Tikrit Journal for Agricultural Sciences (2021) 21 (3):75-81
https://doi.org/10.25130/tjas.21.3.9

IRAQI Academic Scientific Journals
العراقية المجلات الأكاديمية العلمية

ISSN:1813-1646 (Print); 2664-0597 (Online)
*Tikrit Journal for Agricultural Sciences*
Journal Homepage: http://www.tjas.org
E-mail: tjas@tu.edu.iq

TJAS
Tikrit Journal for Agricultural Sciences

**Shireen Ihsan Izzadeen** *
**Nidhal A. Mustafa**
**Mahbuba A. Mustafa**

*Animal Resources Dept., College of Agricultural Engineering Sciences, Salahaddin University- Erbil / Iraq*

**KEY WORDS:**

Ewe, cow, milk yield, physical and chemical traits of milk.

**ARTICLE HISTORY:**

**Received**: 03/05/2021
**Accepted**: 08/07/2021
**Available online:** 30/09/2021



# Evaluation Of Morning And Evening Milk Traits in Some Dairy Animals in Erbil City

## ABSTRACT

The study was done to compare Awassi ewes and Holstein cow's milk in morning and evening period, in a private animal project in Erbil/ Iraq. The physical properties (pH, specific gravity and freezing point °c) of milk samples which recorded insignificant differences between the morning and evening period of Awassi ewes and Holstein cow's milk, as well as milk has flavor in ewes, while it increased in cow's milk. The average yield of cows' milk increased in the morning compared to the evening, while the milk yield of ewes showed an insignificant difference between the morning and evening periods. Fat and fat percentage: protein ratio had decreased in the morning milk compared to the evening milk, instead of in cows the morning milk contained high fat (%) and fat: protein ratio compared to the evening, otherwise, Sheep's milk increased the rates of morning milk protein, lactose and SNF compared to the evening milk, there were insignificant differences between cows' morning and evening milk protein, lactose and SNF percentages. At the animal or species level, sheep's milk outperformed cow's milk in chemical composition.



## INTRODUCTION

Milk provides essential nutrients and is an important source of dietary energy, high-quality proteins and fats. Milk can contribute significantly to the intakes of required nutrients for calcium, phosphorus, selenium, riboflavin, magnesium, vitamin B12 and pantothenic acid. Among these mineral components, calcium and phosphorus make up a larger part in milk that is essential for bone growth and the proper development of newborns (Al-Wabel, 2008). With progress in the lactation stage, milk yield and energy balance tend to differ and together this contributes to the fluctuation of the concentration of milk ingredients (Zelal, 2020). For a successful dairy production process, knowledge of different levels of microorganism in milk is essential to determine the quality of milk. District, type of breed, climatic conditions and lactation periods are known as seasonal changes that affect milk formation (Islam et al., 2013). Advanced methods should be used for the analysis, monitoring, production and processing of milk. Fresh milk considered as a complete diet because it contains essential nutrients such as fat, protein, lactose, vitamins and minerals in balanced ratio compared to other foods (Shojaei and Yadollahi, 2008). Milk fat is different from other animal fats in that contains many more types of fatty acids. Fat helps in the proper metabolism of sugars and acts as a carrier of the fat-soluble vitamins (E, D, A and K). Milk protein is essential for formation of new tissues, repair of broken-down tissue and overall development of the body

* *Corresponding author: E-mail*: shireen.izzadeen@su.edu.krd

system (Islam et al., 2008). Moreover, changes in milk fat and milk protein content are of interest to the farmer in connection with changes in feeding in relation to changes since the economic value of the milk depends on the fat and protein content (Nielsen et al., 2005). The ratio of protein and milk fat content in cow's milk, refer to cows with nutritional errors according to the chemical composition of milk, which can help detect some metabolic disorders in cows (Bunevski, et al., 2020). Chládek, et al. (2011), indicates that the milk recording sheet provides information not only on milk yield, but also on milk fat, milk protein and lactose content. The analysis of content of milk component provides a wide variety of important data that aid in rapid adjustment of nutrition or in a herd breeding programs. Sheep milk is characterized by lower cholesterol content, more beneficial composition of fatty acids and better hygiene (lower somatic cell content) compared to buffalo or cow's milk. (Molik et al. 2008 and Olechnowicz et al. 2010). Iraqi sheep including Awassi, are mainly raised for the purpose of producing meat, milk and wool, and represent 50-60% of the Iraqi sheep which spread in the northern and middle areas of Iraq and considered one of the most important agriculture animals that are able to eat pastures and field residues and provide man with milk and meat (Al-Maiyah and Kadhim 2016 and Al-Sabea et al., 2020). Friesian cows are considered one of the most important purebred breeds of milk that entered Iraq due to its high production of milk and the length of its production season and the pace of adaptation to new environmental conditions and the possibility of mating with local livestock and improve (Salim and Salman 2020). The aim of this study is to evaluate the daily morning and evening milk, as well as to know the physical and chemical quality of raw milk in some dairy animals in Erbil City.

## MATERIALS AND METHODS

This experiment was conducted at Kosar Dairy Farm, during the period from July to August, 2020. A total 132 raw milk samples from Awassi ewes and Holstein-Friesian cows were included in this study. Then, morning and evening daily milk samples were analyzed during the experiment. Milk samples were collected from animals that gave birth to a female compared to a male who was born. Morning and evening milk production was recorded to determine the total milk yield in a day. To stop the growth activity of acid-producing organisms, raw milk samples (25 ml in total) were collected and stored in an ice box and transported to the laboratory for analysis. Physio-chemical properties (Fat %, Protein%, Lactose %, Solid Not Fat (SNF) % and Freezing point) were determined by Lactostar "FUNKE GERBER" Labortechnik (12/05) machine (Germany) at the Food Technology Laboratory of Agriculture Engineering Sciences. In addition, the farm used mineral and salt blocks as dietary supplements. Organoleptic tests were carried out by a panel of expert judges to evaluate the flavor of collected raw milk samples, and the milk pH samples were measured by portable pH meter. Statistical data were analyzed using CRD (Completely Randomized Design) by the SAS institute program (SAS, 2005). Duncan's multiple range tests were used to compare differences among the treatments.

## RESULTS AND DISCUSSION

### Physical characteristics

The results of the physical characteristics of milk samples obtained from an ewes and cows are presented in the (Table 1.) Insignificant differences between the physical properties of milk samples (pH, specific gravity and freezing point °c), also insignificant differences in milk flavor between morning and evening period of ewe. However, the same table shows that the morning milk collected from cows had a significant score ($p \leq 0.05$) better flavor (10.0) compared to evening milk (9.0). Anantakrishnan, et al. (1993) suggested that if the pH value of milk was (6.5 -6.7), then the milk samples may be given free from bacterial contamination or mastitis. This results are quite similar to Bari's (2001) study, which showed that the flavor of milk collected from dairy farms is normal (pleasant and aromatic), and may be due to the fact that the farmers take hygienic measures during milking and not to let a dairy animal eat some flavored feed prior to or while milking his animals.

**Table (1) Effect of morning and evening raw milk samples of Awassi and Holstein-Friesian on some physical characteristics**

| Traits | Awassi Milk | | Holstein-Friesian Milk | |
|---|---|---|---|---|
| | Morning | Evening | Morning | Evening |
| pH | 6.67±0.315 [a] | 6.65±0.342 [a] | 6.35±0.331 [a] | 6.35±0.325 [a] |
| Flavor (1-10) | 9.0±0.730 [a] | 9.0±0.804 [a] | 10.0±0.572 [a] | 9.0±0.603 [b] |
| Specific gravity | 1.035±0.033 [a] | 1.032±0.029 [a] | 1.027±0.029 [a] | 1.029±0.030 [a] |
| Freezing point °c | -0.568±0.045 [a] | -0.538±0.051 [a] | -0.474±0.050 [a] | -0.468±0.058 [a] |

[a,b] Mean values within a row having different superscripts differ significantly at (p≤0.05). the superscripts with similar letter indicate non-significant.

In the (Figure 1.) indicates insignificant difference among morning and evening total raw milk samples for some physical properties (pH, Flavor, Specific gravity and Freezing point °c) between the both ewe and cows. This finding is consistent with the work of Islam et al. (2013) who found that the results regarding organoleptic parameters of milk samples taken from the three markets were insignificant differences among the organoleptic parameters such as color, flavor, taste and texture of milk samples.

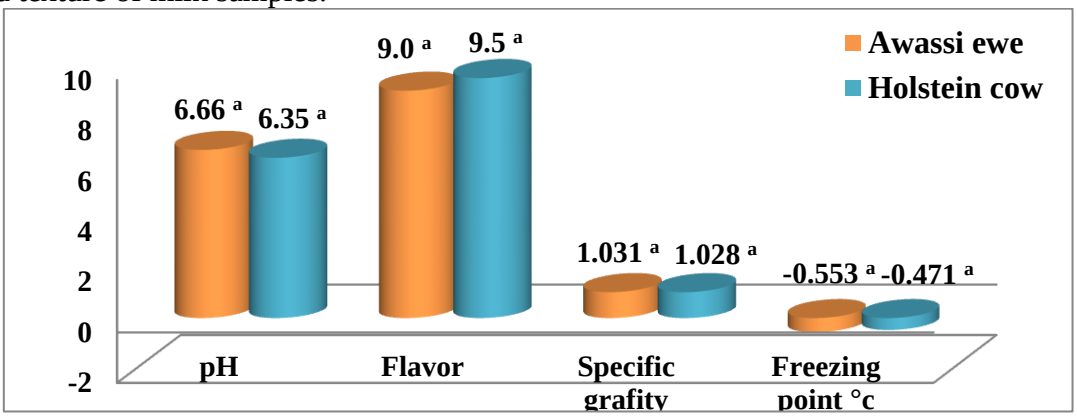


Figure (1) Comparison between total raw milk samples of morning and evening period in ewes and cows of some physical characteristics. The superscripts with similar letter indicate non-significant (p>0.05).

Table 2. showed that the average value of cow's milk yield was significant (p≤0.05) in the morning (9.610 L) compared to the evening period (3.025 L), while there was insignificant difference between morning and evening of ewe's milk. The same table shows the percentage of fat in ewe milk: the percentage of protein was significantly lower (p≤0.05) in the morning compared with the evening instead of cows, the morning milk was higher in fat (%) and fat: the percentage of protein compared to the evening, otherwise; Sheep's milk showed a significant increase (P≤0.05) in the ratios of morning milk protein, lactose and SNF compared to evening milk, while the differences were insignificant between the rates of morning and evening milk protein, lactose and SNF. Bille et al. (2009) who reported that milk yield was higher in morning milk instead of evening milk per cow (18 kg to 8 kg) respectively and this can be attributed to a longer resting period at night or between milking often at this stage, rather than the movement of pasture-seeking cow's energy is conserved for milk synthesis. Milk excretion Milk excretion, which contributed to the dilution of the fat content, was generally higher during morning milking due to the longer interval (Chladek et al., 2011). Ozcan et al. (2015) found that protein and fat values were higher on summer morning. The protein content can be also influenced by the breed, lactation period, season and the feeding status, while the fat content reflects supplementary feeding and effects of sub-clinical mastitis, breed, age and lactation period. Richardt (2004) measured the F/P ratio as an important pointer of animal health. The mean fat / protein ratio was differed significantly (p<0.05) between morning and evening cow milk and the highest F/P ratio was found in morning milk (1.252±0.195). Čejna and Chládek (2005) dictated that the proper F/P ratio for Holstein cows is (1.05 -1.18). High values in the first stage indicated a great energy deficiency. Haas and Hoffrek (2004) included that

the optimum F/P ratio is (1.2–1.4). Low values are prone to subclinical rumen acidosis which can compromise the reproductive performance of cows and increase a possible expansion of mineral metabolism disorders. The F/P ratio higher than (1.4) indicated the sign of energy deficit and if ketone bodies are present, lead to subclinical ketosis. The current study agrees with this range. This result is also quite similar with Bondan et al. (2019) who found lactose content in milk was not influenced by Holstein's milking time with thrice or twice daily milking sessions. Since most of the blood sugar is used by the breast for lactose synthesis in lactating animals, this can be speculated, according to Hamzaoui et al. (2013), that reducing lactose secretion is a strategy to maintain stable glycaemia. Sheep milk contains higher levels of total solids, SNF and major nutrients than goat's and cow's milk, the physico-chemical characteristics of sheep milk have unique properties as compared to goat's and cow's milk (El-Shazly et al., 2012).

**Table (2) Effect of morning and evening raw milk samples of ewes and cows on milk yield and some chemical characteristics**

| Traits | Awassi Milk | | Holstein-Friesian Milk | |
|---|---|---|---|---|
| | Morning | Evening | Morning | Evening |
| Milk Yield (L) | 0.503±0.073 $^{a}$ | 0.201±0.049 $^{a}$ | 9.610±0.720 $^{a}$ | 3.025±0.250 $^{b}$ |
| Fat (%) | 5.569±0.450 $^{b}$ | 6.554±0.429 $^{a}$ | 3.991±0.283 $^{a}$ | 3.456±0.235 $^{b}$ |
| Protein (%) | 4.150±0.393 $^{a}$ | 3.820±0.335 $^{b}$ | 3.188±0.250 $^{a}$ | 3.157±0.198 $^{a}$ |
| Fat : protein ratio | 1.342±0.105 $^{b}$ | 1.716±0.210 $^{a}$ | 1.252±0.195 $^{a}$ | 1.095±0.143 $^{b}$ |
| Lactose (%) | 5.376±0.218 $^{a}$ | 4.925±0.275 $^{b}$ | 4.374±0.218 $^{a}$ | 4.343±0.226 $^{a}$ |
| SNF (%) | 9.868±0.622 $^{a}$ | 9.101±0.550 $^{b}$ | 8.200±0.577 $^{a}$ | 8.125±0.498 $^{a}$ |

a,b Mean values within a row having different superscripts differ significantly at ($p \leq 0.05$). the superscripts with similar letter indicate non-significant. SNF: solid not- fat.

Figure 2. refers to the comparison of some chemical characteristics of milk between ewes and cows. The results of (fat, protein, lactose, SNF) percentages and fat: protein ratio were significantly ($p<0.05$) higher in Awassi ewes compared with the Holstein cows.

Figure 3. showed the comparison of some chemical characteristics of total morning and evening milk samples at ewe and cow level. The results showed a significant ($p<0.05$) increases the percentage of SNF (9.485) compared with the other chemical component: fat (6.062), lactose (5.151), protein (3.780) and fat/ protein ratio (1.564) respectively of Awassi ewes milk. Also, there were a significant ($p<0.05$) increases in the percentage of SNF (8.163), lactose (4.359), protein (3.724) and fat/ protein ratio (1.173) respectively of cow milk.

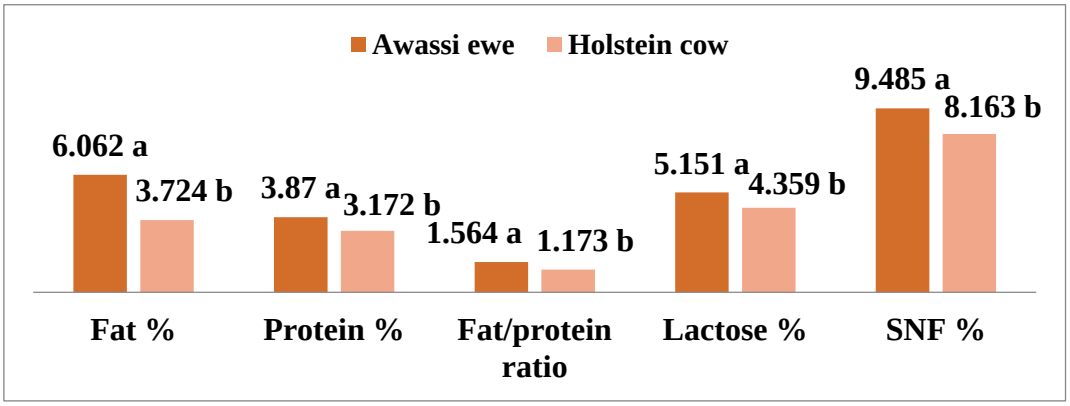


Figure (2) Comparison of some chemical characteristics of total raw milk between ewes and cows. a,b Mean values within a row having different superscripts differ significantly at ($p<0.05$). SNF: solid not- fat.

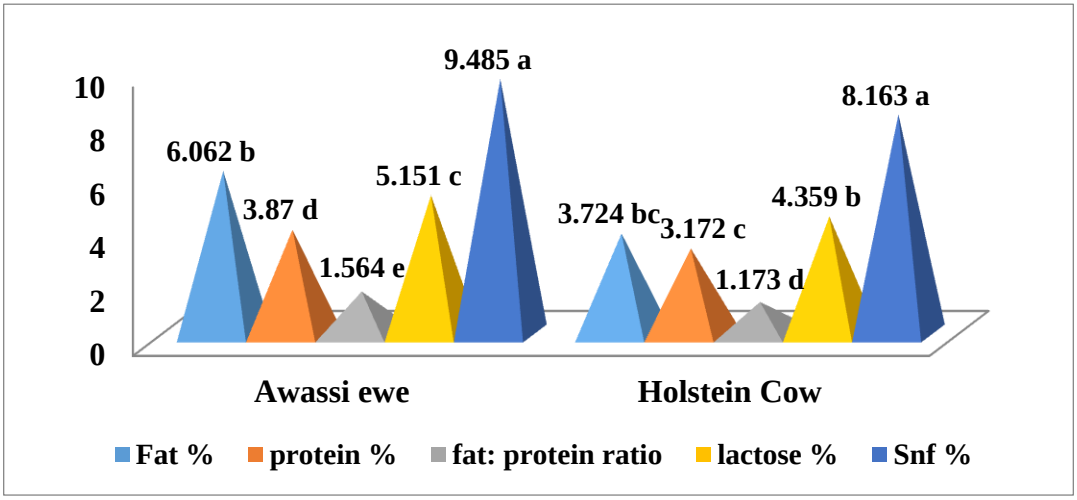


Figure (3) Comparison between total raw milk samples some chemical characteristics in ewes and cows. a,b,c,d,e Mean values within a row having different superscripts differ significantly at ($p<0.05$). SNF: solid not- fat.

## CONCLUSION

This study reveals that the raw milk samples collected from Awassi ewes and Holstein cows in morning and evening, there were statistically significant differences ($p<0.05$) in milk yield, fat, protein, fat/protein ratio, lactose, and SNF collected samples. However, the flavor score in morning cow's milk is higher than that in evening milk, indicating a slightly aromatic difference between the two milking. Although, there were non-significant differences ($p>0.05$) among the physical characteristics like pH, Specific gravity and Freezing point °c of milk samples in two species of animal. However, the effects of different daily milking frequency must be studied separately in each animal breed in more detail to make the right decisions in practical management of dairy products. The advantages and disadvantages of individual repeat milking treatments must also be evaluated from an economic point of view which takes into account milking time, labour costs, feed costs, sanitizing the milking system, milk yield of ewes, milk cost and its composition.

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**تقييم حليب الصباح والمساء في بعض حيوانات الحليب في مدينة أربيل**

**شيرين احسان عزالدين  نضال عبدالغني مصطفى  محبوبة عبدالغني مصطفى**

قسم الثروة الحيوانية، كلية علوم الهندسة الزراعية، جامعة صلاح الدين، العراق

**الكلمات المفتاحية:**
نعجة، بقرة، إنتاج الحليب، الصفات الفيزيائية وكيميائية للحليب.

**الخلاصة**

أجريت الدراسة الحالية لمقارنة صفات حليب النعاج العواسية وابقار الفريزيان في فترة الصباح والمساء ، والتي تم عرضها في مشروع حيواني خاص في أربيل / العراق. سجلت الخصائص الفيزيائية (الرقم الهيدروجيني ، الثقل النوعي ، درجة التجمد( لعينات الحليب اختلافات طفيفة بين فترة الصباح والمساء لنعاج وابقار ، وكذلك نكهة الحليب في النعاج ، بينما ارتفعت في حليب البقر. ارتفاع متوسط إنتاج حليب الأبقار معنويا في الفترة الصباحية مقارنة مع المساء ، بينما سجل إنتاج الحليب فرقاً طفيفاً بين فترة الصباح والمساء في النعاج. وانخفضت النسبة المئوية للدهن ونسبة الدهن: البروتين في حليب الصباح مقارنة مع المساء، على عكس احتواء حليب الصباح على نسبة عالية من الدهن ونسة الدهن: البروتين مقارنة مع المساء، كما ارتفع معنويا نسب بروتين الحليب الصباحي واللاكتوز و SNF مقارنة بحليب المسائي في النعاج، بينما كانت الفروق طفيفة بين نسب بروتين الحليب الصباحي والمسائي واللاكتوز و SNF على مستوى الحيوان أو نوع الحيوان في النعاج، حقق حليب النعاج تفوقاً في المكونات الكيميائية مقارنة بحليب ابقار.