



Effect of some physiological and environmental factors in milk quality of Awassi ewes

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Abstract

The present study was carried out at the experimental animal farm , college of Agriculture , Kufa University by using data collected for 80 Awassi ewes in different age and lactation stage in the period of 2009 to 2013 to determine the effect of dam age and parity, lactation stage , type and sex of birth and year of birth in milk protein , fat , lactose ash and PH. Results was showed a significant effect($p \leq 0.05$) of lactation stage in protein fat and ash , the highest values were in late period of lactation (6.92,6.27and1.51)% respectively. The highest value of lactose was in early lactation (4.38)% .The highest values were found in 4th parity (6.99 , 6.31 and 1.48)% respectively. Dam age effect significantly ($p \leq 0.05$) in milk fat , the highest value was in older dams compared with younger dams (6.37 and 5.14) % respectively. Single birth gave a significant increase ($p \leq 0.05$) in milk protein and fat (6.94 and 6.09)% respectively. Females birth gave a significant increase in milk protein , fat and ash (6.77, 5.92 and 1.17) respectively. Significant effect ($p \leq 0.05$) of year of birth in milk protein ,fat and ash, the highest values were found in 2010 (6.75, 6.20 and1.11)% respectively. Milk PH was not affected significantly by all factors.

Key words: Awassi ewes Milk components

**تأثير بعض العوامل الفسلجية والبيئية في نوعية الحليب لدى الأغنام العواسية
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المستخلص:

أجريت الدراسة في حقل التجارب الحيوانية التابع لكلية الزراعة جامعة الكوفة وذلك من خلال جمع وتحليل البيانات العائدة لـ 80 نعجة عواسية بأعمار ومراحل حلب مختلفة وللفترة مابين 2009 – 2013 وذلك لتحديد تأثير عمر الأم وتسلسل الولادة ومرحلة الحلب وجنس المولود في مكونات الحليب الرئيسية كالبروتين واللاكتوز والدهن والرماد والأس الهيدروجيني. أظهرت النتائج وجود تأثير معنوي ($P < 0.05$) لمرحلة الحلب في كل من نسبة البروتين والدهن والرماد وكانت أعلى القيم في مرحلة الحلب المتأخرة وبلغت 6.92 و 6.27 و 1.51% على التوالي. كما تأثرت القيم أعلاه بتسلسل الولادة وكانت أقصاها في تسلسل الولادة الرابع وبلغت 6.99 و 6.31 و 1.48% على التوالي بينما كانت أعلى نسبة لللاكتوز في بداية الحلب

وبلغت 4.38%. كان هنالك تأثير معنوي ($P < 0.05$) لعمر الأم في نسبة الدهن وقد أعطت النعاج الأكبر عمرا أعلى نسبة دهن وكانت بحدود 6.37% مقارنة بالنعاج الأقل عمرا والتي أعطت نسبة دهن للحليب بحدود 5.14%. تفوقت النعاج ذات الولادات المفردة معنويا ($P < 0.05$) في نسبتي البروتين والدهن مقارنة بالنعاج ذات الولادات التوأمية وقد أعطت بحدود 6.94 و 6.09% على التوالي كما تفوقت النعاج ذات الولادات الأنثوية معنويا ($P < 0.05$) على النعاج ذات الولادات الذكرية في نسبتي البروتين والدهن كما كان هنالك تأثيرا معنويا ($P < 0.05$) لسنة الولادة في نسب البروتين والدهن والرماد كانت أقصاها لدى النعاج الوالدة سنة 2010 وبلغت 6.75 و 6.20 و 1.11% على التوالي. كلمات مفتاحية: الأغنام العواسية, مكونات الحليب.

Introduction

Awassi is one of the dual-purpose, fat-tailed sheep breeds which can be accepted as a sheep-milk resource in south-west Asia (Iraq, Jordan, Palestine, Lebanon and Turkey). It also exists in Europe, Australia, New Zealand, and China. The breed is well adapted to harsh conditions and capable of producing and reproducing under these circumstances (FAO. 2007).

Sheep milk is characterized by lower cholesterol content, more beneficial composition of fatty acids and better hygiene (lower somatic cell content) compared with cow of buffalo or cow milk. (Pakulski et. al. 2006, Molik . et.al.2008 , Olechnowicz et . al. 2010).

Despite the low production of milk and the short lactation period, ewe milk is a major importance in countries where climatic conditions and tradition are not conducive to raising dairy cattle.

Many studies refers that the sheep milk quality and components are influenced by breed or genotype. Milk composition varies considerably among breeds of sheep(Belo et . al 2009). Management factors are also effect in milk quality such as nutrition (Gilbert 1992) , using of hormones (Stelwagen et . al 1993), Calving season (Boquier et. al 1990) ,shearing (Knight et. al 1993) and milking techniques (Anifantakis 1990). In addition ,many studies refers that the milk sheep composition is affected by many physiological factors such as dam

weight and age, lactation stage and birth type (Bencini and Johanston .1997)

The major aim of this study is to provide valuable information on quality of Awassi ewes milk and determine the environmental and physiological factors such as year of birth , dam age , parity, lactation stage, sex of birth and type of birth in milk composition such as total protein, fat content, lactose, ash and PH and use this information as guidelines or indicators for the management strategies for ewes under the farming conditions for selecting and improving the performance of domestic animals depending on this indicators .

Materials and methods

Experimental Animals and management:

Data were made available by the department of animal resources ,college of agriculture , university of Kufa for the period 2009 to 2013 on 80 Awassi breed ewes selected from the experimental flock reared under extensive conditions.

Flock is housed under semi-open sheds and can be fed on the concentrated ration consuming about (500 – 600) gm / head / day, for the period from mating season to the last six weeks of pregnancy . Ration is normally containing 37% yellow corn , 40% wheat bran ,10% hulled barley , 5 – 10% soy bean meal ,1% NaCl and 1% CaCO₃ .and green roughages such as Alfalfa and clover can be added throughout the season. Annual routinely operations on sheep are dipping and washing with chemicals in order to kill extra parasites so sheep will be ready to

mating after hand wool shaving. Sires and dams will be recorded in breed records .Lambs are weighed directly after parturition and tagged with plastic tags . Lambs stays with their dams up to 90 days (weaning age) .The health status of the flock must be under regular observations.

Physiological analysis:

Milk samples were collected and analyzed routinely in the same day of lactation . Protein , fat , lactose and ash were measured using lacto flash and PH was measured using PH-meter.

Statistical analysis :

Data were analyzed using SAS .2000 computer program by C.R.D design according to the following model :

$$Y_{ijklmn} = \mu + A_i + B_j + C_k + DL + F_m + G_n + e_{ijklmn}$$

Where:

μ : is an overall means .

A_i : Effect of parity ($1^{st} - 4^{th}$).

B_j : Effect of dam age (> 3 years and < 3 years).

C_k : Effect of sex birth (male and female).

DL : Effect of birth type (single and twin).

F_m :Effect of lactation stage (early, from parturition to 3^{rd} month – late, from 3^{rd} month till dry period).

G_n : Effect of year birth (2009 – 2013).

E_{ijkl} : is a random error.

Results and Discussion

Lactation stage: Results presented in (table -1) showed that a significant effect ($p \leq 0.05$) of lactation stage in milk contents . Total protein , fat and ash were significantly lower in the beginning of lactation stage it's about (5.61, 4.83 and 0.94) % respectively compared with the end of lactation stage it's about (6.92 , 6.27 and 1.51) % respectively

Lactose was significantly higher in the beginning of lactation stage (4.38%) and decreased gradually to 3.12 % in the end of lactation stage .This results are partially similar to those establish by (Pulina et . al

1992) who refer to the negative correlation among milk components such as protein , fat and ash and milk yield and positive correlation between milk yield and lactose ratio. Lactation stage was not effect significantly in the PH content in Awassi ewes milk and this results is not agreement with Bhosale et. al (2009) .

Parity and Dam age: Results showed that a significant effect ($p \leq 0.05$) of parity and dam age in milk composition. Total protein and ash were significantly lower in the first parity its about (5.11 , and 0.61)% respectively compared with the fourth parity it's about (6.99 and 1.48)% respectively. This was accordance with (Orhan et.al. 2011) working in Red Karaman sheep. Lactose and PH were not affected significantly by parity and this result came a similar with the (Kralickova et . al. 2012) research.

Components of milk were not significantly affected by ewe's age , except fat%. Fat percentage was lower in older ewes compared with that of younger ewes it was (5.14 and 6.37) % respectively . These results may be attributed to negative association between milk production and fat percentage, where ewes at this age produced higher milk than other groups.

Many possible causes could be suggested to explain the increase in milk compositions as the number of lactations progressed. Firstly, the increased body weight of the ewes with a greater number of lactations which leads to a greater availability of body reserves for the synthesis of milk components. This hypothesis may be supported by the fact that the differences between the groups which diminished in late lactation when the contribution of body reserve to milk component synthesis was reduced . Secondly, the greater development of the udder glandular tissue as the number of lactations rises could also result in an

increased synthesis of milk constituents. (Grummer 1991).

Birth type: Birth type was effect significantly ($p \leq 0.05$) in milk protein and fat content. Ewes that gave twin birth gave lower milk protein and fat it was about (5.11 and 4.22) % respectively compared with ewes that gave single birth which gave (6.94 and 6.09) % respectively.

These results are in agreement with the results of earlier study, (Gardner and Hogue. 1982) reported that Hampshire and Corriedale ewes that gave birth to single lambs produced milk with a higher concentration of fat and protein. The negative relationship between yield and quality of milk may explain why twin-bearing ewes who produce more milk have lower concentrations of fat and protein in the milk. (Bencini and Pulina .1997) .Lactose ,ash and PH were not affected significantly by birth type .

Year of birth: was effect significantly($p \leq 0.05$) in milk protein , fat and ash parameter. Ewes that birth in 2010 gave the highest values it's about (6.75 ,6.20 and 1.11)% respectively , while ewes that birth in 2009 gave the lower values in milk protein and ash it's about (5.03 and 0.64)% . lowest milk fat was in ewes that birth in the year 2011 it was 4.85%.Lactose and PH were not affected significantly by year of birth. These results are in good agreement with those

reported by (Hllgrimsson and Olafsson. 1997) who found that the milk yield and composition were affected by the year of birth .

Sex of birth: In the present study, sex of birth was effect significantly ($p \leq 0.05$) in milk components. Milk protein ,fat and ash were lower in milk of ewes that gave males birth it's about (5.27 , 4.80 and 0.82)% respectively compared with ewes that gave females birth it's about (6.77 ,5.92 and 1.17) % respectively while no significant effect of sex of birth in both milk lactose and milk PH. However, the difference resulted from the increase of milk yield in ewes that gave males and the negative correlation between milk yield and its components. This results are not similar to those establish by Godfrey et al(1997) and Macciotta et al.(1999) who noticed no significant effect of sex of lamb on milk yield or its components. .

Conclusion

The current study showed that the milk yield is correlated either positively with protein , fat and ash or negatively with lactose content. As milk yield changes according to environmental factors such as year of birth and physiological factors such as lactation stage , sex and type of birth and dam age ,therefore the wide variation in milk components can be useful in the improving of the awassi ewes performance.

Table – Effect of physiological and environmental factors in milk components.

	Prot%	Fat%	Lactose%	Ash%
PH				
Lactation stage				
Early	5.61 ± 1.02 a	4.83 ± 0.81 a	4.38 ± 0.33 a	0.94 ± 0.09 a
6.70 ± 1.21 a				
Late	6.92 ± 1.00 b	6.27 ± 0.46 b	3.12 ± 0.20 b	1.51 ± 0.34 b
6.81± 0.91 a				

Parity

1st	5.11± 0.51 a	5.25 ± 0.25 a	4.06 ± 0.22 a	0.61± 0.06
a	6.30 ± 1.10 a			
2nd	5.40 ± 0.64 a	5.09 ± 0.32 a	4.31 ± 0.84 a	0.91 ± 0.02
a	6.41± 0.91 a			
3rd	6.18 ± 0.88 ab	5.22 ± 0.61 a	4.66 ± 0.55 a	1.41 ±
0.11 b	6.32 ± 1.30 a			
4th	6.99 ± 0.81 b	6.31 ± 74 a	4.77 ± 0.71 a	1.48 ±
0.09 b	6.17 ± 1.15 a			

Dam age				
> 4 years	5.90 ± 0.88 a	5.14 ± 0.85 a	4.41± 0.33 a	1.38 ±
0.99 a	6.36 ± 1.06 a			
4years	6.22 ± 0.97 a	6.37 ± 0.78 b	4.19 ± 0.61 a	1.29 ±
0.90 a	6.81 ± 1.55 a<			

Birth type				
Single	6.94± 1.44 a	6.09 ± 1.16 a	4.80 ± 0.65 a	1.15 ± 0.89
a	6.67 ± 1.13 a			
Twin	5.11 ± 1.10 b	4.22 ± 0.83 b	4.15 ± 0.39 a	0.93 ± 0.12
a	6.60 ± 1.21 a			

Year of birth					
2009	5.03 ± 1.14 a	5.00 ± 0.90 a	4.17 ± 0.40 a	0.64 ± 0.04 a	
6.71 ± 1.32 a					
2010	6.75 ± 1.10 b	6.20 ± 1.20 b	4.69 ± 0.65 a	1.11 ± 0.09 b	6.22
± 1.08 a					
2011	6.00 ± 0.94 b	4.85 ± 0.36 a	4.38 ± 0.68 a	0.73 ± 0.06 a	6.69
± 1.33 a					
2012	5.88 ± 0.38 ab	5.02 ± 0.77 a	4.29 ± 0.16 a	0.77 ± 0.03 a	6.39
± 1.26 a					
2013	6.14 ± 0.75 ab	5.81 ± 0.54 ab	4.34 ± 0.53 a	1.09 ± 0.08 ab	6.55
± 0.84 a					

Sex of birth				
Male	5.27 ± 0.44 a	4.80 ± 0.26 a	4.20 ± 0.14 a	0.82 ± 0.06 a
6.31 ± 0.99 a				
Female	6.77 ± 0.61 b	5.92 ± 0.81 b	4.62 ± 0.37 a	1.17 ± 0.07 b
6.29 ± 0.89 a				

Values within each subclass with different superscripts differ significantly ($p \leq 0.05$).

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