

## Research Article

# Effect of watering frequency on milk parameters, feed and water intake in Achai-Jersey cross cattle

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### Abstract

Water is a vital nutrient for sustaining life and optimizing growth, lactation and reproduction of dairy cattle. It is pertinent to mention here that achieving better production and good health without considering the availability of free access to clean drinking water is not possible. In order to investigate the effect of different watering regimes on different productive parameters, the current study was designed. The trial period comprises of six weeks with a total number of twelve healthy lactating cows in mid-lactation. These animals were divided into three different groups. The experimental groups received watering regime as water twice a day, thrice a day and *ad libitum*. Results indicated that watering frequency had a significant ( $P < 0.05$ ) effect on milk production, water intake and feed intake. Average milk production in Group-A, B and C was 4.34, 4.89 and 5.08 liters respectively. Water intake in cows of group Group-A, B and C was 28.90, 31.28 and 33.26 liters, respectively. Feed intake in cows of group A, B and C was 20.87, 22.23 and 25.31 kg, respectively. Watering frequency had a significant effect ( $P < 0.05$ ) on milk production, water intake and feed intake. The watering frequency however, showed non-significant effect on milk composition in all treatment groups. Hence, it was concluded that ad-lib water availability positively effects milk production and feed intake of Achai-Jersey cross cattle. It is recommended that free access to clean drinking water is adequate to satisfy the water requirement of lactating cows for better feed consumption and thus higher milk production.

**Keywords:** Achai-Jersey cross cattle, feed intake, milk production, watering frequency, water intake

### Introduction

Water is a vital nutrient governing all physiological functions of the animal body. Relative to other nutrients, water is consumed in considerably larger quantities. Therefore, dependency of animal on water for proper health and production is of considerable importance. Water

consumption depends largely upon the ambient temperature, feed type, milk yield and cleanliness of the water. Water intake is directly proportional to feed intake in both beef and dairy cattle and it is thus essential to provide palatable water to livestock to sustain productivity [1]. Water intake in cows for ideal milk production

depends upon free access to water. Overall water content in the body of adult dairy cattle ranges between 56 and 81% of body weight depending upon stage of growth and lactation cycle [2].

The water prerequisite and consumption in livestock is largely dependent on species and breed of dairy animals, production status, environment or climate in which livestock are reared and feed type and intake. All the above parameters are directly or indirectly proportional to several aspects of water metabolism and physiology [3]. Although there is a general consensus that water quality affects the palatability and water consumption of animals. Salt intake alters water and feed intake which subsequently affects growth rate of the animal [4].

Lactating dairy cows metabolize large amount of water and this could make them predispose rapidly to water deprivation. Khan [5] reported that the reducing or decreasing water has negative effect on milk production whereas free access to drinking water has a positive effect on milk yield. Water helps regulate body temperature and electrolyte balance, thus preventing issues like dehydration and other metabolic disorders. Milking cows require 4-5 liters of water for each liter of milk produced [6].

Young animals require more water than mature animals due to higher water content in the body and thus higher susceptibility to dehydration and stress. Lactating cows need larger proportion of water due to the fact that milk comprises 86-87% water. Water acts as transport medium for nutrients to different body tissues and excretion of waste products from the body. It also plays special role in heat exchange and maintains thermoregulation [7].

The temperature of water has no significant effect on drinking behavior of the animal. Studies on the behavior of cattle indicate that cattle having free access to fresh water will consume more forage. Also water deprivation for 72

hours reduced milk production by 50% in lactating sheep and goats [8].

Zelege [9] reported that drinking water did not affect lactose content while protein, fats, and dry matter were found to be higher in dry season compared to wet months because of decreased water intake in the later. Water requirement is influenced by environmental factors, animal factors and physiological factors i.e. reproductive status and milk production [10].

According to some studies it was found that cattle are sensitive to the palatability of water and prefer to drink clean water without contamination. Due to continuous attention paid by dairy producers and nutritionists to other nutrients in the ration, the quality and provision of free drinking water often does not receive enough attention.

Considering water's significance for dairy animal production, health, and performance, this study aims to investigate the effect of watering frequency on milk production, composition, feed intake and water intake.

## **Materials and Methods**

### **Study area**

The present study was carried out at Livestock Research and Development Station Surezai Peshawar during the year 2023-24.

### **Daily routine practices**

All experimental animals (Achai-Jersey cross cattle) were provided same feeding regime and environmental conditions under same management. All the animals were housed group wise in the same shed, in a separate stall for individual feeding and watering. The shed where the animals were kept had proper natural ventilation and day light. The experimental animals were hand milked twice daily and individual milk production was recorded at milking time for each animal.

### **Study protocol**

The trial period consist of 6 weeks including one week adjustment period. A total number of twelve (12) healthy

lactating cows in their mid-lactation period were selected for the trial purpose. These cows were further divided into three different groups.i.e. Group-A, Group-B and Group-C.

The experimental groups received watering regime as: G-A group animals were offered water twice a day; similarly G-B group were offered water thrice a day while the animals in G-C had a free access to water throughout the trial.

Individual milk production was recorded at milking time. For determination of milk composition and its analysis, milk samples were collected on weekly basis; and were analyzed for milk fat, lactose, protein and total solids.

To analyze feed intake all the animals were offered same feed at the rate of 3.25% DM of body weight and feed intake were calculated with the help of following formula:

**Feed intake = Feed offered-Feed refused**

Water to the experimental animals were offered through water buckets and the consumption was recorded by the following formulae

**Water intake= water offered-water refused**

#### **Statistical Analysis of the Data**

The conclusive data was documented in Microsoft Excel. The data was subsequently analyzed using the “Statistix” software tool. The means were computed using the LSD test. The statistical significance of the differences among the means was determined at a significance level of 0.05.

#### **Results**

The present study was conducted to study the effect of watering frequency on milk production, milk composition, feed intake and weight gain in Achai-Jersey cross cattle. The results of the trial are given below in the following subheadings.

Data regarding effect of watering frequency on milk production of experimental groups is presented in (Table 1). Watering frequency had a significant

effect ( $P<0.05$ ) on the milk production as evident from (Table 1). It is obvious from the data that the animals in group-C having free access to drinking water and have higher average milk production of 5.08 liters as compare to group-B animals which were offered three time drinking water in a day having production of 4.89 liters. The lowest increase was observed in group-A animals with an average of 4.34 liters which were offered drinking water twice a day.

Data regarding effect of watering frequency on milk composition of experimental animals is presented in (Table 2) showing significant effect ( $P<0.05$ ) on the milk production but had a non-significant effect ( $P> 0.05$ ) on milk composition (fat, protein, lactose, total solids) in all treatment groups. The data collected during the trial reveals that there were no significant differences in milk composition of all the investigated groups. Milk fat observed in Group-A and group-C was 4.05 which is slightly higher than group-b having value of 4.03.

Water is an essential nutrient for sustaining life and it also optimizes the growth, lactation and reproduction of dairy cattle. Data regarding effect of watering frequency on water intake of experimental animals is presented in (Table 3) which indicates significant effect ( $P<0.05$ ) on water intake in all the experimental groups. It is evident from the collected data that the animals in group-C having free access to drinking water have higher average water consumption (33.26 liters) as compared to group-B animals having average (31.28 liters). The lowest average water consumption was observed (28.90) in group-A animals.

Feed intake significantly ( $P<0.05$ ) effected as evident in (Table 4). The results of the present study show a positive correlation of water intake and feed intake. The data revealed that the animals in group-A with watering frequency twice a day has a lower average feed intake (20.87 kg) as compared to group-C animals having

higher average feed intake (25.31) which had free access to drinking water. The overall correlating effect of watering

frequency on milk production, composition, feed and water intake is presented in (Fig. 1).

**Table 1. Shows the data regarding the effect of watering frequency on milk production of experimental groups on weekly basis**

Group	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	4 <sup>th</sup> week	5 <sup>th</sup> week	6 <sup>th</sup> week	Mean
A	4.15a	4.32b	4.35b	4.32b	4.400b	4.5a	4.34
B	4.45a	4.65ab	4.85ab	5.125a	5.1250a	5.17a	4.89
C	4.77a	4.9a	5.15a	5.225a	5.250a	5.2a	5.08
P-value	0.261	0.0493	0.043	0.039	0.032	0.084	

**Table 2. shows the data regarding effect of watering frequency on milk composition of experimental animals**

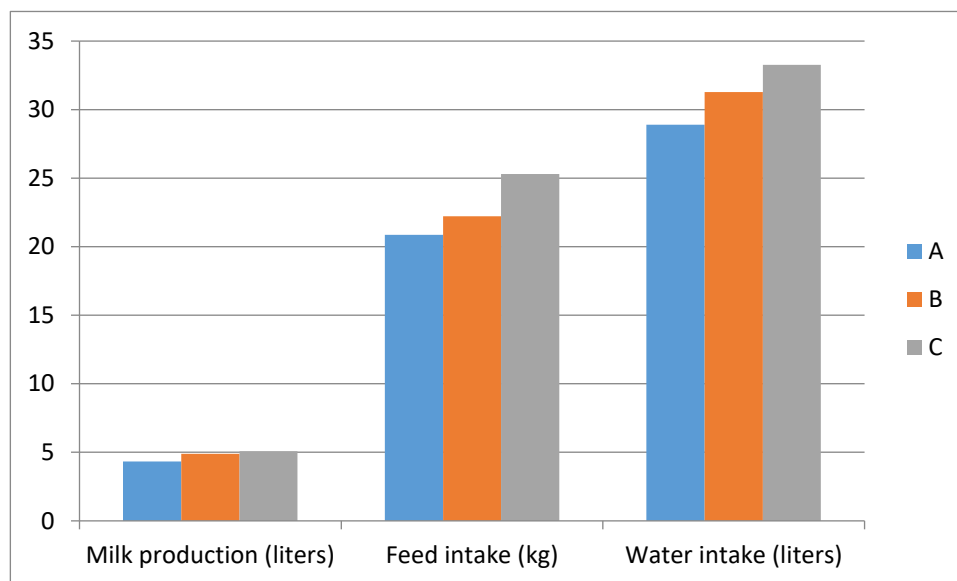
Group	Fat	Lactose	Protien	Total solids
A	4.05	4.09	4.19	13.08
B	4.03	4.10	4.15	13.075
C	4.05	4.13	4.24	13.125
P-value	0.9610	0.8883	0.5557	0.3675

**Table 3. shows the data regarding effect of watering frequency on water intake (liters) of the experimental animals**

Group	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	4 <sup>th</sup> week	5 <sup>th</sup> week	6 <sup>th</sup> week	Mean
A	28.50c	28.90b	29.20b	28.90b	28.80b	29.13c	28.90
B	31.00b	31.20ab	31.20a	31.20a	31.80a	31.30b	31.28
C	33.00a	33.20a	33.00a	33.20a	33.80a	33.38a	33.26
P-value	0.0015	0.0071	0.0040	0.0050	0.0025	0.0031	

**Table 4. shows the data regarding effect of watering frequency on feed intake of experimental animals**

Group	1 <sup>st</sup> week	2 <sup>nd</sup> week	3 <sup>rd</sup> week	4 <sup>th</sup> week	5 <sup>th</sup> week	6 <sup>th</sup> week	Mean
A	20.0 <sup>b</sup>	20.37 <sup>b</sup>	20.32 <sup>b</sup>	21.50 <sup>b</sup>	21.50 <sup>b</sup>	21.50 <sup>b</sup>	20.87
B	21.75 <sup>ab</sup>	21.75 <sup>b</sup>	21.75 <sup>b</sup>	22.37 <sup>b</sup>	22.75 <sup>b</sup>	23.00 <sup>b</sup>	22.23
C	24.50 <sup>a</sup>	25.00 <sup>a</sup>	25.00 <sup>a</sup>	25.37 <sup>a</sup>	25.75 <sup>a</sup>	26.25 <sup>a</sup>	25.31
P-value	0.0167	0.0085	0.0081	0.0212	0.0050	0.0029	



**Figure 1.** shows comparison watering frequency of all experimental groups on studied parameters

### Discussion

This research provides understanding of how watering frequency effects feed intake which ultimately leads to better milk production. Thus, we compare different watering regimes to investigate its effect on milk production and its composition, feed intake and water intake in Achai-Jersey cross cattle at Surezai, Peshawar.

The current study reveals a significant effect of different watering regimes on milk production which is evident from the data that the animals in group-C having free access to drinking water and have higher average milk production of 5.08 liters as compare to group-B animals which were offered three time drinking water in a day having production of 4.89 liters. The findings of present study were supported by Meyer [3] who reported that milk production increased with increment of water intake. Findings of the present study is also supported by Khan [5] who reported that the reducing or decreasing watering had negative effect on milk production whereas free access to drinking water had a positive effect on milk yield. Results of the present trial are parallel with the research conducted by Senn [11] who is of the view that water deprivation

decreased milk yield by about 30%. The results of the present study is supported by Thokal [12] 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, but there was no significant effect of watering frequency on fat, protein, solids not fat and total solids contents of milk.

Findings of the present study in terms of milk production is in line with the findings of Little [10] who reported that milk production reduced by 28% on third day of water deprivation in the dairy cow, but milk composition was not altered much. The present study is in contrast with the findings of Aganga [8] who reported that water deprivation for 72 hours reduces 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 and lactose content.

Water availability also affects water intake of the animals significantly. It is evident from the collected data that the animals in group-C having free access to drinking water have higher average water consumption (33.26 liters) as compared to group-B animals having average (31.28 liters). The lowest average water

consumption was observed (28.90) in group-A animals. The findings of present study in terms of water intake were supported by Thokal [12] who reported that the mean value of water intake by cows was significantly ( $P < 0.05$ ) greater in watering thrice a day as compared to cows watering twice a day. The findings of Abdelatif [13] and Ahmed are also parallel to the present study who 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.

Watering frequency significantly affects feed intake in cattle as water availability is critical for their digestion, metabolism and overall health. Feed consumption is highly related to water intake. The optimal water to feed intake ratio is crucial for proper nutrient absorption and health. An adequate level of water intake is necessary for proper digestive and other vital functions of the body [14]. The present study is supported by the studies conducted by Jaber [15] which shows that when Awassi sheep experienced a 3 to 4 days intermittent watering regimen voluntary feed intake was reduced to approximately 60% as compared to control group. In contrast, Kay [16] states that drinking water is not needed for swallowing and moistening feed, since water can be circulated from the blood to maintain high salivation; it is, however, needed to replace the inevitable water loss by excretion and evaporation. Findings of the recent study are supported by study conducted by Misra [17] and Singh who reported that animals watered once in a day, had lower feed intake. Similarly [7] Burgos reported that feed intake declined during the first 3 days of water restriction depending on the restriction level. Findings of present study were supported by Silanikove [18] who reported that reduction in water intake causes reduction in dry matter intake.

## Conclusion

The results of the present study showed that free access to water show increase milk production and feed intake. On other hand water restriction to two and three times a day has marked decrease in milk production and daily feed intake of Achai-Jersey cross cattle. It is recommended that free access to clean drinking water is adequate to satisfy the water requirement of Achai-Jersey cross cows for better feed consumption and higher milk production. The findings of the present study will be of great value to farmer's community and other stakeholders in improving their milk production and keeping good health of their dairy animals.

## Authors' contributions

Conceived and designed the experiments: Z Ullah, I Ullah & K Kalim, Performed the experiments: Z Ullah, S Ullah, & N Ullah, Analyzed the data: FU Zaman, Z Ullah, S Khan & I Ullah, Contributed materials/analysis/ tools: Z Ullah, M Irshad, S Ullah & Z Ullah, Wrote the paper: Z Ullah, I Ullah & N Ullah.

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