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EFFECT OF MAGNETIC DRINKING WATER, FEED FORM AND IT'S RESTRICTED ON SASSO BROILERS. I. PRODUCTIVE PERFORMANCE

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ABSTRACT: The experiment was conducted to evaluate the effect of using magnetic drinking water feed form with its restricted on the broilers (Sasso strain) chicks' performance: body weight (BW), daily body weight gain (DBWG), daily water consumption (DWC), daily feed consumption (DFC), feed conversion ratio (FCR), and mortality percentages (MR) during the whole experimental period of 8 weeks old. A total number of 1600 chicks unsexed Sasso broiler was used, divided into eight Treatments with two replicates for each treatments, in factorial experimental design 2 x 2 x 2. The results of present study shows highly significant differences ($p \leq 0.001$) between water treatments on BW at 8 weeks of age, where the birds drank magnetic water has heavier BW than those drank ordinary water. Also, feed form and restricted diet had significant differences on Sasso broiler BW, since those fed crumble diet or fed ad-libitum has heavier weight than those fed pellet diet or fed 90% amount of feed. The results of DBWG show a significant difference between all treatments studied, since magnetic water, pellet diet and ad libitum feeding has the superiority in this respect. Magnetic water and ad-libitum feeding significantly reduced ($p \leq 0.001$) DWC values, while the effect of feed form in this respect was insignificant. The only significant differences ($p \leq 0.001$) of DFC values was found between feeding treatments, since those fed ad-libitum has higher DFC (80.99 g) than those fed 90% amount of diet (70.63 g).The results of FCR indicates highly significant differences between water treatments, since those drink magnetic water have better FCR values compared with those drank ordinary water. Feed form has insignificant differences between FCR values, where both forms has equal value (2.31), however feed restriction has highly significant better FCR value (2.21) than those fed ad-libitum (2.41). In respect of MR, magnetic water treatment has significant ($p \leq 0.05$) higher MR than those of drink ordinary water. Feed forms have insignificant effect on MR, while the feed restriction has highly significant ($p \leq 0.01$) better MR value (2.06%) than ad-libitum feeding (3.44%). Also the results recommend the use of magnetic water with whatever pellet or crumble diet to improve final body weight of Sasso broilers. Pellet or crumble diet fed ad libitum can use with magnetic water to obtain higher Sasso broilers DBWG and TBWG values throughout the grow-out period. Magnetic water improved FCR of Sasso broilers and this positive effect was for both forms studied.

Key Words: Magnetic water - feed from - Feed restriction - Sasso performance.

INTRODUCTION

In this treatment water properties could be change to become more energized, active, soft and high pH toward slight alkaline and free of germs (Yacout et al., 2015). Several reports are available on the application of water magnetization on broiler production (Alhassani and Amin, 2012). Rona (2004) found that using magnetic drinking water for chickens resulted in shortening of fattening period of broiler chickens, an increase in growth rate by 5-7%, improving meat quality, flavor and tenderness, as well as a decrease in feed intake and an improve in feed conversion ratio were detected (SagBaug, 2003). On the other hand, different types of feed forms have been evolved in commercial broiler production at the present time. Broiler chicks can attain 2 kg body weight within 35 days, consuming only 3 kg feed (Choct, 2009). The physical form of feed is mash, pellet and crumble, for different age of birds, is a critical factor in meat yield of broiler. The feed consumption significantly differed among broiler fed different form diets (Mirghelenj and Golian, 2009). However, the feed forms are important factor which directly influence the cost of production of broiler. Dietary manipulation methods (feed restriction) play an important role in controlling the broiler growth. In general, it can be defined as constrain due to the need to weight feed on a daily basis. There are many dietary methods for feed restriction physical (quantitative) feed restriction, skip- a- day feeding, reducing hours of illumination feeding or the diet dilution, chemical, and use of low protein or low energy, and energy to protein ratio (Zubair and leeson, 1996).

The current study was carried out to evaluate the effect of using the magnetic drinking water and both of the form and feed restriction on the broilers Sasso chicks' performance.

MATERILS AND METHODS

The present study was carried out at the Poultry Research Center, Faculty of Agriculture, Alexandria University. A total number of 1600 one day old of unsexed Sasso broiler, with an average initial weight 40.0 ± 2.0 g, were used in this experiment. The study included eight groups of treatments, with two replicates for each treatments (16 pens), in factorial experimental design 2 x 2 x 2 (two types of water treatments by two diet forms and two types of amount of feed). All birds were randomly divided in each pen. The birds were randomly allocated to eight treatments combinations: T1 birds received a magnetic water and fed ad-libitum crumble diet, T2 birds drank magnetic water and fed 90% amount of crumble diet, T3 birds drank magnetic drinking water and fed ad-libitum pellets diet, T4 birds drank magnetic water and fed 90% amount of pellets diet, T5 birds drank ordinary water and fed ad libitum crumble diet, T6 birds drank ordinary water and fed 90% amount of crumble diet, T7 birds drank ordinary water and fed ad-libitum pellets diet, and T8 birds drank ordinary water and fed 90% amount of pellets diet. Birds of each replicate were kept in a partition (pens) of 5 square meters space, 2.5 meter long and 2 meter width (20 birds / square meter) from one day up to 21 days of age, after that (10 birds / square meter) from 22 days up to the end of the experimental period, reared on the floor bedded with dry wood shavings provided with 6 cm. height. Sasso broiler was provided with fresh magnetic water treatment (MWT) every 12 hours following the recommendations of the magnetic funnel

manufacturer, produced by Delta Water company (Web site: http://www.deltawater.net/). Magnetic water treatment provided from 1 to 10 day-old via inverse hand-fill drinkers (4 liter) then the bigger capacity (8 liter) were used tills the end of the experimental period (56 days of age). At 8 days of age until the end of the experimental period, the restricted birds (T2, T4, T6 and T8) received 90% of the quantity consumed by the broilers fed ad libitum (T1, T3, T5 and T7) on the previous day (Rokeshi and Jafari, 2015; Trocino et al., 2015). The chicks were brooded on floor brooder at a starting temperature of 31.1 ◦C for the first week, and then decreased gradually 1-3 ◦C every two days to reach 26 : 28◦C until the end of the experimental period. The partitions without fans, and has one window for each partition. The chicks were exposed to continuous lighting (24 hrs. per day), one lamp 40-watt for each pen until the end of the fattening period. Two experimental commercial diets were used in this study, the first diet was starter diet used from 1-20 day of age, contained 23.37 % crude protein and 3041.07 Kcal ME /Kg., and the second was fattening diet used from 21 day till the end of the experimental period (56 days of age), contained 21.28 % crude protein and 3068.37 Kcal ME /Kg, Water was available all the time; also all birds were kept under similar management conditions. The studied traits were: individual weekly body weight (BW), daily body weight gain (DBWG), daily water consumption (DWC), daily feed consumption (DFC), feed conversion ratio (FCR) and mortality rate (MR). These traits calculated for the whole experimental period (1-56 days of age).

Data were analyzed using SAS (SAS Institute, 2004; version 9.1) for statistical analysis program. Before analysis, all percentages data were transformed to their corresponding arcsine angles according to Snedecor and Cochran (1981). The significant tests for the differences between each two means for any studied trait were done according to Duncan (1955).

RESULTS AND DISCUSSION

Body weight (BW):

The BW results (Table 1) noted a significant higher BW for birds of magnetic water, fed crumble diet or fed ad libitum (1914, 1900 and 1940 g, respectively) than those of drink ordinary water, fed pellet diet or fed 90% amount of feed (1838, 1865 and 1826 g, respectively).

The improvements obtained with magnetic water in the present study for Sasso broiler BW are in line with the pervious findings by Rona (2004). Al-Fadul (2006) reported that magnetization of the water significantly increased Arbor Acres broiler BW especially in the late weeks. However, other researchers found that the use of magnetic water did not influence the performance of chickens (Al-Mufarrej et al., 2005; Alhassani and Amin, 2012). The differences results among studies in this field may be due to broiler strain, the magnetizer device type, power of magnetization, speed of the device, experimental procedures ……etc.

The present results confirm the previous finding results that observed the superiority of weights for broiler chicks fed crumble diet (Jahan et al., 2006; Chehraghi et al., 2013) or crumble-pellet diets (Jafarnejad et al., 2010; Lv et al., 2015) over other forms studied. In contrast, Rierson (2011) reported that Cobb 500 male broilers fed a pelleted diet

had significantly better performance than those fed crumbles. These differences among studies may be due to strain of bird, the feed process procedures, the specifications of different forms (physically and their composition), particle size (degree of grinding) … etc

The present results shows that the feed intake of 90% feed significantly reduced 56-day Sasso broiler BW which are line with the findings of Omosebi et al. (2014), Nassef et al. (2015), Trocino et al. (2015) and Adeyemi et al. (2015), with different broiler strains, types and duration of feed restriction. Early feed restriction had insignificant or a low impact on broiler body weight as stated by Saber et al. (2011) and Rahimi et al. (2015). However, Rokeshi and Jafari (2015) found that early quantitative feed restriction improved the productive parameters which allow a complete recovery of broiler body weight. The inconsistent results and the variation in literature within this field may be partially due to differences in strain, management, method, timing, severity and duration of feed restriction applied.

Considering the second order interactions (Table 1), the birds of drink magnetic water and fed ad libitum pellet diet has significant ($p \leq 0.05$) highest 56-day BW (1980 g), while those of drink ordinary water and fed 90% amount of pellet feed has the lowest (1767 g) ones.

Generally, the feed restriction method applied in the current study (continuous 90% of feed during 8-56 days of age) obviously affected the final BW of Sasso broilers, and this effect was negatively higher with those of drink ordinary water than those drink magnetic water.

Daily body weight gain (DBWG):

The DBWG results (Table 1) noted obviously significant higher DBWG for chicks of drink magnetic water , fed crumble diet or fed ad libitum (33.5, 33.2 and 33.1 g, respectively) over those of drink ordinary water, fed pellet diet or fed 90% amount of feed (32.2, 32.6 and 31.9 g, respectively).

The improvements found in the present study for DBWG of Sasso broiler as a result of drinking magnetic water are in line with the pervious findings by Al-Fadul (2006), Nada et al. (2007), and Gholizadeh et al. (2008). Magnetic water did not influence the performance of broiler chickens as found by Al-Mufarrej et al. (2005), and Alhassani and Amin (2012).

The diet form played an important role on the broiler growth performance, the present results support the previous results observed the superiority of weights for broiler chicks fed crumble diets (Jahan et al., 2006; Chehraghi et al., 2013) or crumble-pellet diet (Jafarnejad et al., 2010; Lv et al., 2015) over other forms studied. However, the studies of Maertens et al. (2015) and Naderinejad et al. (2016) observed the superiority of final weights for broiler chicks fed pellet diets during different stage of fattening period over those fed mash form. Rierson (2011) with Cobb 500 male broilers and Amer (2015) with Sasso broiler reported that receiving pellet diet had significantly better performance than those fed crumbles diet.

The present results showed that the 90% of ad libitum feed intake in the present study significantly reduced 1-56-day DBWG which are in line with the findings of Jalal and Hana Zakaria (2012), Nassef et al. (2015), and Trocino et al. (2015) with different types and duration of feed restriction. Feed restriction had insignificant or a low impact on broiler body weight as stated

by Saber et al. (2011), and Rahimi et al. (2015).

Considering the second order interaction, the birds of drink magnetic water and fed ad libitum whatever crumble or pellet diet has higher DBWG during 1-56 days of age (34.2 and 34.7 g, respectively), while those of drinks ordinary water and fed 90% amount of pellet diet has the significant lower (30.9 g) ones.

These results recommends that pellet or crumble diet fed ad libitum can use with magnetic water to obtain higher Sasso broilers DBWG values throughout the studied growth period.

Daily water consumption (DWC): The birds of drink magnetic during 1-56 days of age had highly significant ($p \leq 0.001$) lower DWC value (211.50 ml) than those of drink ordinary water (218.63 ml).The birds fed crumble diet had an insignificant higher DWC value (215.63 ml) than those fed pellet diet (214.50 ml). The birds fed 90% amount of feed consumed highly significant ($p \leq 0.001$) more DWC (218.25 ml) than those fed ad libitum (211.88 ml).

The present results shows that magnetization of water significantly reduced water consumption of Sasso broiler chickens, which confirms the pervious results of Al-Mufarrej et al. (2005) and Al-Fadul (2006). The reduction of water intake for the birds consumed magnetized water could be explained by the interpretations of Al-Mufarrej et al. (2005) and McMahon (2009), since they attributed the decrease in water intake to the changes in water properties such as surface tension, fluidity, absorbency, pH level and dissolving capabilities.

Lal and Atapattu (2007) reported that broiler water intake was not significantly affected by the dietary physical form, it being 478 and 502 ml per day during 28-42 days old for mash and pellets, respectively. However, Huang et al. (2011) found that the broilers fed fines and mash diets consumed lower amount of water than those received pellets diet.

The present results of DWC values were in line with the findings of D'Eath et al. (2009), who reported that overdrinking has been reported in feed-restricted chickens. Although Morrissey et al. (2014) found that birds fed on a skip-a-day regime drank more than control birds only around feeding time and much less on off-feed days and so did not seem to replace feed with water. In contrast, Huang et al. (2011) noted that the average daily water intake for 0 to 42 days was significantly higher on ad libitum than on restricted feeding, an observation which could be related to higher feed intake.

The second order interaction among treatments studied showed highly significant ($p \leq 0.001$) effect on DWC values during 1-56 days of age. Generally, the birds of drink magnetic water and fed pellet diet whatever ad libitum or restricted feed has the lowest DWC (209.50 and 206.50 ml, respectively). Also, the lowest DWC value were observed for those of the drink magnetic water and fed ad libitum crumble diet (207.50 ml). The differences among the later three types of interaction groups were insignificant. The birds of drink magnetic water and fed restricted crumble diet or those of drink ordinary water and fed restricted pellet diet recorded the highest DWC values (222.50 and 224.00 ml, respectively).

These results indicate that magnetic water was more effective with pellet form more than with crumble form in decreasing DWC. The results of DWC increased in feed restriction groups, except for those

of drink magnetic water and fed pellet diet.

Daily feed consumption (DFC):

The Sasso broiler chicks of drink magnetic water or fed pellet diet (Table 2) consumed insignificant lower daily feed (74.60 and 75.56 g, respectively) during 1-56 days of age than those received ordinary water (77.01 g) or fed crumble diet (76.05 g). The Sasso broiler chicks fed restricted amount of feed during 1-56 days of age consumed highly significant ($p \leq 0.001$) lower daily feed amount (70.63g) than those fed ad libitum (80.99g). Normally, the applied continuous and severe feed restriction throughout the experimental period in the present study affected DFC trait.

The insignificant differences results of DFC between Sasso broiler of drink magnetic or ordinary water confirms the previous findings with broiler chickens by Al-Fadul (2006), Nada et al. (2007), Gholizadeh et al. (2008), and Alhassani and Amin (2012).

The results confirm the previous finding results, observed the superiority of weights for Sasso broiler chicks fed crumble diet (Table 1). Chehraghi et al. (2013) and Amer (2015) showed that birds consumed pellet form diet had highest values in that respect over those fed either crumble or mash diets. Lv et al. (2015) observed that Ross 308 fed the crumble-pellet diets had higher average daily feed intake ($p \leq 0.01$) than those fed the mash diet. Birds of pelleted diets had higher significant feed intake than those fed mash diets (Rezaeipour and Gazani, 2014; Amer et al., 2015; Shabani et al., 2015; Naderinejad et al., 2016).

The results showed that the feed intake of 90% feed in the present study reduce significantly 56-day Sasso broiler BW which are line with the findings of Adeyemi et al. (2015), with different broiler strains, types and duration of feed restriction.

The second order interactions among the three treatments in that respect showed significant ($p \leq 0.05$). The birds of drink ordinary water and fed ad libitum crumble feed consumed highest significant amount of feed (82.95 g) during the whole experimental period, while the birds of drink magnetic water and fed 90% pellet or crumble diet consumed significant lower feed (69.25 g).

The results of Table (2) indicated that magnetic water significantly decreased DFC of Sasso broilers compared with those of drink ordinary water whatever they fed crumble or pellet feed. Also, feed restriction results obtained reveals a highly significant decrease in DFC throughout the experimental period, which caused highly significant ($p \leq 0.001$) reduction in BW, DBWG of Sasso broiler chickens (Table 1). Therefore it is suggested to reduce the applied quantity feed restriction method, for its benefits and to increase DFC, which give the opportunity for compensatory growth.

Feed conversion ratio (FCR):

The FCR values of water treatment showed highly significant ($p \leq 0.01$) better values for birds of drink magnetic water or those fed restricted feed (2.23 and 2.21, respectively) than those drink ordinary water or fed ad libitum (2.38 and 2.41, respectively), However the feed form recorded insignificant effect in that respect (Table 2).

The present results confirm the pervious findings of Al-Fadul (2006) and Nada et al. (2007), who found that FCR of broiler chickens was improved by magnetization of water. However, the water magnetic

treatment exhibited no significant differences for FCR trait as shown by Al-Mufarrej et al. (2005) and Alhassani and Amin (2012).

The crumble or pellet diets showed better FCR than mash diet, as found by Zohair et al. (2012), Amer (2015) and Shabani et al. (2015). Feed restriction improved FCR in the present study and has been well documented by Mehmood et al. (2013), Adeyemi et al. (2015) and Rokeshi and Jafari (2015). However, feed restriction seemed to be insufficient to markedly improve the FCR (Shabani et al., 2015).

The second order interactions among treatments for Sasso broiler FCR was significant ($p \leq 0.05$), the chicks of drink magnetic water and fed 90% amount of crumble diet has significant better FCR value (2.11), while the chicks of drink ordinary water and fed ad libitum crumble diet has significant highest FCR value (2.54, worst value). The differences in FCR between groups received of magnetic water with ad libitum pellet diet and those of corresponding group of ordinary water were 2.31 and 2.45, respectively, with significant differences between them (Table 2). These results indicated that magnetic water improved FCR of Sasso broilers and this positive effect was for both forms studied. Also, the results showed, in general, the superiority for the birds fed restricted feed over those fed ad libitum in that respect was detected, except for those fed restricted pellet diet. With support of the previous conclusion, the restricted pellet diet associated with drinking magnetic water obtained significant better FCR value (2.18) than those of corresponding group of drink ordinary water (2.31). The same trend was observed with those fed crumble diet (2.11 and 2.24, respectively). On the other wards, the improvement in FCR of Sasso broilers fed 90% of pellet or crumble diet was due to drinking magnetic water and of course with their low feed consumption.

Mortality rate (MR):

The MR values showed significant better values for Sasso broiler ordinary water ($p \leq 0.05$) or those fed restricted ($p \leq 0.01$) diet (2.22 and 2.06%, respectively) than those of drink magnetic water or fed ad libitum (3.27 and 3.44%, respectively), Also the feed form recorded insignificant effect in that respect (Table 2).

Gholizadeh et al. (2008) stated that magnetic water increased livability of broiler chickens. However, the result of Alhassani and Amin (2012) showed that it has being insignificant effect. Despite the present result of water treatment for MR values, the both values are within the normal level for commercial broiler production. Generally, broiler mortality usually peaks at approximately 3 to 4 days after placement, declines until approximately day 9 or 10 then stabilizes until approximately day 30, and after day 30 a gradually increase is observed until approximately day 40 to 45. After day 45, mortality rates increased until harvest (Tabler et al., 2004). The feed form results of MR support the pervious findings pointed out by Attia et al. (2014), Chehraghi et al. (2013) and El-Hammady et al. (2014) who recorded t no significant effect of feed form on mortality rate. On the other hand, some drawbacks of pelleted diets have been pointed out (Arce-Menocal et al., 2009; Zohair et al., 2012). Also, broiler chickens fed mash diet had a significantly lower mortality rate than birds fed pellet (Zohair et al., 2012). Also, Amer et al. (2015) found that Sasso broilers fed mash diet has significantly lowest mortality rate (5.10%) during 1-8 weeks of age than

those fed crumble (9.80%) or pellet (8.09%) diet.

The feed restriction results of MR are in agreement with the pervious findings of Mehmood et al. (2013), who found that feed restriction had positive effect on mortality rate. The second order interaction among treatments studied showed highly significant ($p \leq 0.01$) effect on MR values. Generally, the birds of drink ordinary water and fed 90% amount of crumble or pellet feed has significant lowest equal MR values (1.34%, for both) during the whole experimental period. Whereas, the birds drank magnetic water and fed ad libitum crumble diet and those drink ordinary water and fed ad libitum pellet diet has significant highest MR value (5.52, 3.69%, respectively). These results indicate that feed restriction method applied in the present study affected positively MR trait (lower values) especially with those drinking ordinary water. However, the feed form has fluctuated manner of effect with water and feed restriction treatments.

CONCLUSIONS

The results of current study indicate a remarkable performance of magnetized water and might be suggested to use it as drinking water for Sasso broiler chicks, while both of studied feed forms produced nearly the same performance. However, although the feed restriction applied in the present study had a slightly lower performance than ad libitum feeding, but the continuity and severity should be alleviated. Further studies needed with magnetic water on other commercial broilers strains.

Table (1): The effects of magnetic water (W), feed forms (F) and feed restriction (R) treatments on Sasso broiler body weight, daily body weight gain, daily water consumption traits (M±SE) during the whole experimental period

Parameters **Effects**	**56-d Body weight** **(g)**	**Daily Body weight gain** **(g/bird/day)**	**Daily water consumption** **(milliliter/bird/day)**
Water treatments (W)			
Magnetic water	1914 [a] ±11.58	33.5 [a] ±0.21	211.50 [a] ±1.77
ordinary water	1838 [b] ±11.98	32.2 [b] ±0.21	218.63 [b] ±1.24
Feed forms (F)			
Crumbles	1900 [a] ±11.40	33.2 [a] ±0.20	215.63±1.67
Pellets	1865 [b] ±12.55	32.6 [b] ±0.22	214.50±1.88
Feed restriction (R)			
ad-libitum	1940 [a] ±12.01	33.1 [a] ±0.21	211.88 [a] ±1.14
90% amount of feed	1826 [b] ±11.45	31.9 [b] ±0.20	218.25 [b] ±1.92
Significance			
W	***	***	***
F	*	*	NS
R	***	***	***
Interactions			
MW × C× ad	1951 [b] ±18.60	34.2 [ab] ±0.33	207.50 [a] ±2.02
MW × C× R	1883 [d] ±21.53	32.9 [b] ±0.39	222.50 [c] ±1.44
MW × P×ad	1980 [a] ±26.88	34.7 [a] ±0.49	209.50 [a] ±0.29
MW × P × R	1817 [e] ±25.42	31.8 [c] ±0.45	206.50 [a] ±0.87
OW × C× ad	1869 [d] ±38.59	32.7 [b] ±0.71	212.50 [ab] ±0.87
OW × C× R	1840 [e] ±20.47	32.2 [c] ±0.36	220.00 [bc] ±1.15
OW × P×ad	1900 [c] ±20.38	33.3 [b] ±0.36	218.00 [b] ±0.58
OW × P × R	1767 [f] ±22.85	30.9 [d] ±0.41	224.00 [c] ±2.31
Significance W × F × R	*	*	***

MW= Magnetic water C= Crumbles ad= ad-libitum
OW= ordinary water P= Pellets R= 90% amount of feed
* = Significant at p≤ 0.05 ***= Significant at p≤ 0.001 NS= not significant
a,b,c… Means having different letters in the same column and effect indicating significant differences (p≤ 0.05).

Table (2): The effects of magnetic water (W), feed forms (F) and feed restriction (R) treatments on Sasso broiler daily feed consumption, feed conversion ratio, mortality rate traits (M±SE) during the whole experimental period

Parameters / **Effects**	**Daily feed consumption** (g/bird/day)	**Feed conversion ratio** 1-56 days	**Mortality rate** (%)
Water treatments (W)			
Magnetic water	74.60±2.03	2.23^{a} ±0.04	3.27^{b} ±0.51
ordinary water	77.01±2.27	2.38^{b} ±0.06	2.22^{a} ±0.37
Feed forms (F)			
Crumbles	76.05±2.24	2.31±0.06	2.98±0.56
Pellets	75.56±2.16	2.31±0.04	2.51±0.34
Feed restriction (R)			
ad-libitum	80.99^{b} ±1.06	2.41^{b} ±0.04	3.44^{b} ±0.45
90% amount of feed	70.63^{a} ±0.95	2.21^{a} ±0.04	2.06^{a} ±0.41
Significance			
W	NS	**	*
F	NS	NS	NS
R	***	**	**
Interactions			
MW × C× ad	79.65^{c} ±1.05	2.34^{d} ±0.04	5.52^{f} ±0.78
MW × C× R	69.55^{a} ±0.35	2.11^{a} ±0.01	2.53^{c} ±1.46
MW × P×ad	79.95^{c} ±2.25	2.31^{d} ±0.07	2.01^{b} ±0.01
MW × P × R	69.25^{a} ±0.55	2.18^{b} ±0.02	3.02^{d} ±0.01
OW × C ×ad	82.95^{e} ±2.85	2.54^{f} ±0.09	2.52^{c} ±0.01
OW × C× R	72.05^{b} ±3.55	2.24^{c} ±0.11	1.34^{a} ±0.48
OW × P×ad	81.40^{d} ±3.20	2.45^{e} ±0.10	3.69^{e} ±0.97
OW × P × R	71.65^{b} ±2.45	2.31^{d} ±0.08	1.34^{a} ±0.48
Significance W × F × R	*	*	**

MW= Magnetic water C= Crumbles ad= ad-libitum
OW= ordinary water P= Pellets R= 90% amount of feed
* = Significant at p≤ 0.05 **= Significant at p≤ 0.01 ***= Significant at p≤ 0.001 NS= not significant
a,b,c… Means having different letters in the same column and effect indicating significant differences (p≤ 0.05).

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الملخص العربى

تأثير ماء الشرب الممغنط و شكل العلف والتقنين الغذائى على الأداء الإنتاجي لكتاكيت اللحم (ساسو)

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أجريت هذه الدراسة بمركز بحوث الدواجن، كلية الزراعة، جامعة الإسكندرية وصممت التجربة لدراسة تأثير إستخدام ماء الشرب الممغنط وشكل العلف والتقنين الغذائى على أداء كتاكيت اللحم (سلالة الساسو). استخدم فى هذه التجربة عدد 1600 كتكوت غير مجنس عمر يوم واحد من كتاكيت الساسو بمتوسط وزن أولى 40 ± 2 جم. الدراسة شملت 8 مجاميع من المعاملات مع مكررتين لكل معاملة (بإجمالي 16 مكررة)، فى تجربة عاملية 2 x 2x 2 (2 معاملة للماء x 2 معاملة لشكل العلف x 2 معاملة غذائية):
T_1 طيور تشرب الماء الممغنط وتغذى على عليقه محببة بحرية، T_2 طيور تشرب الماء الممغنط وتغذى على 90% كمية من العليقة المحببة، T_3 طيور تشرب الماء الممغنط وتغذى على عليقه مفتتة بحرية، T_4 طيور تشرب الماء الممغنط وتغذى على 90% كمية من العليقه المفتته ، T_5 طيور تشرب الماء العادى وتغذى على عليقة محببة بحرية، T_6 طيور تشرب الماء العادى وتغذى على 90% كمية من العليقة المحببة، T_7 طيور تشرب الماء العادى وتغذى على عليقه مفتته بحرية، و T_8 طيور تشرب الماء العادى وتغذى على 90% كمية من العليقه المفتته. استمرت التجربة من عمر يوم إلى عمر 56 يوم. الصفات المدروسة كانت: وزن الجسم الإسبوعى خلال الفترات 1-21 ، 22-42 ، 43-56 و 1-56 يوم من العمر – الزيادة في الوزن وكذلك حساب استهلاك العلف اليومى و الإجمالى – معدل التحويل الغذائى - استهلاك الماء اليومى والإجمالى ومعدل النفوق خلال تلك الفترات.
النتائج المتحصل عليها يمكن تلخيصها فيما يلى:
- أظهرت النتائج إختلافات معنوية جداً (أقل من 0,001) فى وزن الجسم الحى لكتاكيت اللحم ساسو عند عمر ثمانية أسابيع حيث أن الطيور التى شربت الماء الممغنط تفوقت على مثيلتها التى شربت الماء الطبيعى فى كل من وزن الجسم النهائى ومعدل الزيادة اليومية والكلية لوزن الجسم. كما أن شكل العلف وإتباع نظام التقنين الغذائى كان له أثر معنوي حيث وجد أن الطيور التى غذيت على عليقه مفتته أو غذيت تغذية حرة كانت أثقل وزناً عن مثيلتها التى غذيت على عليقه محببه أو غذيت على عليقه 90% من كمية العليقه. وأظهرت نتائج معدل الزيادة اليومية للوزن المكتسب إختلافات معنوية بجميع المعاملات المدروسة حيث أن كل من الماء الممغنط والعليقه المفتته والتغذية الحرة كان لها التفوق بهذا الصدد.
- بينما الماء الممغنط والتغذية الحرة كان لهم تأثير معنوى (أقل من 0,001) أقل فى قيم ومعدل إستهلاك الماء اليومى بينما تأثير شكل العلف وجد به إختلافات ضئيله. كما أظهرت النتائج إختلافات معنوية فى إستهلاك العلف اليومى فالطيور التى غذيت على العليقه الحرة أظهرت إستهلاك أعلى فى معدل إستهلاك العلف اليومى (80,99 جم) بالمقارنه بمثيلتها التى غذيت على عليقة 90% تحديد غذائى (70,63 جم). وأشارت النتائج لوجود إختلافات معنوية جداً فى معامل التحويل الغذائى بين معاملات الماء حيث أن الطيور التى شربت الماء الممغنط كانت أفضل فى معامل التحويل الغذائى عن مثيلتها التى شربت الماء الطبيعى. وأيضاً وجد إختلافات ضئيلة بالنسبه لأشكال العلف فى معامل التحويل الغذائى حيث كانت القيم متساوية (2,31) . ومع ذلك أظهرت النتائج إختلافات معنوية جداً حيث أن التقنين الغذائى كان أفضل فى الكفاءة الغذائية (2,21) بالمقارنه بالتغذية الحرة (2,41).
- أشارت النتائج أن هناك إختلافات معنوية (أقل من 0,05) فى نسبة النفوق حيث أن الطيور التى شربت الماء الممغنط كان لها نسبة نفوق أعلى عن مثيلتها التى شربت الماء الطبيعى بينما أظهرت معاملات شكل العلف إختلافات ضئيلة فى نسبة النفوق بينما كانت هناك إختلافات معنوية جداً (أقل من 0,01) فى نسبة النفوق حيث كانت أفضل فى معاملات التقنين الغذائى (2,06 %) عن مثيلتها من التغذية الحرة (3,44%).