION

1- Doe reproductive performance

Conception rate was found to be higher ($P<0.05$) in the does of G3 (rabbits alternated drank well water with tap water every week) by about 21.1 % than that in G2 (rabbits drank saline well water). Furthermore, the conception rate of G3 exceeded their counterparts of control group by about 7.4 % with insignificant differences.

On the other hand, does of G3 have insignificant decrease in number of services per conception (9.6 %) compared to G2 (Table 2). Improvement of the conception rate in does of G3 may be due to that alternated drank saline water with tap water washed the excess ingestion minerals that may realized the maintenance in mineral balance and consequently improved the reproductive performance of doe.

The ingestion of well water leads to changes in the retention and excretions of minerals and may change mineral balance (Marai and Habeeb, 1994). So, maintenance of mineral balance in animals is important for the rabbit production and reproductive performance (Marai *et al*., 2010).

Minerals play a significant role in many aspects of production and reproduction including successful establishment of pregnancy and conception rate. Minerals activate enzymes; which are essential co-factors of metabolic reactions function as carriers of proteins, regulate digestion, respiration, water balance, muscle reaction, nerve transmission and skeletal strength (Haenlein, 1991).

Concerning the gestation length, the present findings revealed that there were no significantly differences among all treatments (Table 2).

Table 2. Reproductive performance of V-line doe rabbits as affected by drinking saline well water.

Items	Treatment groups		
	G1	G2	G3
Conception rate (%)	$66.6^{ab}\pm 3.7$	$61.1^{b}\pm1.9$	$74.0^{a}\pm5.7$
No. of services/conception	1.56 ± 0.07	1.66 ± 0.05	1.50 ± 0.11
Gestation period (day)	31.7±0.21	31.4± 0.12	31.7± 0.19

a, b Means bearing different superscripts within the same row are significantly different (P<0.05).
G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.

2- Litter traits

The results in Table (3) demonstrated that does receiving alternated saline water with tap water (G3) had higher (P<0.05) litter size at birth, litter size at weaning, litter weight at birth and litter weight at weaning by 32.7, 23.0, 24.1 and 13.6 %, respectively as compared to the does drinking tap water (G1) and by about 22.2, 33.3, 19.0 and 36.0 % when compared to the does of drinking saline water (G2).

On the other hand, overall of mortality rate (%) of does drank well water had the highest value (26.5 %) followed by does of G3 (16.8 %) and control group (10.3 %).

These results agreed with those of (Marai *et al*., 2010) where litter size and weight at birth and weaning and mortality, seemed to be negatively affected with drinking high saline water (particularly ≥3000 ppm NaCl) and the effects were progressive with the increase in the level of salinity. The rate of mortality directly increased as the concentration of NaCl increased in drinking water (Habeeb *et al.*, 1997 and Marai *et al.*, 2005).

This biostimulation method keep the maintenance of mineral balance and resulted in enhancing the reproduction performance of doe rabbits. The results illustrated that, litter traits significantly improved with the use of alternated natural saline well water with tap water (G3).

Table 3. Litter traits and mortality rate of V-line doe rabbits as affected by drinking saline well water.

Items	Treatment groups		
	G1	G2	G3
Litter size at birth	$5.8^{b} \pm 0.37$	$6.3^{b} \pm 0.32$	$7.7^{a} \pm 0.48$
Litter size at weaning	$5.2^{b} \pm 0.25$	$4.8^{b} \pm 0.29$	$6.4^{a} \pm 0.32$
Litter weight at birth (g)	$338.7^{b} \pm 12.6$	$353.3^{b} \pm 13.6$	$420.5^{a} \pm 27.8$
Litter weight at weaning (g)	$2597.5^{b} \pm 109.2$	$2168.8^{c} \pm 67.6$	$2951.1^{a} \pm 106.3$
No. of stillbirth	0.0 ± 0.00	0.2 ± 0.15	0.0 ± 0.0
Stillbirth (%)	0.0 ± 0.00	2.7 ± 1.9	0.0 ± 0.0
No. of dead bunnies, pre-weaning	$0.6^{b} \pm 0.18$	$1.5^{a} \pm 0.37$	$1.3^{ab} \pm 0.32$
Pre-weaning mortality (%)	$10.3^{b} \pm 2.4$	$23.8^{a} \pm 4.3$	$16.8^{ab} \pm 4.3$
Overall of mortality rate (%)	$10.3^{b} \pm 2.4$	$26.5^{a} \pm 6.4$	$16.8^{ab} \pm 4.3$

a, b, c Means bearing different superscripts within the same row are significantly different ($P<0.05$).

G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.

3- Offspring growth performance

Results revealed that receiving saline water had no significantly effects on offspring growth performance (Table 4), although, does in G3 had higher bunny weight at birth and weaning in addition to higher average daily gain and relative growth rate as compared to G2 and G1 groups.

4- Economical indicator

Drinking tap water (G1) associated with an increase ($P<0.05$) in daily feed intake as compared to G2 and G3 groups (Table 5). Similar trend was reported by El-Darawany *et al.* (1994) and Ayyat *et al.* (1991). Feed intake was found to be decrease gradually with the progressive increase of the salinity levels (Ayyat *et al.*, 1991; Gad, 1996 and Marai *et al.*, 2005). This increment in daily feed intake of G1 and G3 groups may be a result to the appetizing effect of the low levels of salinity consumed and/or alternated

Table 4. Offspring's of V-line doe rabbits as affected by drinking saline well water.

Items	Treatment groups		
	G1	G2	G3
Bunny weight at birth (g)	59.1±1.8	56.7±1.6	54.8±2.2
Bunny weight at weaning (g)	510.3±29.8	471.6±28.7	481.0±31.7
Average daily gain (g)	16.1±1.0	14.8±1.0	15.2±1.1
Relative growth rate (%)	157.2±1.6	154.4±3.1	156.2±3.5

G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.

Table 5. Economical indicate of V-line doe rabbits as affected by drinking saline well water.

Items	Treatment groups		
	G1	G2	G3
Daily feed intake (g)	173.7^{a}±6.6	161.4^{b}± 6.0	166.1^{b}± 5.2
Total feed intake (kg)	26.0^{a}±2.0	24.2^{b}± 1.7	24.9^{b}±1.4
Daily water intake (ml)	211.8^{c}±6.1	264.5^{a}± 7.4	233.0^{b}±7.3
Efficiency index (kg, live weight)	5.2^{b} ± 0.22	4.3^{c} ± 0.13	5.9^{a} ± 0.21
Feed conversion	5.0^{a} ± 0.30	5.6^{a} ± 0.29	4.2^{b} ± 0.27
Cost of feeding for producing 1 kg live weight (L.E.)	15.0^{a} ± 0.45	16.7^{a}± 0.44	12.6^{b} ± 0.41

a, b, c Means bearing different superscripts within the same row are significantly different (P<0.05).
G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.
Total feed intake = daily feed intake × 150 days (experimental period).Cost of feeding for producing 1 kg live weight (L.E.) = feed conversion × price of 1 kg feed (L.E. 3.0/kg).

drank saline water with tap water may decrease ingestion of salts and appropriate the requirements of does and hence enhance feed intake and feed conversion (Marai *et al*., 2010).

In contrary, daily water intake increased ($P<0.05$) in rabbits of G2 and G3 by about 25.0 and 10.0 %, respectively as compared to control group (G1).This result demonstrated that daily water intake was significantly increased with the use of well water which was agreement with results reported by (Amal, 2003; Ayyat *et al*., 1991 and Abdel-Samee & El-Masry, 1992). The obtained results may related to the fact that drinking a high level of saline water increases the need for water used in the excretion of the most anions and cations through increasing water output saline water this behavior related to the wisdom of body for keeping health to the systematic physiology and realized body homostatsis. The animal increases its water intake through drinking a large amount of it (Baile and McLaughlin, 1987; pond *et al*., 1995; Guyton and Hall, 1996; Suckow & Douglas, 1997 and Amal, 2003).

Rabbits of G3 improved ($P<0.05$) their efficiency index and feed conversion by 36.1 and 24.4 %, respectively when compared to G2 and by 14.0 and 15.9 %, respectively when compared to G1. Moreover, cost of feeding for producing one kg live weight in the rabbits of G3 decreased ($P<0.05$) by about 4.08 and 2.4 L.E. as compared to G2 and G1, respectively. This result proved that alleviating the salinity of well water by using alternation with fresh tap water every week as a biostimulation method in farms of desert area in Egypt could improve the reproductive performance of doe rabbits (Table 3, 4 and5)

5- Semen quality, reaction time and testosterone hormone

Bucks of G2 exhibited a decrease ($P<0.05$) in ejaculate volume by 29.3 % as compared to G3 (Table 6). Sperm concentration, total sperm output, total motile sperm and semen quality factor were significantly decreased in the bucks of G2 by 38.9, 47.8, 61.9 and 57.5 %, respectively as compared to G1.

Sperm motility was decreased ($P<0.05$) in the bucks of G2 by 26.8 and 25.8 % as compared to G1 and G3, respectively. Similar trend was obtained by (Yousef *et al*., 2003 a & b) in rabbits and Amal (2013) in cocks. The drastic effect of accumulate saline water intake may reflect on low semen quality and may be due to severe degeneration of testes tissue and aggregation of RBC'S in central vein and in the sinusoids, aggregation of

Table 6. Semen quality of V-line buck rabbits as affected by drinking saline well water.

Items	Treatment groups		
	G1	G2	G3
Ejaculate volume (ml)	0.76^{ab}±0.05	0.65^{b}± 0.07	0.92^{a}±0.04
Sperm concentration (×10^6ml)	192.5^{a}±23.0	117.5^{b}±20.2	140.0^{ab}±20.1
Total sperm output (×10^6)	146.3^{a}±24.7	76.3^{b}±23.3	128.8^{ab}± 20.1
Sperm motility (%)	83.7^{a}±1.7	61.2^{b}± 4.5	82.5^{a}± 2.1
Total motile sperm (×10^6)	122.4^{a}±23.1	46.6^{b}± 17.8	106.2^{ab}±15.7
Live spermatozoa (%)	80.6^{a}±0.63	65.6^{b}± 2.6	83.5^{a}±1.0
Dead spermatozoa (%)	19.4^{b} ± 1.6	34.4^{a} ± 2.6	16.5^{b} ± 1.0
Sperm abnormalities (%)	10.0^{b} ± 0.64	16.0^{a} ± 0.90	9.2^{b} ± 0.81
Semen quality factor	117.9^{a} ± 20.3	50.0^{b}± 13.2	107.5^{ab}± 17.1
Hydrogen ion (pH)	6.9^{b} ± 0.02	7.3^{a} ± 0.05	7.0^{b} ± 0.03

a, b Means bearing different superscripts within the same row are significantly different (P<0.05).
G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.

lymphocytes, necrosis of tubular epithelium, severe hemorrhage, severs degeneration of the kidney tissues (Attia *et al.,* 2015).

Lower semen quality may reflect an adverse effect of drinking saline water on the spermatogenic process by cause a stress on the pituitary gland and led to alteration in the gonadotropins releasing cells activity which controls the androgenic secretion by testes (Attia *et al.*, 2015). They found that the long term of saline exhibited a marked reduction in the semen quality by the significant reduction in the sperm-cells concentration, percentages of alive sperm-cells and percentage of advanced motility of spermatozoa.

Also, bucks of G2 (drinking 5568 ppm TDS) showed an increase in dead spermatozoa, sperm abnormalities and hydrogen ion (pH) by 77.3, 60.0and 5.3 %, respectively as compared to G1 and increased by 108.4, 73.9 and 4.5 %, respectively when compared to G3 (Table 6). The significant increase in pH value in G2 may be due to the increased percentage of dead cells. Good quality semen is usually on the acid side of neutrality than semen with lower sperm-cells concentration and semen containing many dead spermatozoa may evolve ammonia, which will increase the pH value (Graves, 1978). Drinking saline water for bucks resulted in an increase in the acrosomal damage which might contribute to the elevation percentage of dead and abnormal sperm (Yousef *et al.*, 2003 a & b and Attia *et al.*, 2015).

Bucks drank well saline water (G2) had a significant increase in reaction time as compared to G1 and G3 groups. However, bucks of G2 had insignificantly decreased testosterone hormone by 36.9 and 32.5 % as compared to G1 and G3 groups, respectively (Figure 1, A and B). This decrease in libido as a result of drinking high level of saline well water may be due to the decrease in testosterone level and leydig cell function (El-Darawany and Farghaly, 1995; Veeramachaneni *et al.*, 2001 and Attia *et al.*, 2015).

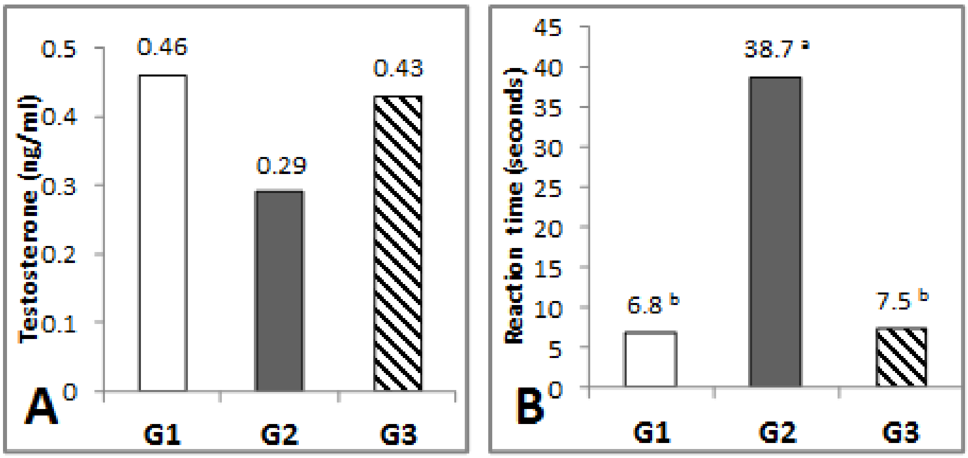

Figure 1. (A and B). Testosterone hormone and reaction time of V-line buck rabbits as affected by drinking saline well water.

a, b Means bearing different superscripts are significantly different (P<0.05).

G1 (Control) = Rabbits drank tap water (301 ppm TDS); G2 =Rabbits drank saline well water (5568 ppm TDS); G3 = Rabbits alternated drank saline well water with tap water weekly.

The insignificantly differences between the rabbits alternated drank saline water with tap water (G3) and the rabbits drank tap water (G1) in the all semen quality traits may indicated that bucks drinking saline water with tap water (G3) has led to reducing the negative impact of continuous drinking saline water (G2) on the semen characteristics and reaction time. On the other hand, this partially improved on semen quality of bucks alternated saline water with tap water (G3) may attributed to the alternation induced enhancement of plasma testosterone and/or may reflect a positive effect on spermatogenic process. The testosterone has been found in addition to his stimulatory effects on the male accessory reproductive organs to have a profound influence on the sperm output (Mann, 1964).

Conclusively, applying alternating water system as a bio-stimulation method could eliminate the drastic effects of continuous drinking well saline water on reproductive performance of rabbits under new reclaimed lands.

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تأثير تناوب شرب ماء البئر المالح على الأداء التناسلى للأرانب

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تهدف التجربة إلى دراسة تأثير شر ب ماء البئر المالح ودراسة تناوب شرب المياه المالحة مع مياه الصنبور كل أسبوع باعتبارها أحد طرق التحفيز الحيوي لتقليل التأثير الضار لشرب المياه المالحة على الأداء التناسلى للأرانب. استخدم فى هذه الدراسة عدد ٤٨ أرنب V-Line عمر خمسة شهور (٣٠ أنثى متوسط وزن الجسم ٢٩٥٥,٠ ± ٣٢,٦ جم وعدد ١٨ ذكر بالغ متوسط وزن الجسم ٢٨٥٠,٠ ± ٣١,٢ جم). قسمت الأرانب عشوائيا إلى ثلاثة مجموعات متساوية (١٠ إناث و٦ ذكور/ مجموعة). أرانب المجموعة الأولى اعتبرت كنترول (كانت تشرب ماء الصنبور ، ٣٠١ جزء فى المليون أملاح كلية ذائبة)، أرانب المجموعة الثانية (كانت تشرب ماء البئر المالح ، ٥٥٦٨ جزء فى المليون أملاح كلية ذائبة) وأرانب المجموعة الثالثة (تناوبت شرب ماء البئر المالح مع ماء الصنبور أسبوعياً حتى نهاية التجربة).

أظهرت النتائج أن معدل الحمل إرتفع معنويا في إناث المجموعة الثالثة (+ ٢١,٠ %) عن إناث المجموعة الثانية. كما أظهرت إناث المجموعة الثالثة إنخفاض غير معنوى في عدد التلقيحات اللازمة للحمل بـ ١٠,٠% مقارنة بإناث المجموعة الثانية. أظهرت إناث مجموعة الثالثة ارتفاع معنوى فى عدد ووزن الخلفات مقارنة بإناث المجموعة الأولى والثانية. من ناحية أخرى ارتفع معنوياً معدل النفوق في إناث المجموعة الثانية (٢٦,٥%) مقارنة بالمجموعة الأولى (١٠,٣ %). زاد معنوياً شرب الماء اليومى فى إناث المجموعة الثانية والثالثة مقارنة بالمجموعة الأولى. تحسن معنوياً دليل الكفاءة الإنتاجية والتحويل الغذائي فى إناث أرانب المجموعة الثالثة مقارنة بالمجموعة الثانية والأولى. بالإضافة إلى ذلك انخفضت معنوياً تكلفة إنتاج ١ كجم وزن حى لأرانب المجموعة الثالثة بحوالى ٤,٠٨ و ٢,٤٠ جنيه مصرى مقارنة بالمجموعة الثانية والأولى على التوالي.

من ناحية اخرى، أظهرت النتائج انخفاض معنوى فى حجم القذفة بـ ٢٩,٣ % مقارنة بذكور المجموعة الثالثة. كما انخفض معنوياً تركيز الحيوانات المنوية والعدد الكلى للحيوانات المنوية والحركة الكلية للحيوانات المنوية وعامل جودة السائل المنوي فى ذكور المجموعة الثانية مقارنة بالمجموعة الكنترول. انخفض معنوياً

حيوية الحيوانات المنوية في ذكور المجموعة الثانية بمقارنة بالمجموعات الأخرى. ايضاً أظهرت ذكور المجموعة الثانية زيادة معنوية في عدد الحيوانات المنوية الميتة والمشوهة وتركيز أيون الهيدروجين (الأس الهيدروجيني) مقارنة بالمجموعات الأخرى. بينما أظهرت ذكور المجموعة الثانية زيادة في وقت الرغبة الجنسية مقارنة بالمجموعات الأخرى وانخفاض غير معنوى لهرمون التستسترون بـ ٣٦,٩ و ٣٢,٥ مقارنة بالمجموعة الأولى (الكنترول) والمجموعة الثالثة، على التوالى.

التوصية:تخلص الدراسة إلى أن نظام تناوب شرب الماء المالح مع الماء العذب أسبوعياً كأحد طرق التحفيز الحيوى أدى إلى تقليل التاثيرات الضارة لشرب الماء المالح بصفة مستمرة على الأداء التناسلى للأرانب فى الأراضى حديثة الأستصلاح .

الكلمات الدالة: أرانب ، ماء البئر المالح ، الأداء التناسلى ، صفات السائل المنوى ، هرمون التستسترون