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Annals of Agricultural Science, Moshtohor (ASSJM)
https://assjm.journals.ekb.eg/

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Original Article Vol. 62(3) (2024), 87 – 96 DOI: 10.21608/assjm.2024.314057.1313

Effect of using Magnetic Water on Zaraibi Kid's Growth Performance, Carcass Traits, Blood Metabolites and Immunity

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Abstract

The aim of this study is to investigate the effect of magnetic water on growth performance, carcass traits, blood metabolites and immunity of Zaraibi kids. Fifteen Zaraibi male kids after weaning at 4 months of age were divided randomly into three groups (each of five kids). The first group was drinking tap water (control). The second group was drinking magnetic water (T_1, 2000 gauss). The third group was drinking magnetic water (T_2, 4000 gauss). The experiment duration lasted for 140 days during which the weight of the kids was measured every two weeks, and feeding and drinking were estimated. Body weight changes (BW) were recorded biweekly during 140 days of experimental period while, average daily gain (ADG) and feed conversion ratio (FCR) were calculated. Three males were randomly selected from each group after the end of the experiment for slaughter and carcass traits evaluation. Blood samples were collected and analyzed at the end of experiment (slaughtering time) from all kids. Results showed that there were significant ($P<0.05$) differences among groups in growth performance parameters. T_1 and T_2 had higher body weight, total weight gain, average daily gain and carcass traits means than control group. Blood metabolites were significantly ($P<0.05$) higher in treatment groups (T_1 and T_2) than control group except for A/G ratio, Urea, AST and ALT. It can be concluded that drinking magnetic water (T_1, 2000 gauss and T_2, 4000 gauss) can be improving effectively the growth performance, carcass traits, blood metabolites and immunity of Zaraibi kids.

Keywords: Magnetic water, Growth performance, Carcass traits, Blood metabolites, Zaraibi kids.

Introduction

Small ruminants contribute to the economy of many farmers in developing countries, including Egypt **Al-Tamimi (2007).** One of the most promising goat breeds in Egypt is the Zaraibi goat, which is mainly found in the northeastern Nile Delta. The Zaraibi goat is characterized by its large head, Roman nose, lower jaw, and long, drooping ears. Horns are often absent in both sexes. It is also characterized by a very variable body color, from cream to red, brown, or black or a mixture of them, sometimes with white spots. The body is also covered with short hair (**Shaat *et al.*, 2007 and Galal *et al.*, 2005**). Water is the basic and main element of all living organisms, as it represents 98% of all molecules in the animal body. Water is the element of life because of the important roles it plays within the living organism. It is an essential component in the circulatory system. It also regulates body temperature, transports oxygen, hormones, antibodies, and dissolves enzymes, in addition to a role in the digestion and absorption of feed and disposal of waste, so it was important to pay attention to water and its quality and find ways to improve it. There are many studies that confirm the ability of magnetic water to enhance the ability of cells to transport water. This is due to increasing the permeability of the cell membrane. This process increases the speed of cells getting rid of toxic metabolic substances. This may occur due to the regulation and management of osmotic balance and concentration ions between outside and inside cells. In addition to the positive effect of magnetized water on cell hydration, which may reach 20%, which is a very good indicator of the body's general health (**Mahdi, 2016; El-Sabrout and El-Hanoun 2019; Lee *et al.*, 2019 and Al-Bayar *et al.*,2020**). Scientists have used the magnetic field in many fields, including the medical field, to treat some diseases (**Bodrova *et al.*, 2020**), including the industrial and agricultural fields. The magnetic field is used in its various branches of irrigation water and plant cultivation (**Abdulraheem and Jameel, 2021;**

Fayed *et al.*, 2021); in animal and poultry (**Radha and AL-Sardary, 2021**) and in fish production (**Abdelkhalek *et al.*, 2021**). Among these branches, we are interested in animal production, and one of its uses in this field is to treat the water that the animal drinks with a magnetic field to improve water quality by passing water through a magnetic field, which works to change many of the chemical and physical properties of water and thus improves the quality of water (**Ali *et al.*, 2014**). Studies have shown the important role that the magnetic field plays in improving water by changing its various properties, as is more evident in unconventional water such as salt water and acidic water, which makes the use of magnetized water one of the solutions to water shortage in arid and semi-arid regions (**Dokhani, 2020**). The use of the magnetic field to treat water improves the quality and properties of water, which positively affects the improvement of the animal's immune system and increases its weight. It also increases the yield of milk production and its components in Zaraibi goats, Awassi sheep, and dairy cattle. It also improves the blood picture, biochemical parameters, and antioxidant status in humans and animals. It also reduces the environmental impact in livestock (**Ebrahim and Azab, 2017; Lindinger, 2021).**The aim of this study is to investigate the effect of drinking magnetic water on Zaraibi kid's growth performance, carcass traits, blood metabolites and immunity.

Materials and Methods

This study was done during the period from June 2022 to October 2022 at Animal Production Research Station, Sakha, Kafer El-Sheikh Governorate, belongs to Animal Production Research Institute (APRI), Agriculture Research Center (ARC), Ministry of Agriculture in cooperation with the Department of Animal Production, Faculty of Agriculture, Benha University, Egypt.

Experimental animals and management:

Fifteen Zaraibi male kids after weaning at 4 months of age were divided randomly into three groups (each of five kids). The first group was drinking tap water (control). The second group was drinking magnetic water (T_1, 2000 gauss). The third group was drinking magnetic water (T_2, 4000 gauss). The experiment duration was 140 day, during which the weight of the kids was measured biweekly, and feed and drink were estimated. Feeding has been adjusted according to body weight according to **NRC (2007).**Samples from Egyptian clover hay (ECH) and concentrate feed mixture (CFM) were analyzed according to **AOAC (1995)** for ether extract (EE), crude protein (CP) and ash percentages while, crude fiber (CF) was measured using the method of **Van Soest *et al.* (1991).** Chemical composition of experimental diet illustrated in table 1.

Table 1. Chemical composition of experimental diet (% on DM basis).

Items	Concentrate feed mixture (CFM)*	Egyptian clover hay (ECH)
DM	92.2	**89.84**
OM	95.43	**89.34**
CP	14.45	**12.72**
CF	12.95	**27.44**
EE	2.50	**2.80**
NFE	65.53	**46.38**
Ash	**4.57**	**10.66**

***** Concentrate feed mixture (CFM) was consisted of: 40% wheat bran, 30% ground yellow corn, 24% undecorticated cotton seed meal, 3% cane molasses, 2% lime stone and 1% common salt.

Preparation of magnetized water:

A sample of water was analyzed from each group to see the effect of the magnetic field on it and the analysis was done through the National Water Research Center.Two permanent magnets were borrowed from (Nefertari Biomagnetic Comp., Egypt) 2000 Gauss and 4000 Gauss, The intensities of its magnetic field was confirmed by checking it with a Gauss meter, The magnet was installed before the animal drinking basin tap of the experimental animals the water was constantly available to the animal and the water was changed every 12 hours.

Kid's growth performance:

Animals were weighed in the morning before feeding at the beginning of the experiment, then biweekly intervals during the whole experimental period. Fresh water was freely available throughout the day. The consumption rate of water and feed intake was estimated every two weeks intervals. Body weight changes (BW) was recorded every two weeks during 140 days of experimental period while, average daily gain (ADG) and feed conversion ratio (FCR) were calculated according to **Budisatria *et al.*(2021)**.

Blood parameters:

Blood samples were collected at the end of experiment (slaughtering time) from all kids in each group, from the jugular vein, then transferred to three vials, one contained EDTA (Ethylenediaminetetra acetic acid) for determination of packed cell volume (PCV), hemoglobin concentration (Hb) and white blood cells (Wbc), while the second vial contained

sodium fluoride for glucose estimate after separation and the third one was centrifuged at 3000 rpm for 15 minutes, then serum was separated, frozen and stored at -20°C until subsequent analysis of total protein, albumin, ALT, AST, urea, glucose and total antioxidant capacity. White blood cells were counted according to the method of **Shastry (1983)**, Hemoglobin (Hb, g/dl) concentration was determined according to **Drabkin and Austin (1932)**, Hematocrit value was determined according to **Schalm *et al.* (1975)**. Serum total protein (TP) was determined according to **Henry *et al.*, (1974)**, albumin (ALB) in blood serum was measured according to the method described by **Doumas *et al.*, (1981)**. Globulin was calculated by subtracting the albumin from the total protein concentration. Urea in blood serum was measured according to the method described by **Patton and Crouch (1977)**. Serum glucose was measured according to the method described by **Trinder, (1969)**. Aspartric aminotransaminase (AST) was measured according to **Young DS,(1990)**; alanine aminotransaminase (ALT) according to **Young DS,(1990)**. Total antioxidant capacity (TAC) according to **Koracevic *et al.*, (2001).**

Carcass traits:

Three males were randomly selected from each group after the end of the growth experiment for slaughter and evaluation of the traits of the carcass where the animal was fasting 12 hours before the slaughter process according to **Abdullah (2023)** and the weight of the animal was recorded fasting and then slaughtered and skinned was recorded and then the weight of the hot carcass was recorded and the weight of the organs was recorded heart, spleen, kidneys, liver, lungs, trachea, testicles, internal fat and kidney fat as well as the weight of the head, four legs, skin and digestive system (stomach and intestines) free and full in order to calculate the weight of the digestion system. The empty body weight is also calculated by Fasting body weight (FBW) - weight of the digestion system. By the following equation, the ratio of dressings was calculated according to **Rasmiaa (2022)**:

$$\text{Dressing 1 \%} = \frac{CW+(LW+HW+KW+SW+TW)}{FBW} \times 100$$

CW= carcass weight. LW= liver weight. HW=heart weight. KW= kidneys weights. SW=spleen weight. TW= testes weight FBW= Fasting body weight

$$\text{Dressing 2 \%} = \frac{CW+(LW+HW+KW+SW+TW)}{EBW} \times 100$$

EBW= Empty body weight **(Tadesse *et al.*, 2016)**

After cutting the ribs 9, 10 and 11, they were weighed and then dissected for the ribs to separate the meat, fat and bone and weigh each of them, then calculate the percentage related to each

Then the meat sample was dried in a drying oven at 60 °C for 48 hours to calculate the moisture content, then the grinding process was carried out and a sample was taken from it to analyze the percentage of protein, fat and ash. according to **AOAC (1995).** Then the prime and second cuts were weighed and the percentage of each was calculated.

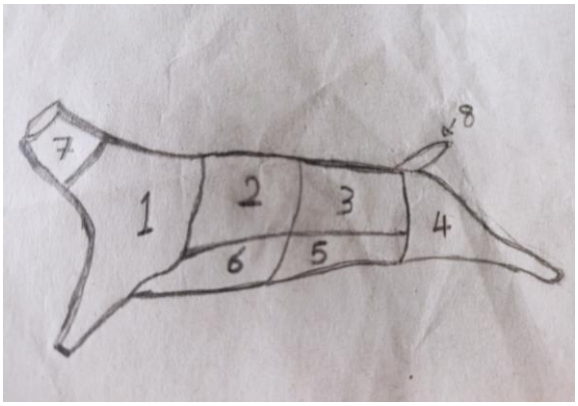

Figure1. Diagram of carcass cuts

Prime cuts	**Second cuts**
1. Shoulder	5. Flank
2. Rack	6. Brisket
3. Loin	7. Neck
4. Round	8. Tail

Statistical analysis:

The obtained data in this study were statistically analyzed using general linear models (GLM) procedure of **SAS (2000)**.

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

Where: Y_{ij} = the observation of growth performance, carcass traits and blood metabolites for the ij Zaraibi kids; μ= general mean, common element to all

observations; T_i= the fixed effect due to the i^{th} treatment with magnetic water (i=1, 2, 3 while, 1= control, 2= 2000 Gauss, 3= 4000 Gauss); e_{ij}= random error associated with the individual observation and assumed to be (N,IND) and (0, Ɓ2e). Tests of significance for differences between means were carried out according to **Duncan (1955).**

Results and Discussions

Kid's growth performance:

Table 2 shows result observed that the final body weight (23.03, 23.62 and 20.78 kg, respectively), total body weight gain (10.57, 11.04 and 9.04 kg, respectively) and average daily gain (75.49, 78.89 and 64.56 g/d, respectively) of T_1 and T_2 treatments was significantly higher (ranged between P<0.01 and P<0.001) than the control group as showed in Table 2. The results were consistent with **Abdullaziz *et al.* (2022)** indicated that treatment with magnetic water (3600 Gauss) led to improved water quality, which led to improved digestion of nutrients and intake of dry materials, which led to a significant increase (P<0.01) in final body weight of Baladi goats at the age of one year (34.18 vs. 36.99 kg). Also, **Mahdi (2016)** found that drinking magnetized water for male Shami goats at the age of 1.0 - 1.5 years led to a significant increase (P<0.05) in final body weight, as the increase was significant for T_2 (2000 Gauss) compared to the control (80.8 vs. 74.5 kg), while the increase was not significant between the T_1 (1000 Gauss) and the control (77.8 and 74.5 kg), and it was also non-significant between the T_2 and T_1. As well as, **Mahdi (2016) and Masri *et al.* (2019)** found that the use of magnetized water (1000-2000 Gauss) in drinking Shami goats aged 1-1.5 years led to a significant increase (P<0.05) in the total weight gain compared to the control, where the treatment (2000 Gauss) was significantly higher (P< 0.05) than the treatment (1000 Gauss) (12.5 vs. 9.2 kg), and the treatment (1000 Gauss) was significantly higher compared to the control (9.2 vs. 7.8 kg). On other species, **Jiaxun *et al.* (2020)** demonstrated that drinking magnetized water for lambs at 30-day-old increased feed intake and also improved average daily gain (ADG) (27.4%) compared to control group.

Table 2. Effect of using magnetic water on growth performance of Zaraibi kids.

parameter	Control	T_1 (2000 G)	T_2 (4000 G)		Significant
	Mean	Mean	Mean	SEM*	
Initial body weight, kg	11.74	12.46	12.58	0.27	NS
Final body weight, kg	20.78 [b]	23.03 [a]	23.62 [a]	0.49	**
Total body weight gain, kg	9.04 [b]	10.57 [a]	11.04 [a]	0.26	***
Average daily gain, g/d	64.56 [b]	75.49 [a]	78.89 [a]	1.19	***
Feed conversion ratio, (feed/gain)	7.85 [a]	7.19 [b]	6.95 [b]	0.18	*
Water intake, l/d	2.12	2.00	1.95	0.10	NS

[a,b] Within rows means bearing different superscripts differ significantly at P<0.05. *SEM= Standard error of mean. NS= non-significant, *= P<0.05 and **= P<0.01, and *** = P<0.001.

Feed conversion ratio of the control group was significantly (P<0.05) higher than T_1 and T_2 treatments (7.85, 7.19 and 6.95 feed/gain, respectively). Using of magnetized water did not showed a significant effect on water consumption between treatments (Table2). Similar results were concluded by **Lindinger (2021)** indicated in a review study that structured water (SW), including magnetized water, increased feed conversion ratio. Also, **Al-Rashid and Baz (2015)** indicated that the treatment of water with magnetic field (0-500-1500-2000 gauss) in Awassi lambs at ages 3-7 month led to an improvement in the feed conversion ratio in the treatments compared to control, and the treatment (1500 gauss) showed a highest improvement by significant difference (P< 0.05) compared to Other treatments, followed by fourth treatment (2000), followed by the second treatment (500 gauss) by significant difference (P<0.05) and least of them was control. As well as, **Al-Mafarji and Alsaadi (2023)** explained that there is an improvement in the conversion ratio of Awassi ewes that consume magnetized water compared to ewes that consume well water and tap water.

Kid's carcass traits:

Table 3 shows results indicates that there is a significant superiority (P<0.05) in the fasting body weight of the treatment T_2 and T_1 compared to the control (24.1, 23.47 and 20.63 kg, respectively). There was also a significant increase (P<0.05) in the hot carcass weight for treatment T_2 and T_1 compared to the control (10.72, 10.27 and 8.47 kg, respectively). It also showed that there was a non-significant increase between the treatments and the control in each of the percentage of the prime cut, and the dressing percentage1. It also found a non-significant decrease for the percentage of second cut between the treatments and the control, while the increase was significant in the dressing percentage2 between the treatment T_2 and the control (55.54 and 50.97%, respectively), and a non-significant increase between T_2 and T1 (55.54 and 54.2%, respectively)

and between T_1 and the control (54.2 and 20.97%, respectively) as observed in Table 3. The present results of kids' carcass traits are similar to those obtained by **AL-Obaidy (2014)** reported that the magnetized water improved some traits of the carcass in Awassi lambs at ages 140 day, where the T_1 treatment (2000 Gauss) was significantly ($P<0.05$) superior to the control in empty body weight (37.4 vs. 29.13) and hot carcass weights (25.98 vs. 19.23), while there were no significant differences in dressing percentage between treatments. Also, **Abdul-Sahib (2016)** indicated that the use of magnetically treated water (1500-2500 gauss) showed an improvement in the average weight of slaughter, the average of hot carcass weight and dressing percentage for the second treatment (2500 gauss) compared to the first treatment (1500 gauss) (47 vs. 43.51 kg) (24.91 vs. 21.79 kg), which showed an improvement compared to the control, and the increase was significant between (1500 gauss) and the control of male lambs Awassi with 6-7 month of age and **Jiaxun *et al.* (2020)** explained that using water treated with a magnetic field to drink lambs at 240 days led to an increase in carcass weight (28.2%), carcass lean weight (32.5%), carcass net meat weight (25.5%), and carcass fat weight (31.3%).

The study showed an increase in the weight of the carcass cuts of the groups treated with magnetized water over the control group, where the increase was significant for each of the round, loin and shoulder cuts weight for group T_1 and T_2 compared to the control, while for rack cut weight was not significant between the treatments groups and the control (Table3). There was no significant effect of magnetized water on carcass offal's weight (liver, heart and kidney) except for belt weight was higher in T_1 and T_2 than control group. Finally, the percentage of moisture, protein, fat, and ash in the *Longissimus dorsi* rib (eye muscle) were not affected by drinking magnetized water. The results were consistent with those of **Lindinger (2021)** indicated in a review study that structured water (SW), including magnetized water, had no effects on carcass composition.

Table 3. Effect of using magnetic water on Zaraibi kid's carcass traits.

Parameter	Control	T_1 (2000 Gauss)	T_2 (4000 Gauss)		Significant
	Mean	Mean	Mean	SEM*	
Fasted weight, kg	20.63^{b}	23.47^{a}	24.1^{a}	0.61	*
Hot carcass weight, kg	8.47^{b}	10.27^{a}	10.72^{a}	0.50	*
Prime cut, %	81.28	83.03	83.86	1.04	NS
Second cut, %	18.72	16.97	16.14	1.05	NS
Dressing percent 1, %	45.3	47.77	48.52	1.16	NS
Dressing percent 2, %	50.97^{b}	54.2^{ab}	55.54^{a}	1.00	*
Carcass cuts, Kg					
Round	2.41^{b}	2.96^{a}	3.11^{a}	0.10	**
Loin	1.06^{b}	1.30 ^{ab}	1.39^{a}	0.08	*
Rack	1.45	1.83	1.91	0.16	NS
Shoulder	1.95^{b}	2.42^{a}	2.55^{a}	0.09	*
Liver	0.44	492.66	512.43	0.02	NS
Heart	0.09	87.1	90.92	0.004	NS
Kidneys	0.08	89.9	97.76	0.01	NS
Belt	1.47^{b}	1.62^{a}	1.63^{a}	0.02	*
Meat chemical analysis (%):					
Moisture	73.78	74	74.08	±1.12	NS
Protein	19.54	19.92	20.23	±0.70	NS
Fat	3.82	3.21	2.9	±0.38	NS
Ash	1.26	1.12	1.06	±0.10	NS

^{a,b} Within rows means bearing different superscripts differ significantly at $P<0.05$. *SEM= Standard error of mean. NS= non-significant, *= $P<0.05$ and **= $P<0.01$.

Kid's blood metabolites;

Table 4 showed that there was a significant difference ($P<0.05$) in each of the hemoglobin level (Hb), hematocrit (HCT) percentage and white blood cells (WBC) count between the water treated with magnetic field and the control group, so the Hb, HCT

and WBC count were 10.4, 11.46 and 11.66 g/dl; 24.38, 27 and 27.5%; 9.55, 11.2 and 11.38 103/ µl for control, T_1 and T_2 treatments, respectively. These results agreement with those reported by **ALAbbasy and Shihab (2020)** found a significant increase (P≤0.05) in the percentage of packed cell volume (PCV), hemoglobin concentration (Hb) and White blood cells (Wbc) in the group treated with magnetic water (1000 Gauss) compared to the control in local male lambs, (28.1 vs. 26.1%) (9.1 vs. 8.3 g/dl) (9.65 vs. 7.48 cell/ml^3), respectively. The improvement in Hb, HCT and WBC count may be due to improved digestion, nutrient decomposition, absorption, and increased oxygen carrying to cells (**Al-hafez *et al.*, 2015 and Yacout *et al.*, 2015).**

There was a significant superiority (P<0.05) for the two treatments (T_1 and T_2) over the control group in each of protein, albumin, globulin, glucose and total antioxidant capacity (5.71, 5.81 vs. 5.29g/dl), (3.14, 3.22 vs.2.86 g/dl), (2.57, 2.6 vs. 2.42 g/dl), (66.57, 68.30 vs.62.82 mg/dl) and (0.61, 0.62 vs. 0.54 mM/L), respectively. It also found improvement in albumin/globulin ratio, urea, aspartate aminotransferase (AST) and alanine transaminase (ALT) without any statistically significant differences. The results were consistent with **Yacout *et al.* (2015)** concluded that using magnetized water (1200-3600 Gauss) to drink goats led to a significant increase (P<0.01) in the glucose in the blood compared to the control. The increase was significant in T2 (3600 Gauss) compared to T_1 (76.93 vs. 70.26), and T_1 (1200 Gauss) was significantly higher than the control group (70.26 vs. 64.13), respectively. Also, revealed that water treated with a magnetic field led to an improvement in kidney function, as he showed that treatment with a magnetic field at levels (1200 and 3600 Gauss) caused significantly decrease (P<0.05) in urea compared to the control treatment (11.81 and 11.14 vs. 15.33 mg/dl, respectively). **Abdullaziz *et al.* (2022)** observed that water treatment with a magnetic field showed a significant improvement in the percentage of protein, albumin, and globulin compared to untreated water in Baladi goats (8.58 vs. 7.24 g/dl) (4.48 vs. 3.87 g/dl) (4.1 vs. 3.36 g/dl), respectively. As well as, the same authors recorded that the use of magnetized water in Baladi goats showed a significant improvement in total antioxidants capacity compared to the control (0.55 vs. 0.5, mM/L). Finally on other species, **ALAbbasy and Shihab (2020)** concluded that treating the water with a magnetic field showed a decrease in AST and ALT in the second half of the experiment compared to the untreated water, while there was no effect in the first half of the experiment in local male lambs.

Table 4. Effect of using magnetic water on Zaraibi kid's blood metabolites.

Parameter	Control	T_1 (2000 Gauss)	T_2 (4000 Gauss)		Significant
	Mean	Mean	Mean	SEM*	
Hb, g/dl	10.40^b	11.46^a	11.66^a	0.28	*
HCT, %	24.38^b	27.00^a	27.50^a	0.63	*
WBC ×10^3/ µl	9.55^b	11.20^a	11.38^a	0.47	*
Total Protein, g/dl	5.29^b	5.71^a	5.81^a	0.12	*
Albumin, g/dl	2.86^b	3.14^a	3.22^a	0.09	*
Globulin, g/dl	2.42^b	2.57^a	2.60^a	0.05	*
A/G ratio	1.18	1.22	1.24	0.03	NS
Urea, mg/dl	31.67	31.02	30.50	1.19	NS
Glucose, mg/dl	62.82^b	66.57^a	68.30^a	1.22	*
ALT, u /L	10.92	10.71	10.52	0.16	NS
AST, u /L	30.92	30.51	30.40	0.68	NS
TAC, mM/L	0.54^b	0.61^a	0.62^a	0.02	*

^{a,b} Within rows means bearing different superscripts differ significantly at P<0.05. *SEM= Standard error of mean. NS= non-significant, HB= hemoglobin, HCT= hematocrit, WBC=White blood cells, ALT= alanine transaminase, AST= aspartate aminotransferase and TAC = total antioxidant capacity.

Conclusion

It can be concluded in the present study that drinking magnetic water (T1, 2000 gauss and T2, 4000 gauss) can be improving effectively the growth performance, carcass traits, blood metabolites and immunity than drinking tap water without negative effects on Zaraibi kids.

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تأثير إستخدام الماء الممغنط على أداء النمو وصفات الذبيحة ومحتويات الدم والمناعة فى صغارالماعز الزرايبى

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هدفت هذه الدراسة إلى معرفة تأثير استخدام الماء الممغنط على أداء النمو وصفات الذبيحة ومحتويات الدم والمناعة فى صغارالماعز الزرايبى. تم تقسيم خمسة عشر من صغار ذكور الماعز الزرايبي في عمر الفطام (4 أشهر من العمر) إلى ثلاث مجموعات (كل منها خمسة حيوانات). تم تقسيم الحيوانات عشوائيا إلى ثلاث مجموعات على النحو التالي: المجموعة الأولى الكنترول كانت تشرب الماء العادى. المجموعة الثانية كانت تشرب الماء الممغنط (T_1، 2000 جاوس). المجموعة الثالثة كانت تشرب الماء الممغنط (T_2،4000 جاوس). تم تعديل التغذية وفقًا لوزن الجسم وفقًا NRC (2007). تم تسجيل وزن الجسم والمأكول كل أسبوعين خلال 140 يوم من فترة تجربة النمو ؛ تم حساب متوسط الزيادة الكلية واليومية بوزن الجسم ومعامل التحويل الغذائى. فى نهاية التجربة تم أخذ عينات الدم من كل الحيوانات للتحليل وتم اختيار ثلاث حيوانات عشوائيا للذبح من كل مجموعة لدراسة صفات الذبيحة. أظهرت النتائج وجود فروق ذات دلالة إحصائية بين المجموعات في وزن الجسم النهائى ومتوسط الزيادة الكلية واليومية بوزن الجسم و معامل التحويل الغذائى. أظهرت المعاملة الثانية (T_2, 4000 جاوس) أعلى أداء للنمو من المعاملة الأولى (T_1, 2000 جاوس) ومجموعة الكنترول. وعلى العكس أظهر معامل التحويل الغذائى زيادة فى المجموعة الكنترول مقارنة بالمعاملتين T_1 و T_2 .كما سجلت نتائج مماثلة فى صفات الذبيحة ومحتويات الدم. أظهرت النتائج زيادة معنوية ($P<0.05$) فى الوزن الصائم ووزن الذبيحة الدافىء ونسبة التصافى للمعاملتين T_1 و T_2 مقارنة بمجموعة الكنترول بينما لا توجد معنوية لنسبة قطعيات الذبيحة ووزن ملحقات الذبيحة والتحليل الكيماوى للحم. أظهرت محتويات الدم زيادة معنوية ($P<0.05$) فى المعاملتين T_1 و T_2 مقارنة بمجموعة الكنترول فيما عدا A/G ratio و اليوريا و AST و ALT.

ويمكننا أن نستنتج أن شرب الماء الممغنط (2000 جاوس و4000 جاوس) يمكن أن يزيد بشكل فعال من أداء النمو وصفات الذبيحة ومحتويات الدم والمناعة فى صغار الماعز الزرايبى بدون تأثير سلبى.