Manipulation of Diet Intake and Milk Production of Red Sindhi Cows by Varying the Water and Feeding Frequencies

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ABSTRACT

Background: Current research was carried out at Red Sindhi farm, Tando Muhammad Khan, during the year 2018, in order to manipulate the diet intake and milk production of Red Sindhi cows by varying the water and feeding frequencies.

Methods: A total of 300 Red Sindhi cows under 3rd lactation were selected and were divided into 5 groups. Cows in group A (control) were offered ad-libitum feed and water, in group B; 2 time feed (Morning 6:00AM and 6:00PM) and ad-libitum water, in group C; 3 times feed (6:00AM, 2:00 Noon and 10:00PM) and ad-libitum water, in group D, ad libitum feed and 2 times water (6:00AM and 6:00PM), in group E; ad libitum feed and 3 times water (6:00AM, 2:00 Noon and 10:00PM).

Result: Results of present study indicated that the daily water intake was found significantly maximum (47.00±1.45) in group B and minimum (43.33±0.88) in group D. Statistically significant difference was seen in group D compared to other groups, while no significant difference among groups A, B, C and E. Maximum daily feed intake (19.66±2.40) was recorded in group A and minimum daily feed intake (15.00±0.57) was recorded in group B. There was significant difference in daily feed intake in group E with groups A and B. However there was no significant difference in daily feed intake between groups A and B as well as groups C, D and E, correspondingly. Maximum weekly milk production (40.00±1.45 kg) was recorded in group A and minimum milk production (34.00±0.88 kg) was recorded in group B. However there was significant difference in milk production among groups A and B, while non-significant difference between groups C and D as well as A and E, correspondingly.

Conclusion: In conclusion, Red Sindhi cows produced significantly higher milk under group A (control) offered 24 hours water and ad-libitum feed compared to all other groups.

Key words: Cow, Diet intake, Feeding frequency, Milk production, Watering.

INTRODUCTION

Water as an essential compound composes about 60 to 70% of animal body. It maintains ionic balance and body fluids and also supports nutrients digestion, absorption and assimilation and excretion of waste material (King and Stockdale, 2014). Compared to other terrestrial mammals the water need of dairy cows is much higher during the lactating stage. This is due to fact that the production of dairy cows i.e. milk is mostly (87%) contains the water (Alamer, 2015). Physiological studies on dairy cows have indicated that total water content in the body of dairy cow ranges from 56 to 81% per total body weight (Aganga, 2012). Moreover, during early lactation cows have higher (69%) live weight that compares to cows in late lactation stage (52.4%). In pregnant cows total water content in the body is estimated as 65% (Andrew et al., 2014). Approximately 2/3 of water in cows’ body is found in intracellular compartments, while remaining 1/3 part remains in extracellular spaces, connective tissues and blood. In gastro intestinal tract water ranges from 15 to 35 percent of total body weight (Devendra, 2014). The daily need of dairy cow for water is influenced by many factors such as body condition, quantity of milk production, feed intake, size of body, air temperature, air movement and composition of diet composition (Senn et al., 2014). In dairy cows, water need is mainly fulfilled by drinking source, water rich feed resources and metabolic oxidation i.e. metabolic water. Amongst all resources drinking water represents the main resource of water consumption (Meyer et al., 2016). There is direct correlation of dry matter intake with water consumption in dairy cows (Senn et al., 2016; Little et al., 2012). If water consumption is lower than normal, dry matter intake in feed will typically decrease. On other hand if water consumption is normal then dry matter intake would also be appropriate for maintaining physiological processes, growth; lactation and pregnancy in cow’s body (Dahlinborn, 2011). As per previous reports efficient feed utilization by cows could be concerned to breed, animal physiology and feed quality. It is assumed that water consumption of dairy cows also considerably influences the diet intake and overall milk production. Thus current study was planned in order to observe possible effects of water and feeding frequencies on diet intake and milk production of Red Sindhi cows.

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**MATERIALS AND METHODS**

Present research was conducted at Red Sindhi farm, Tando Muhammad Khan during the year 2018. A total 300 Red Sindhi (n=300) cows were selected randomly and distributed into 5 groups containing 60 cows in each. Cows in group A (control) were offered *ad-libitum* feed and water, in group B; 2 time feed (Morning 6:00AM and 6:00PM) and *ad-libitum* water, in group C; 3 times feed (6:00AM, 2:00Noon and 10:00PM) and *ad-libitum* water, in group B, *ad-libitum* feed and 2 times water (6:00AM and 6:00PM), in group E; *ad-libitum* feed and 3 times water (6:00AM, 2:00Noon and 10:00PM). All groups (A, B, C, D and E) contained same composition of feed and water. Similar type of housing and bedding system was provided to the all experimental cows. Data regarding different parameters of study like daily water intake, daily feed intake and daily milk production were recorded during the study period of 30 days. For calculating the daily water intake, quantity of water supplied and water refusal were recorded. Using below given formula, water intake/animal/day was calculated:

\[
\text{Water intake (liters/animal/day)} = \frac{\text{Total water offered (liters) - Total water refused (liters)}}{}
\]

For computing the daily feed intake following formula was used. Quantities of total feed supply and feed refusal were put in the formula and feed intake/animal/day was calculated.

\[
\text{Feed intake (kg/animal/day)} = \frac{\text{Total feed offered (kg) - Total - feed refused (kg)}}{}
\]

Further, daily milk production of each animal from all groups was recorded in kilograms on spread sheet and data was analyzed to have average means.

**Data analysis**

The collected data was tabulated and analyzed by statistical software, Student Edition of Statistics (SXW) version 8.1. Statistical test namely Analysis of Variance was applied and results were presented in term of Means ± SE. Differences were considered significant at (P < 0.05).

**RESULTS AND DISCUSSION**

Current study was carried out at Red Sindhi farm, Tando Muhammad Khan, on a total of Three Hundred (n=300) (3rd Lactation) cows. Cow were distributed into 5 groups and influence of different water and feeding frequencies on the diet intake and milk production was assessed. Results regarding daily water intake (liters) of Red Sindhi cows is shown in the Fig 1. Fig indicates that maximum daily water intake (47.00±1.15) was recorded in group B and minimum daily water intake (43.33±0.88) was observed in the group D. Statistically significant (P < 0.05) difference was found for daily water intake in group D compared to rest of the groups, however, among groups A, B, C and E no significant (P > 0.05) difference was seen against daily water intake. Findings of our study are line with (Mengistu *et al.*, 2007), who reported that daily water intake in animals remains higher in 1st compared to 2nd, 3rd and 4th supply. Adogla-Bessa and Aganga, (2000) also revealed lower water intake cows, when deprived for 48 and 72hours compared those who were deprived for 24 hours.

Concerning daily feed intake (kg) of Red Sindhi cows, results are depicted in the Fig 2. Fig reveals maximum daily feed intake (19.66±2.40) in the group A and minimum daily feed intake (15.00±0.57) in the group B. Significant (P < 0.05) difference was noticed for daily feed intake in group E contrast to group A and B. However, between group A and B no significant (P > 0.05) variation was seen for daily feed intake. The results of present study showed a linear trend of water intake with feed intake. Findings of current research are in agreement with (Silanikove, 1985). He indicated that reduction of water intake results reduced dry matter intake in cows. Silanikove *et al.* (1997) also reported supportive
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results. They showed that free water intake has positive influence on dry matter intake in animals. Little et al. (1976) reported findings also agree with our results. They revealed that reduced water intake is strongly correlated with dry matter intake in cows. Further, in support of present study, King and Stockdale (2014) reported that 1 time supply of water/day to animals considerably reduces the feed intake. Alamer and Al-hozab (2004) reported reduced feed intake as a result of water deprivation. As per their reports feed intake remains highest in summer (96.5 percent) compared to winter (62 percent). Alamer, (2015) reported that decline in dry matter intake remains almost similar in 25 and 50 percent watering restrictions. The results of present study confirmed the findings of the above cited studies i.e. intake

of dry matter intake and green fodder is significantly favored with the increase of water intake.

Daily milk production (kg) of Red Sindhi cows of different groups was recorded and findings are given in the Fig 3. Figure shows maximum daily milk production (40.00±1.45) in group A and minimum milk production (34.00±0.88) in group B. Statistically there was considerable (P < 0.05) difference for daily milk production between group A and B, while non-considerable (P > 0.05) difference between groups C and D as well as A and E, correspondingly. Our findings are supported by Meyer et al. (2004) who found that milk production increases with the water intake. Khan et al. (2012) also supported to our study. They showed that reducing watering has negative influence on milk production, however

\[ \text{Fig 2: Effect of water and feeding frequencies on the daily feed intake (kg).} \]

\[ \text{abc} \] Values are significantly different (P < 0.05) from each other.

Group A = Control (ad-libitum feed + water).
Group B = 2 times feed (Morning 6:00AM and 6:00PM) + ad-libitum water.
Group C = 3 times feed (6:00AM, 2:00Noon and 10:00PM) + ad-libitum water.
Group D = Ad-libitum feed for 24 hours + 2 times water (6:00AM and 6:00PM).
Group E = Ad-libitum feed for 24 hours + 3 time water (6:00 AM, 2:00 PM and 10 PM).

\[ \text{Fig 3: Effect of water and feeding frequencies on the daily milk production (kg).} \]

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Group A = Control (ad-libitum feed + water).
Group B = 2 times feed (Morning 6:00AM and 6:00PM) + ad-libitum water.
Group C = 3 times feed (6:00AM, 2:00Noon and 10:00PM) + ad-libitum water.
Group D = Ad-libitum feed for 24 hours + 2 times water (6:00AM and 6:00PM).
Group E = Ad-libitum feed for 24 hours + 3 time water (6:00AM, 2:00PM and 10PM).
ad libitum water access supports the milk yield. Findings of present study are also in line with (Aganga et al., 2016) who stated that water deprivation of 72 hours reduces the milk yield by 50 percent, while water deprivation of 72 hours results increased viscosity of milk as well as protein, fat and lactose. In support to our findings Little et al. (1984) reported that milk production reduces by 28 percent on 3rd day of water deprivation in dairy cow, while milk composition is not altered at all. Hilali et al. (2015) found that water deprivation for 48 hours causes reduction in milk production by 28 percent. Senn et al. (2016) indicated that water deprivation decreases the milk yield by 30 percent. Thokal et al. (2004) agreed with present study and reported that average milk production decreases by 16 percent because of water restriction. King and Stockdale, (2014) disagreed with present study and who reported that there is no significant reduction in average milk production of cow on free access watering and twice a day watering.

CONCLUSION
On the basis of present finding it is concluded that the Red Sindhi cows produces significantly higher milk on ad-libitum feed and water supply.

REFERENCES
Adogla-Bessa, T. and Aganga, A.A. (2000). Responses of Tswana goats to various lengths of water deprivation. South African Journal of Animal Science. 30: 87-91.
Aganga, A.A. (2012). Water utilization by sheep and goats in northern Nigeria. World Animal Review. 73: 9-14.
Aganga, U., Dahlborn, K. and Olsson, K. (2016). Effects of intermittent watering on water balance and feed intake in male Ethiopian Somali goats. Small Ruminant Research. 67: 45-54.
Alamer, M. (2015). Effect of water restriction on lactation performance of Aardi goats under heat stress conditions. Small Ruminant Research. 84: 76-81.
Alamer, M. and Al-Hozab, A. (2004). Effect of water deprivation and season on feed intake, body weight and thermoregulation in Awassi and Najdi sheep breeds in Saudi Arabia. Journal of Arid Environment. 59: 71-84.
Andrew, T., Alamer, M. and Al-Hozab, A. (2014). Effect of water deprivation and season on feed intake, body weight and thermoregulation in Awassi and Najdi sheep breeds in Saudi Arabia. Journal of Arid Environment. 59: 71-84.
Dahlborn, K. (2011). Effect of milking frequency on mammary functioning and shape of the lactation curve. Journal of Dairy Science. 84: 204-211.
Devendra, C. (2014). The comparative efficiency of feed utilization of ruminants in the tropics. Tropical Science. 13: 123-132.
Hilali, N.E., Maltz, A., Halevi, M. and Shinder, D. (2015). Metabolism of water, sodium, potassium and chlorine by high yielding dairy cows at the onset of lactation. Journal of Dairy Science. 80: 949-956.
Khan, R., Qureshi, M.S., Mushtaq, A., Ghufarullah, A. and Naveed, A. (2012). Effect of quality and frequency of drinking water on productivity and fertility of dairy buffaloes. Journal of Animal and Plant Science. 22: 96-101.
King, K.R. and Stockdale, C.R. (2014). Milk yield of dairy cows given restricted access to water in a Mediterranean-type climate. Animal Production Science. 21: 167-171.
Little, W., Sansom, B.F., Manston, R. and Allen, W.M. (1976). Effects of restricting the water intake of dairy cows upon their milk yield, body weight and blood composition. Journal of Animal Production. 22: 329-339.
Little, W., Sansom, B.F., Manston, R. and Allen, W.M. (1984). Importance of water for the health and productivity of the dairy cow. Research in Veterinary Sciences. 37: 283-289.
Little, W., Sansom, B.F., Manston, R. and Allen, W.M. (2012). Effects of restricting the water intake of dairy cows upon their milk yield, body weight and blood composition. Journal of Animal Production. 22: 329-339.
Mengistu, U., Dahlborn, K. and Olsson, K. (2007). Effects of intermittent watering on water balance and feed intake in male Ethiopian Somali goats. Small Ruminant Research. 67: 45-54.
Meyer, J., Benlamlih, S. and Dahlborn, K. (2014). Effect of dehydration, rehydration and hyperhydration in the black Moroccan goat. Comparative Biochemistry and Physiology Part A: Physiology. 109: 1017-1026.
Meyer, U., Everingham, H., Gadeken, D. and Flachowsky, G. (2004). Investigations on the water intake of lactating dairy cows. Livestock Production Science. 90: 117-121.
Senn, M., Gross-Luem, S.I.N.A., Kaufmann, A. and Langhans, W. (2016). Effect of water deprivation on eating patterns of lactating cows fed grass and corn pellets ad libitum. Physiology and Behavior. 60: 1413-1418.
Senn, M.R., Patil, V.C. and Udar, S.A. (2016). Effect of drinking water frequency on milk yield, fat, total solids and solids-not-fat content in crossbred cows. Indian Journal of Animal Research. 38: 47-49.
Silanikove, N. (1985). Effect of dehydration on feed intake and dry matter digestibility in desert (Black Bedouin) and non-desert (Swiss Saanen) goats fed on lucerne hay. Comp. Biochem. Phys. A. 80: 449-452.
Silanikove, N.E., Maltz, A., Halevi. and Shinder, D. (1997). Metabolism of water, sodium, potassium and chlorine by high yielding dairy cows at the onset of lactation. Journal of Dairy Science. 80: 949-956.
Thokal, M.R., Patil, V.C. and Udar, S.A. (2004). Effect of drinking water frequency on milk yield, fat, total solids and solids-not-fat content in crossbred cows. Indian Journal of Animal Research. 38: 47-49.