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The Effect of Non-Genetic Traits on Physical and Chemical Milk Characteristics of Awassi Ewes

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Annotation: An experiment was conducted in the Animal Production Department, College of Agriculture/ Kirkuk University to find out the effect of some lactation traits on the physical and chemical properties of milk from Awassi ewes. Experimental Group In all experimental groups, 15 healthy lactating ewes (2–3 yr) were selected based on maternal ewe age, offspring sex and type of partum. The animals were all housed under standard conditions (identical diet, as well as environmental and husbandry practice). Monthly hydraulic milk samples were obtained in from the both state and tested for the action of milk fat, protein, lactose, SNF (solids-not-fat), and freezing level of milk as properly as different of the physic properties of milk had been markedly determined as per the well-known methods. Data were statistically analysed in SPSS, with a level of significance of $p \leq 0.05$. Abstract Ewe age had a significant effect on the various properties of milk. The proportion of fat in milk was greater in the second (298 g of fat/kg of milk) and lesser in the third (176 g of fat/kg of milk) lactation (2.96% versus 1.76% respectively). Indeed, the ages significantly affected SNF, protein, and density of milk. Such changes are thought to result from functional and aging alterations in mammary gland physiology. There were significant (P < 0.05) differences between offspring sex for fat with milk from ewes lambing females containing significantly (2.76%) more fat than those from ewes lambing twin females (0.94%). Maternal sex-biased investment appears in the output. Apart from the parity, the birth type also had an effect on the percentage of fat in the milk: milks from nulliparous, single-born lamb ewes and multiparous, twin-born lamb ewes were richer in fat (2.59%) than milks from ewes with twins (1.46%), because twins diluted the fat with higher milking output in these ewes than of the single-born ones.

The parameters (Especially fat) in composition of milk from Awassi sheep are affected based on the age of Ewe, and the sex of Offspring and Lambing type. These findings draw attention to the importance of non-genetic dairy ewe management for milk quality and production output when subjected to varying environmental and physiological factors.

Keywords: Sheep, Awassi, Milk, Physical traits, Ewe age, Lambing type.

INTRODUCTION

Actually the Awassi is another Middle-Eastern "type" which occurs over much of the Middle East - even under poor conditions but still. In general, the breed has high milk production potential and also has fairly good quality meat [1,2]. Such cattle are called as camel-tension sheep The awassi breed tends to product high fat and protein milk, which may be utilized for cheese and/or yogurt if the milk is inoculated (with a culture) [3].

Yet, non-genetic environmental factors are still influencing the yield and quality of milk that can be harvested from Awassi ewes. These factors are more pronounced on the quality and overall performance of a dairy product [4]. All the non-genetic factors affecting milk composition includes environmental factors: ambient temperature, humidity and season. These cloches are integrated in their breeding season protection (provided it cools down outdoors) and animals will be so much more tolerant to rainout throughout the year than raised in arid to semi-arid climates they use cloches. However, HL reduces the milk amount partially by reducing fat and protein [5, 6].

Feeding and metabolic behavioral changes due to heat stress impair the synthesis of milk components, primarily fat [7]. The second reason is seasonality, where the researchers found significant month to month variation of milk yield and composition [8].

Nutritional metrics also offer a high return for milk quality. Milk components biosynthesis might be affected by protein/energy balance and forage quality, and contents of concentrates in the diet

[9]. Evidence for this can be found in the link between milk biochemical composition with its fat and protein contents which tend to be elevated in response to energy and protein rich diets [10]. Furthermore, modified systems of feeding that targets lactation may help in improving the production of milk without exceeding the limits of health status of ewes.

It also calls for certain management practices (housing, milking frequency, health interventions) associated with lower milk yield. Milk quality is adversely affected by stress resulting from overcrowding or lack of ventilation in housing and disease [11]. Although important, the milking interval also has an effect, with high milking frequency resulting in more milk being machines but also lower fat and protein percentages in the early lactation [12]. Also udder health is crucial as mastitis and other infections can greatly decrease the milk production potential (hygiene, vaccination, veterinary follow-up) (13).

This study was conducted to examine the influence of two non-genetic factors (age of the ewe and its interaction with the effects of type of birth and sex of the offspring) on certain physical and chemical traits of milk in Awassi ewes. In Middle Eastern countries, where dairy systems (both traditional & modern) are under stressful environmental conditions, therefore, awareness of these effects is highly critical for the production of a better quality of milk.

MATERIALS AND METHODS

Abstract This experiment was conducted over the period from [17/11/2024 to 6/2/2025] located at the Animal Production department, College of Agriculture, Kirkuk university which is aimed to study the effect of some Factors on their milk production traits of lactating Awassi ewes.

About 15 ewes 2-3. The animals were subjected to one diet, which was modified for both groups. Individual Feed Intakes The feed intake from each individual animal was measured and corrected as necessary, with ad libitum access to clean water. Moreover, methods applied to exclude environmental interferences, utilizing automated control systems in which the environmental status (i.e. temperature, humidity, and illumination) were optimized and regulated during the experimental period.

All ewes were milked at 8:00 h using a hand milking machine and after the adequate cleaning procedures of teats, to reduce the variability of samples. The obtained milk was stored in sterile containers and processed the same day. To allow for normalization, comparisons made in relation to udder quarter used milk within-quarter. Fat, protein, lactose and total solids were determined in milk; pH was measured with a pH meter (H195128, Hanna instruments, USA) and titratable acidity (TA) was determined using the standard titration method. Each analysis yields three replicates, so data are shown as means ± standard error of means.

Methods: The data were statistically evaluated with SPSS, and the non-genetic effects were tested by one-way ANOVA. Statistical and estimation of descriptive statistical of average value ± standard error for all the above mentioned characters with 5% significance ($p \leq 0.05$).

RESULTS AND DISCUSSION

The continouse values reflect the significant effects of ewe age on the physico-chemical characteristics of milk (Table 1) among the three lactation stages (early lactation, mid-lactation and late lactation). In the second period, value of 2,96% was highest, and value of 1,76% the lowest, with a significant difference ($p \leq 0,05$) of milk fat content. These lower fat contents during late lactation are consistent with [14] where it was found that fat yield typically decreases with parity and with stage of lactation as animals become further into lactation, possibly due to changed hormonal and metabolic requirements for mammary secretion.

Grazing duration had a significant impact ($p \leq 0.001$) on the contents of solid nonfat (SNF) and protein, respectively, with their peak values on the third period (11.29 for SNF). This trend might be due to the slightly lower proportion of protein fractions in aged ewes, perhaps due to a higher mineralization due to [15, 16], in later years increased percentage of SNF in aged dairy small ruminants has been correlated with better partitioning of nutrients and also decreased water content of milk.

The density of the milk (36.59 to 39.27) for the 3rd period was significantly greater ($p \leq 0.001$) than that of the 1st period. This is explained by SNF and protein content increasing together with the density of the milk [17]. It is possible too, that high cell density in both groups of ewes aged 8–10 or >10 years, reflects dilution effects acting upon SCC, as fat and protein proceeds to reduce with age, whilst the concentration of milk components rises (Khan et al. Fourcho and Auckbur (reproduced2010)).

Likewise, protein content was greater ($p \leq 0.01$) (5.42%) in stage I, with a sequential increase at stage III (5.78%). By contrast, differential proteins that are greater in older ewes might correspond to a higher turnover of secretory tissues, a higher level of cell maturity and/or a higher supply of amino acids, with the authors of [18] indicating that milk protein synthesis should be regulated by age and stage of lactation.

Between both periods, the milk freezing point depression values shows high significative difference ($p \leq 0.01$). The extraction was high at the end of one month, which indicate solutes of sugars and salts (62.51). This parameter may serve as an index for the detection of adulteration of milk or osmolality variation of milk owing to the age-dependent physiological variation.

The only other high values were for lactose ($p \leq 0.01$), which was higher (4.60) in the third than in the first two periods. While previous reports have suggested an age invariant or a decreasing number with age (which is believed to be due to immune selection), this difference is not seen. This was balanced with the declining contribution from mature ewes due to the declining lactation phase, reducing its effect on osmotic adjustment in the mammary gland and thereby maintaining yield.

Table 2 Influence of Offspring Sex on Physical and Chemical Properties of Ewe Milk

Differences among these and upper hierarchical level traits analysed for effects of sex or offspring group were only significant ($p \leq 0.05$) for milk fat content. None of the other traits tested under the same conditions showed this contrast.

At per twinning of two female (0.94%) and of case with only male (2.32%) or male and female (1.98%) at birth weight, the ewe's lambing female had higher (>2.76%) than mean milk fat content. This finding is also consistent with previous observation that cows likely produce greater milk fat when they give birth to female calves.

Milk composition has been associated with similar broiler–sibling relationship in bovines, whereby mothers bearing daughters had higher fat an energy-concentration milk [19]. For example, the effect of suckling to stimulate milk production and mammary function supporting the neonate, will be greater because of the fetal hormonal influence, and female-offspring traits may be favored over male offspring traits (20).

The SNF values were not statistically different and ranged from 10.93 to 11.33%. The paired stability of these fractions as a function of offspring sex ratio suggests some stability of the mineral and protein fractions of milk over time. Similarly, in the work of the authors [18], the percentage of SNF variance due to non-genetic sources was very low and the majority of the variance through stage of lactation and feeding was explained compared to that of the offspring,

The density and protein values of milk (bold text) were nonsignificant between experiments (density range 36.87–39.13 kg/m^3 [$p = 0.86$] and protein range 5.50% to 5.82% [$p = 0.25$]). The relative higher protein of mixed-sex ewes (5.82±0.27) would indicate more energetic expense associated with suckling a larger or multiple lambs, but was also non-significant. These results confirm that reported by [21] which reported for litter size and composition, a lesser effect of litter size and composition on protein content of milk for ewes with good body conditions.

In all the groups, sex of birth did not affect the freezing point or lactose concentrations, hence no differences in osmolality (and thus carbohydrate content of milk). Values of freezing point (60.43 to 62.67) and lactose contents (4.55% to 4.59% respectively) were closest to one another. Lactose shows a relatively stringent regulation, driven not only by the fetus, but mainly mirroring mammary gland activity [15].

Table 3 shows the representations of types of birth (single and twin) and the effects of type of birth on physical and chemical characteristics of ewe milk.

Other parameters (SCF, SNF, density of milk, protein in milk, freezing point and lactose) did not significantly differ from the effect of type of birth, however, it was only milk fat percentage which remained significantly influenced ($p \leq 0.05$).

Similarly, mothers of single lambs produced milk with almost double (2.59%,n = 5) the amount of fat as mothers of twins (1.46%). If heavier suckling pressure leads to a higher milk yield, the dilution effects as result of increased total milk Fig. Since independence of milk fat and protein checking amongst single- and twin-bearing ewes; a ewes n, months; b d in months and week 2–9.1 (A); and B percentage values were weighted average ± (means) SEM of milk fat (and protein) percentages in single- and twin-bearing ewes (n wks) over the suckling period. 26. These observations also confirmed previous reports [14, 21] commented that although total fat percentage was generally low in lambing ewes with high milk yield, such low total fat percentage reflect the physiological limitation of total lipid synthesis ability under high lactation load.

The average SNF did not differ statistically ($p > 0.05$)(11.17 + 1.66% and 10.96 + 1.43% for twin-bearing and single-bearing ewes, respectively). Similarly, the effect of increased nutritional needs for improved separated solid-manure21/ and increased flow rate through the udder with demand from one or several sources52/ seems to lead to a relatively fixed level of non-fat solids (minerals, protein, and lactose) yield per unit of milk55/. Less number of studies suggest that effects for genetics and nutrition prevails over the effects for size of litter on SNF content [18].

Milk density similarly followed the pattern (twins 38.97 kg/m^3; singles 37.17 kg/m^3; P>0,05). Then, a greater density would indicate slightly more solids of the SNF factors or lower fats (fats are less dense than water). Milk density has also been found to negatively correlate with percentage of milk fat and positively with SNF, as documented in [15].

About 3.5 times more milk was analysed from twin births and milk protein content was marginally higher (5.68 per cent opposed to 5.53 per cent for single births). However, this parameter enhancer is not genetically important, possible compensatory effects of the mother due to the need to provide for more than one lamb and consistent with the results of [22], which showed increased lactation capacity when there is an increase in protein deposition.

There were no between group differences (n.s.) in freezing point and lactose values. Lactose, as the major osmotic regulator of milk volume, is relatively constant, except with mastitis or metabolic disorders [17]. Even though the freezing point would theoretically predict higher solute concentration and thus density in twin-bearing ewes, this slight increase remained within a physiological range.

Conclusion

In the end, ewe age has a major effect on nearly all milk quality variables. The importance of dairy animal age for use of fatty acid composition in dairy species of interest can be further evident from the diversity in individual fatty acids in milk from different classes of dairy cattle which can be utilized for processing specific fatty acid compositions. The composition of milk is generally not influenced by the sex of the offspring—however, the fat content of milk can be strongly influenced by the sex of the offspring. This supports our prediction that maternal investment may differ according to offspring sex, but should be confirmed under regulated nutritional and environmental circumstances.

Along the same line, birth type only has a significant effect on the fat content of the milk; that is, the milk was fatter from ewes lambing single than twin TEF, in this sense. Comments on other compositional qualities: The litter size microchanges only slightly enter into, strongly implying the selective lactational plasticity of pack dimension.

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Table 1: The effect of ewe age on the physical and chemical milk characteristics

Traits	First period		Second period		Third period		Sig.
	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	
Fat	2.59±0.34 ab	50.50	2.96±0.30 a	39.71	1.76±0.25 b	55.69	*
Sold non-fat	10.83±0.08 b	2.91	10.85±0.10 b	3.50	11.29±0.07 a	2.45	***
Milk density	36.59±0.56 b	5.94	36.37±0.60 b	6.35	39.27±0.26 a	2.60	***
Protein	5.42±0.06 b	4.63	5.46±0.08 b	5.63	5.78±0.07 a	4.51	**
Freezing value	59.67±0.49 b	3.17	59.96±0.60 b	3.85	62.51±0.49 a	3.02	**
Lactose	4.55±0.01 b	0.99	4.54±0.01 b	0.99	4.60±0.00 a	0.42	**

N.S.= non-significant, *= significant at (p≤0.05), Means not having a common letter within each column differ significantly.

Table 2: The effect of sex of births on the physical and chemical milk characteristics

Traits	Male		Female		Two Female		Male & Female		Sig.
	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	
Fat	2.32±0.26 ab	42.89	2.76±0.27 a	48.77	0.94±0.29 b	53.06	1.98±0.62 ab	53.83	*
Sold non-fat	11.02±0.10	3.55	10.93±0.07	3.34	11.00±0.21	3.28	11.33±0.32	4.86	N.S.
Milk density	37.65±0.49	5.03	36.87±0.50	6.68	38.80±1.11	4.97	39.13±1.50	6.64	N.S.
Protein	5.58±0.08	5.75	5.50±0.06	5.26	5.54±0.19	5.79	5.82±0.27	8.08	N.S.
Freezing value	60.85±0.64	4.09	60.43±0.44	3.54	60.43±1.58	4.53	62.67±2.14	5.90	N.S.
Lactose	4.57±0.01	0.76	4.55±0.01	1.08	4.59±0.02	0.70	4.59±0.03	1.10	N.S.

N.S.= non-significant, *= significant at (p≤0.05), Means not having a common letter within each column differ significantly.

Table 3: The effect of birth type on the physical and chemical milk characteristics

Traits	Single		Twin		Sig.
	Mean ± S.E.	C.V.	Mean ± S.E.	C.V.	
Fat	2.59±0.20	47.41	1.46±0.38	64.13	*
Sold non-fat	10.96±0.06	3.40	11.17±0.19	4.07	N.S.
Milk density	37.17±0.36	6.10	38.97±0.84	5.27	N.S.
Protein	5.53±0.05	5.43	5.68±0.16	6.89	N.S.
Freezing value	60.59±0.36	3.72	61.55±1.29	5.13	N.S.
Lactose	4.56±0.01	0.97	4.59±0.02	0.82	N.S.

N.S.= non-significant, *= significant at ($p \leq 0.05$), Means not having a common letter within each column differ significantly.