

## EFFECT OF WATERING FREQUENCY ON FEED INTAKE, MILK PRODUCTION AND COMPOSITION IN SAHIWAL CATTLE DURING SUMMER

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### ABSTRACT

The study was carried out to investigate the effect of watering frequency on feed intake, milk production and composition in Sahiwal cattle during summer at the Livestock Experiment Station, University of Agriculture, Faisalabad. Twelve cows, almost at same number and stage of lactation were selected, and divided into three groups viz. G-1, G-2 and G-3 in a completely randomized design. Three Treatments including: watering twice a day, watering thrice a day and *ad libitum* watering were allocated to these groups. Animals were housed individually for individual watering and feeding. Green fodder was offered *ad libitum* to cows of all treatment groups and concentrate was offered 2.0 kg per cow per day as a production allowance. Results showed that watering frequency had a significant ( $P < 0.001$ ) effect on water intake, dry matter intake, milk production and digestibility. The water intake in cows of group G-1, G-2 and G-3 was 37.09, 40.20 and 40.68 liters, respectively. Dry matter intake in cows of group G-1, G-2 and G-3 was 9.90, 10.60 and 10.67 kg, respectively. Milk production in G-1, G-2 and G-3 was 6.41, 7.52 and 7.46 liters, respectively. Digestibility of feed in cows of group-G1, group-G2 and group-G3 was 73.37%, 66.08% and 69.74%, respectively. Watering frequency had a significant effect ( $P < 0.001$ ) on water intake, dry matter intake, digestibility percentage and milk production. The watering frequency however, showed non-significant effect on milk composition in all treatment groups.

**Key words:** watering frequency, feed intake, milk, dairy cows.

### INTRODUCTION

Dairy cows must consume large quantities of water for the production of milk. The amount that a cow will drink depends largely upon the ambient temperature, the kind of feed consumed, milk yield and the temperature and cleanliness of the water. Voluntary water intake of cows for optimum milk production depends upon frequent access, without discomfort and at a moderate temperature. Most cattle normally consume 3 to 4 units of water for each unit of dry feed. Water requirements are directly related to dry matter intake i.e. increased consumption of dry matter will increase water consumption and vice versa. Milking cows require 4-5 kg of water for each kg of milk produced (Banerjee, 2009). In experiment at Beltsville Station, average producing cows were watered once a day, twice a day and at will from watering cups. The cows watered once a day drank less and produced less than those watered twice a day, and the cows watered twice a day drank as much but produced less than those watered at will. Dairy cows watered by means of water bowls in the barn consumed approximately 18 % more water and yielded 3.5 % more milk and 10.7 % more butterfat than cows watered twice a day at an outside tank. Cows in the barn drank an average of 10 times per day, consuming two-third of their water in day time and one third at night (5pm to 5am) and the cows consumed 3.0 to 3.5 units of water for each unit

of milk produced (Etgen and Reaves, 1982). Keeping in view the importance of water on performance of dairy animals the objectives of this study were to find out the effect of watering frequency on feed intake, milk production and composition in Sahiwal cattle.

### MATERIALS AND METHODS

The study was conducted at the Livestock Experiment Station, University of Agriculture, Faisalabad. Twelve cows, almost at the same number and stage of lactation, were selected and divided into three groups viz. G-1, G-2 and G-3 in completely randomized design. Three treatments including: watering twice a day, watering thrice a day and free access to water were allocated to these groups to find out the effect of watering frequency on feed intake, milk production and composition. Each cow was considered a replicate. Animals were housed individually on concrete floor in a separate stall for individual feeding and watering in the same shed with natural ventilation and day light. All experimental cows were provided same managerial conditions. Green fodder offered andorts were weighed daily to calculate the daily dry matter intake (DMI) however, concentrate dry matter was determined on weekly basis. The duration of experiment was six weeks (May/June) including one week adjustment period. Digestibility trial was conducted at the end of experiment

for determination of digestibility using “Total collection method” (Khan *et al.*, 2003). Cows were milked twice a day and individual milk production was recorded at milking time. For milk composition analysis, milk samples were collected weekly; and were analyzed for fat, lactose, ash, protein, specific gravity, solids not fat and total solids. Collected data were analyzed statistically applying completely randomized design (CRD) using MINITAB (2000) software on computer.

## RESULTS AND DISCUSSION

Watering frequency had a significant ( $P<0.001$ ) effect on the water intake (Table 1). Water intake in cows of G-1, G-2 and G-3 was 37.09, 40.2 and 40.68 litres day<sup>-1</sup>, respectively. The results of present study were supported by Thokal *et al.* (2004) who reported that the mean value of water intake by cows was significantly ( $P<0.001$ ) greater in watering thrice a day as compared to cows watering twice a day. Abdelatif and Ahmed (1994) reported reduction in total water intake when sheep were watered at an interval of 24, 48 and 72 hours compared with animals that had free access to water. Similarly, present study was also supported by Mengistu *et al.* (2007) who stated that the calculated daily water intake of every day watering group was significantly higher compared with the every 2<sup>nd</sup> day, 3<sup>rd</sup> day and 4<sup>th</sup> day watering groups. Adogla-Bessa and Aganga (2000) also reported a lower free water intake of Tswana goats deprived of water for 48 and 72 hours as compared to goats watered after every 24 hours.

The watering frequency had a significant ( $P<0.001$ ) effect on feed intake (Table 1). The average dry matter intake in cows of G-1, G-2 and G-3 was 9.9, 10.6 and 10.7 kg day<sup>-1</sup>, respectively. The results of present study show a positive correlation of water intake and feed intake. Findings of present study were supported by Silanikove (1985) who reported that reduction in water intake causes reduction in dry matter intake. Silanikove *et al.* (1997) reported that free water intake had a positive effect on dry matter intake. Little *et al.* (1976) reported that 40% drop of water intake connected to 16% decrease in dry matter intake. Similarly, Little *et al.* (1984) reported that dry matter intake was reduced

about 10 % of normal on third day of water deprivation. Burgos *et al.* (2001) reported that feed intake declined during the first 3 days of water restriction depending on the restriction level. Misra and Singh (2002) reported that animals watered once in day, had lower feed intake. Alamer and Al-hozab (2004) reported a decline in feed intake as a result of water restriction which was highest in summer (96.5%) followed by spring (75%) and winter (62%) in Awassi and Najdi sheep in Saudi Arabia. Alamer (2009) reported that fall in dry matter intake with almost a similar rate in 25 and 50 % watering restriction in goats. The results of present study confirmed the findings of the above cited studies; the dry matter intake and green fodder intake increased significantly with the increase in water intake.

The watering frequency had a significant ( $P<0.001$ ) effect on digestibility of feed (Table 1). The average percentage of digestibility on dry matter basis in cows of G-1, G-2 and G-3 was 73.37, 66.08 and 69.74, respectively. Findings of present study were supported by Utley *et al.* (1970) who reported apparent digestibility consistently higher when the water intake was restricted. Devendra (1971) also supported the results of present study who observed increased digestibility as length of water deprivation increased. Silanikove (1985) reported apparent digestibility of dry matter increased significantly in breeds (Black Bedouin and Swiss Saanen) of goats during dehydration (watering after three days). Silanikove (1992) reported that the water restriction reduced appetite and increase the digestibility of feed. Burgos *et al.* (2001) reported that the lower energy intake during 50% water restriction was compensated by a higher digestibility of organic matter and energy. But findings of present study were not in agreement with Hadjigeorgiou *et al.* (2000) who reported that the effect of water intake on lucerne hay nutrients digestibility was not significant.

Watering frequency had a significant effect ( $P<0.001$ ) on the milk production (Table 2). Milk production in Sahiwal cows of G-1, G-2 and G-3 was 6.41, 7.52 and 7.46 litres day<sup>-1</sup>, respectively but had a non-significant effect on milk composition (fat, protein, lactose, solids not fat, total solids, ash and specific gravity) in all treatment groups (Table 2).

**Table 1. Effect of watering frequency on daily water intake, daily green fodder intake, daily dry matter from green fodder, daily total dry matter intake and digestibility of feed.**

	G-1	G-2	G-3	SEM	P
Daily water intake (liters)	37.09 <sup>b</sup>	40.2 <sup>a</sup>	40.68 <sup>a</sup>	0.28	<0.001
Daily green fodder intake (kg)	30.21 <sup>b</sup>	31.24 <sup>a</sup>	31.37 <sup>a</sup>	0.16	<0.001
Daily DMI (Green fodder kg)	8.20 <sup>b</sup>	8.90 <sup>a</sup>	8.99 <sup>a</sup>	0.077	<0.001
Daily Total dry matter intake (kg)	9.90 <sup>b</sup>	10.60 <sup>a</sup>	10.67 <sup>a</sup>	0.077	<0.001
Digestibility (%)	73.37 <sup>a</sup>	66.08 <sup>b</sup>	69.74 <sup>b</sup>	0.6643	<0.001

G1= watering twice a day, G2= watering thrice a day, G3= watering *ad libitum*, SEM= standard error of mean, DMI= Dry matter intake

**Table 2. Effect of watering frequency on milk production and composition**

	G-1	G-2	G-3	SEM	P
Milk production (litres day <sup>-1</sup> )	6.41 <sup>b</sup>	7.52 <sup>a</sup>	7.46 <sup>a</sup>	0.097	<0.001
Fat (%)	4.36	4.26	4.22	0.079	NS
Protein (%)	3.31	3.23	3.25	0.057	NS
Lactose (%)	4.72	4.86	4.95	0.117	NS
Ash (%)	0.61	0.71	0.70	0.010	NS
Solids not fat (%)	8.62	8.73	8.89	0.096	NS
Total solids (%)	13.01	13.08	13.14	0.108	NS
Specific gravity	1.031	1.031	1.032	0.0004	NS

G1= watering twice a day, G2= watering thrice a day, G3= watering *ad libitum*, SEM= standard error of mean.

Findings of present study were supported by Meyer *et al.* (2004) who reported that milk production increased with increment of water intake. Khan *et al.* (2012) reported that the reducing or decreasing watering had negative effect on milk production where as free access to drinking water had a positive effect on milk yield. Findings of present study were also supported by Aganga (1992) who reported that water deprivation for 72 hours reduce milk production by 50% in lactating sheep and goats, but water deprivation for 72 hours causes an increase in the viscosity of milk as well as protein, fat, lactose. Little *et al.* (1984) reported that milk production reduced by 28% on third day of water deprivation in the dairy cow, but milk composition was not altered much. Hilali *et al.* (1994) reported that water deprivation for forty-eight hours caused reduction in milk production by 28%. Senn *et al.* (1996) reported that water deprivation decreased milk yield by about 30%. Thokal *et al.* (2004) agreed with present study who reported that the average milk production was decreased by 16 % due to restriction of watering frequency from free access to twice-a-day in cattle, there was no significant effect of watering frequency on fat, solids not fat and total solids contents of milk. King and Stockdale (1981) disagreed with present study who reported that there was no significant reduction of average milk production (average 12.6 kg/ cow/ day) for a cow on watering free and twice a day, but milk production decreased for a cow on watering once a day.

**Conclusion:** The results of the present study showed that water restriction had a negative effect as shown by animals receiving water twice a day. On other hand free access to water to Sahiwal cows did not give extra benefits over watering thrice a day. It is recommended that watering thrice a day is adequate to satisfy the water requirement of Sahiwal cows for milk production during summer season

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