Effect of Drinking Natural Sea Saline Water on Growth Performance, Some Blood Parameters and Carcass Traits on New Zealand White Rabbits

Huda Qar[1] and U. M. Abdel-Monem[2]

[1]Department of Biology, Faculty of Science and Arts, King Abdul Aziz University, Rabgh, Saudi Arabia
[2]Department of Animal Production, Faculty of Agriculture, Zagaig University, Zagazig, Egypt
ormamohamed_2010@yahoo.com

Abstract: This experiment was carried out to study the effect of drinking natural sea saline water on growth performance and some blood parameters of growing New Zealand White (NZW) rabbits reared under Saudi Arabia conditions. The obtained results indicated that the final body weight, live body gain daily feed intake, feed conversion, water intake, plasma total protein, albumin, globulin, total lipids, cholesterol and urea-N were decreased (p<0.05&0.01) significantly with drinking growing rabbits natural sea water. Also, the carcass weight, dressing % and prime cuts % were decreased, while the rectal temperature and respiration rate were insignificantly affected by the using natural sea saline water up to 20% / litter well water.
[Huda Qar and U. M. Abdel-Monem. **Effect of Drinking Natural Sea Saline Water on Growth Performance, Some Blood Parameters and Carcass Traits on New Zealand White Rabbits.** *J Am Sci* 2014;10(11):55-59]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 8

Key words: salinity, rabbits, growth performance, blood parameters

1. Introduction:

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 animal health since low quality water normally results in reduced water and feed consumption in livestock, especially rabbits. Moreover, 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 (Cheeke, 1987; Ray, 1989, Willis, 1991 and Sandford, 1996).

In the desert areas depend on under groundwater for drinking of animals reared in farms erected in these desert lands. Several trials have been conducted to study the effect of utilizing natural saline water on different animals (Andersen and Stothers, 1978 with pigs, Kamel *et al.,* 1984 with goats, Ahmed *et al.,* J985 and 1989 with sheep, Challies *et al.,* 1987 with cattle, and Balnave & Yoselewitz, 1988 with poultry). However, rabbits received a little attention in this respect although it is considered as a useful contribution to the meat supply in developing countries, which suffer from animal protein shortage. In Egypt, Ayyat *et al.* (1991) and Moustafa *et al.* (2004) studied this aspect on rabbits using saline water.

Therefore, the present experiment was carried out to study the effect of drinking natural saline well-water on growth performance, some blood parameters and the carcass traits of New Zealand White rabbits under heat stress conditions in desert areas.

2. Materials and Methods:

A total of hundred weaning male New Zealand White (NZW) rabbits at 35 days of age and nearly equal average initial live body weight were used in the present study. Rabbits were picked up from the Experimental Animal Unit of King Fahd Medical Research Center, King Abdul Aziz University, Jeddah, Saudi Arabia. They were housed in groups of 5 per plastic cage, maintained under standard laboratory conditions (temperature 22±1°C, 12:12 h light: dark cycle) and offered balanced standard diet (The animals were feed basal diet consisted of 28% alfalfa hay, 18% barley, 18% soybean meal(44%), 25% wheat bran, 6% yellow corn, 3 % molasses, 1.1% limestone, 0.3% sodium chloride, 0.6 % vitamin and mineral premix. The basal diet contained of 18.18 % crude protein, 13.43% crude fiber, 2.29% ether extract, 2656.00 digestible energy(kcal/kg).)
The experimental groups were:
Group 1 (control drinking well water)
Group 2 (drinking well water 95% + Sea water 5%)
Group 3 (drinking well water 90% + Sea water 10%)
Group 4 (drinking well water 85% + Sea water 15%)
Group 5 (drinking well water 80% + Sea water 20%)

Live body weight was recorded individually for each rabbit at 5, 9 and 13 weeks of the age, then weight gain was calculated. Feed intake was determined precisely and calculated as gram per rabbit per day. Unused feed from each cage was collected daily, weighed and taken into consideration for calculation of feed intake. Feed conversion was also estimated (g feed / g gain). Daily water intake was recorded individually for each rabbit during the experimental period. The rectal temperature and

respiration rate were measured in rabbits once every two weeks at 9-11 a.m. Respiration rate was recorded by a hand counter, which counts the frequency of the flank movement per minute. Internal body temperature was taken by medicine thermometer inserted into the rectum for 2 minutes at depth of 2 cm. At the end of the experimental period three male rabbits from each group were randomly taken for slaughter, after complete bleeding, pelt, visceras and tail were removed and the carcass and some carcass components were weighted. The blood samples were collected from rabbits during the slaughter. The blood in non-heparinized tubes was centrifuged at 3000 rpm for 20 minutes. The clear supernatants sera were frozen till the time of various biochemical estimations including the levels of uric acid. Total protein, albumin, and creatinine concentration in plasma were estimated using commercial kits (Bio Merieux, France) according to the procedure outlined by the manufacturer. The globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein.

The obtained data were statistically analyzed by using completely randomize design according to Snedecor and Cochran (1982) by the following model: Xij = μ +Ti +eij where, μ = general mean, Ti= fixed effect of the treatments(1,…..,8) and eij = random error. The differences between experimental groups were separated by Duncan s multiple range test (Duncan, 1955).

3.Results and Discussion

Water requirements of domestic rabbits are relatively high. Rabbits can lose nearly all the fat and more than half the protein from their bodies and still remain alive, but a loss of one tenth of the water of the body will result in death. Furthermore, rabbits can live for a relatively long time without solid food, but lack of water produces a very quick harmful effects (Sandford, 1996).

I-Growth performance:

The effect of drinking saline water (fresh water + natural sea water) on final live body weight in groups treated with drinking water containing 5, 10, 15 and 20% sea water were lower with 7.7, 11.1, 20.2 and 28.1%, respectively, when compared to the rabbits drinking fresh water. Daily body gain showed the same trend under the same levels of salinity (5, 10, 15 and 20%) as shown in Table 2. The decrease values were, 13.1, 18.5, 33.3 and 46.4%, respectively, when compared to the rabbits drinking fresh water. This results were similar to those obtained by Ayyat *et al.*(1991) who found that the decrease values 12.4, 16.5 and 15.5% in body weight and 18.1, 23.9 and 22.9 in body gain of animals given water containing 3000, 4500 and 6000 ppm NaCl, respectively, than in those receiving tap water. Also, Gad (1996) found the same trend, however, Abdel-Samee and El-Masry (1992) found no significant difference in body weight and daily body gain in rabbits drinking either natural saline water containing 4255 ppm or desalinated well water of 3000 ppm and those received fresh Nile water under North Sinai conditions. The decline values in final live body weight and body gain of the groups that drank saline water were high in the group which drank level 20% sea water. Such effect may be due to that the effect of salinity on feed intake.

2-Feed intake, feed conversion and water intake:

The average daily feed intake, feed conversion and water intake were decreased ($p<0.01$, 0.05) significantly by drinking sea water at 20% from total water intake when compared with the control group (Tables 3).

This results agree with Ahmed *et al.* (1989) using sheep; Ayyat *et al.* (1991), Abdel-Samee & El-Masry (1992) and Moustafa, *et al.* (2004) using rabbits. 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 and so, the animal increases its water intake either through drinking a large amount of it (Baile and McLaughlin, 1987; pond *et al.*, 1995; Guyton and Hall, 1996 and Suckow & Douglas, 1997).

3- Rectum temperature and respiration rate

The rectum temperature and respiration rate not affected by drinking sea water at 20% from total water intake when compared with the control group (Table 3). These results were similar to those obtained by Marai *et al.* (2001) who observed that the rectal temperature and respiration rate of rabbits not affected by salinity, however Weeth and Haveland (1961) who say that the rectal temperature of heifers was higher in the 1.2% salt treatment than those given tap water.

4- Blood Components

The data in Table 4 indicated that plasma total protein, albumin, globulin, total lipids, cholesterol and urea-N in rabbits drinking sea water were significantly ($p<0.05$ & 0.01) lower than the animals drinking fresh water. These results were similar to those obtained by Marai *et al.*, 2001, Ellefson & Garaway, 1982; Abdel-Samee & El-Masry, 1992 and Pond *et al.*, 1995. At the same time, the level of total protein in the blood of experimented rabbits was significantly decreased with drinking natural saline water. This result may related to the fact that water is held bach to the body fluids to dilute out the retained salts, resulting in dilution of blood proteins and so, decreases its concentration level (Tietz, 1982; Ayyat *et al.*, 1991 and Suckow & Douglas, 1997).

5- Slaughter performance

Carcass weight, Dressing % and Prime cuts % were decreased ($p<0.01$, 0.05) significantly by

drinking sea water,when compared with the control group (Tables 5). This results agree with Ahmed *et al.* (1989) using sheep; Ayyat et al. (1991), Abdel-Samee & El-Masry (1992) and Moustafa, *et al.* (2004) using rabbits. The decrease in carcass weight in rabbits that drank sea water may be due to depression in final live body weight.

Table 1. Body weight and gain weight (0-8 weeks; ±SE) of growing NZW male rabbits as affected by period of the year and using natural sea water.

Items	W0	W4	W8	G0-4	G4-8	G0-8
Control (0% Sea water)	610.0±6.3	1211.6±7.4	1548.5±11.6 [b]	21.5±0.9	12.0±0.7 [b]	16.8±0.5
Control + 5% *Sea water*	608.9±6.9	1106.8±5.9	1429.0±12.1 [a]	17.8±0.6	11.5 [a]±0.9	14.6±0.5
Control+10% *Sea water*	611.9±8.4	1061.5±9.1 [b]	1376.5±11.7 [b]	16.1±0.7	11.3±0.8	13.7±0.9
Control+15% *Sea water*	610.5±6.7	1002.8±10.2 [b]	1235.1±10.1 [b]	14.0±0.9	8.3±0.5	11.2±0.9
Control+20% *Sea water*	609.1±8.1	939.6±11.4 [a]	1113.1±13.9 [a]	11.8±06	6.2±0.3	9.0±0.8
Significance	N.S	**	**	*	**	**

Means bearing different letters in the same column within each classification, differ significantly ($P \leq 0.05$).
***= $P<0.001$, ** = $P<0.01$, * = $P<0.05$ and N.S. = Not significant.

Table 2. Feed intake, feed conversion, water intake, rectum temperature and respiration rate of growing NZW rabbits as affected by using natural sea water.

Items	Feed intake (g/day)	Feed conversion (g feed intake / g gain)	Water intake (ml /day)	Rectum temperature (RT)	Respiration rate (RR)
Control (0% Sea water)	79.1±4.9	4.7±0.04	151.7±6.1 [b]	39.6±0.08	102±1.83
Control + 5% *Sea water*	71.8±5.1	4.9±0.08	118.1±6.5 [a]	39.4±0.08	100±2.00
Control+10% *Sea water*	68.7 ±6.0	5.1±0.09 [b]	103.6 [b]±8.3	39.5±0.09	99±2.10
Control+20% *Sea water*	60.7±7.0	5.4±0.07 [b]	99.0 [b]±7.9	39.6±0.08	105±1.88
Control+15% Sea water	52.9±5.9	5.9 [a]±0.06	82.1 [a]±6.5	39.7 ±0.05	101 ±1.99
Significane	*	*	**	NS	NS

Means bearing different letters in the same column within each classification, differ significantly ($P \leq 0.05$). ** = $P<0.01$, * = $P<0.05$ and N = Not significant.

Table 3. Blood parameters (±SE) of growing NZW rabbits as affected by period of the year, feeding system and Nigella sativa seeds dietary supplementation.

Items	Total protein (g/100ml)	Albumin (g/100ml)	Globulin (g/100ml)	Total lipids (mg/100ml)	Total cholesterol (mg/100ml)	Urea (mg/100ml)
Control (0% Sea water)	7.3±0.3	4.1±0.7	3.2 ±0.3	671.9±52.5	180.8±30.1	20.4±2.4
Control + 5% *Sea water*	7.2±0.1	4.3±0.5	2.9±0.5	680.5±49.2	178.6±34.2	19.9±2.9
Control+10% *Sea water*	6.8±0.2	3.9±0.6	2.9±0.4	665.8 ±59.1	174.1±31.8	19.8±3.2
Control+15% *Sea water*	6.9±0.4	4.0±0.5	2.9±0.3	675.4 ±32.2	199.9±37.1	17.9±5.0
Control+20% *Sea water*	6.7±0.5	4.4±0.3	2.3±0.3	692.1±41.6	193.4±28.6	18.7±4.2
Significance	N.S	N.S	*	N.S	N.S	N.S

Means bearing different letters in the same column within each classification, differ significantly ($P \leq 0.05$).
** = $P<0.01$, * = $P<0.05$ and N = Not significant.

Table 4. Carcass traits of growing NZW rabbits as affected by period of the year, feeding system and Nigella sativa seeds dietary supplementation.

Items	Carcass weight (g)	Carcass weight (%)	Dressing (%)	Prime cuts (%)
Control (0% Sea water)	1032.6	100	66.7	59.1
Control + 5% *Sea water*	900.1	87.2	62.9	52.9
Control+10% *Sea water*	812.2	78.7	59.0	48.7
Control+15% *Sea water*	708.1	68.6	57.3	47.5
Control+20% *Sea water*	583.2	56.5	52.4	45.2

References:

Abdel-Samee, A.M. and El-Masry, K.A. (1992): Effect of drinking natural saline well water on some productive and reproductive performance of California and New-Zealand white rabbits maintained under North Sinai conditions. Egypt J. Rabbit Sci., 2 (1): 1-11.

Ahmed, M.H.; Farid, M.F.A.; Hassan, N.I.; Borhami, B.E. and Shawket, S.M. (1985): Effect of drinking saline well water in sheep. 1st Inter. Cong. Anim. Prod. In Arid Zone, Damascus, Syria.

Ahmed, M.H.; Farid, M.F.A.; Shawket, S.M. and Hassan, N.I. (1989): Effect of water deprivation on feed utilization and mineral balances in sheep drinking natural saline well water. J. Arid Environment, 16: 323-329.

Afifi, D.S. and Daghash, H.A. (1999): Reproductive performance of California doe rabbits as affected by feeding freshly *Nigella Sativa* seeds. Alex. J. Vet. Sci., 15 (5): 995-1008.

Anderson, D.M. and Stothers, S.C.(1978): Effect of saline water high in sulfates, chlorides and niterates on the performance of young weanling pigs. J. Anim. Sci., 47: 900-909.

Ayyat, M.S.; Habeeb, A.A. and Bassuny, S.M. (1991): Effect of water salinity on growth performance, carcass traits and some physiological aspects of growing rabbits in summer season. Egypt J. Rabbit Sci., 1: 21-34.

Baile, C.A. and McLaughlin, C.L. (1987): Mechanisms controlling feed intake. J.Anim. Sci., 64: 915-922.

Balnave, D. and Yoselewitz, I. (1988): Salinity of drinking water affects egg shell quality. Foodstuffs J., 60: 21.

Challies, D.J.; Zeinstra, J.S. and Anderson, M.J. (1987): Some effect of water quality on the performance of high yielding cows in an arid climates. Vet. Rec., 120: 12.

Cheeke, P.R. (1987): Rabbit feeding and nutrition. Academic Press, London.

Crane, R.K. (1965): Sodium dependent transport in the intestine and other animal tissues. Fed. Proc., 24: 1000.

Dandliker, W.B. and Feigen, G.A. (1970): Quantification of the antigen-antibody reaction by polarization immunochemistry. Immunochemistry, 7: 799-828.

Dandliker, W.B. and Saussure, D.V. (1973): Review article: fluorescent polarization immunoassay. Theory and experimental method. Immunochemistry, 10: 219-227.

Elizabeth, A.Y. and Huda, A. (1985): Corticotropin releasing factor stimulation of adrenocorticotropin and B-endorphin release: Effect of acute and chronic stress. Endocrinology, 117: 23-30.

Ellefson, R.D. and Garaway, W.T. (1982): Lipids and lipoproteins. In: Fundamentals of clinical chemistry. Saunders Co., Philadelphia, pp. 474-541.

Gary, L.C. and Narang, N. (1985): Renal adaptation to potassium in the adrenalectomized rabbits. Role of distal tubular sodium potassium adenosines triphosphate. J. Clinical Investigation, 76: 1065-1070.

Grodsky, G.M. (1979): Chemistry and function of hormones. In: review of physiological chemistry. 17th Ed., Lang Medical Publication, California, USA.

Guyton, A. and Hall, J.E. (1996): Textbook of medical physiology. 9th Ed., W.B. Saunders, Philadelphia, USA.

Jakubowski and Terkel, J.(1986): Establishment and maintenance of maternal responsivness in postpartum Wistar rats. Anim. Behav., 34: 256 – 262.

Kamel, T.H.; Habeeb, A.A.; El-Masry, K.A.; Abdel-Samee, A.M. and Aboulnaga, A.I. (1984): Effect of breed and diluted sea drinking water on water turnover rate, total body water and total body solids in goats. 1st Egyptian British conference on animal and poultry production, Univ. of Zagazig, Egypt.

Linder, H. R. (1959): Blood cortisol in sheep : Normal concentration and changes in ketosis of pregnancy. Nature, 184, Suppl. 21: 1645.

Mervat, M. Kamel (1993): The effect of food deprivation on maternal behaviour and pup development in albino Norway rats. Vet. Med. J. Giza, 41 (1): 123 – 127.

Minton, J. E. and Blecha, F. (1990): Effect of acute stressors on endocrinological and immunological functions in lambs. J. Anim. Sci., 68: 3145 – 3151.

Moustafa M. Ahmed and Moataz A. Abdel-Rahma (2004). Effect of drinking natural saline groundwater on growth performance, behavior and some blood parameters in rabbits reared in new reclaimed lands of arid area in Assiut governorate. Ass. Univ. Bull. Environ. Res. Vol. 7 No. 2, October 2004.

Muller, R.K. (1995): Toxicological analysis. Molina press, Leipzig, Germany.

Numan, M. (1978): Progesterone inhibition of maternal behaviour in the rat. Hormones and Behaviour, 11: 209 – 231.

Parrott, R. F.; Lioyd, D. M. and Goode, J. A. (1996): Stress hormone responses of sheep to food and water deprivation at high and low ambient temperatures. Animal Welfare, 5: 45–56.

Paterson, J. Y. F. (1964): The distribution and turnover of cortisol in sheep. J. Endocrinol., 28: 183.

Pond, W.G.; Chuch, D.C. and Pond, K.R. (1995): Basic animal nutrition anf feeding. 4th Ed., Wiely and Sons, New York, Chichester, Brisbane, Toronto and Singapore.

Ray, D.E. (1989): Interrelationships among water quality, climate and diet on feed lot performance of steer calves. J. Anim. Sci., 67: 357-361.

Sandford, J.C. (1996): Nutrition and feeding of the domestic rabbit. 5th Ed., Blackwell Science.

SAS (1995): Statistical analysis system. User's Guide: Statistics. Version 6, 2nd Ed., SAS Inst. Inc., Cary, NC.

Shutt, D. A.; Smith, A. I.; Wallace, C. A.; Connell, R. and Fell, L. R. (1988): Effect of Myiasis and acute restraint stress on plasma levels of immunoreactive B-Endorphin, adrenocorticotrophin and cortisol in sheep. Aust. J. Biol. Sci., 41: 297–301.

Suckow, M.A. and Douglas, F.A. (1997): The laboratory rabbit. CRC Press, Boca Raton, New York.

Tietz, N.W. (1982): Fundamentals of clinical chemistry. Saunders Company, Philadelphia.

Tomas, F.M.; Jones, G.B.; Potter, J. and Langsford, G.L. (1973): Influence of saline drinking water on mineral balance in sheep. Aust. J. Agric. Res., 24: 377-386.

Tyler, D.D. (1979): Water and mineral metabolism. In: Physiological chemistry. 17th Ed., Lang Medical Publication, California, USA.

Willis, M.B. (1991): Dalton`s introduction to practical animal breeding. Blackwell Science, Oxford.

8/2/2014