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# Study of Milk Yield and Some of Its Chemical Components and Its Relationship with Lambs Growth of Awassi Sheep

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**Abstract:** Data were analyzed from of two flocks of Awassi sheep. The first flock belongs to the College of Agriculture and Forestry, Mosul University, and the second flock belongs to Animal Breeding Station, Mosul (Al-Rashedia) which conducted on 799 and 802 records of ewes and born lambs were recorded during two seasons 2009-2010. The results revealed highly significant (P<0.01) effects for the flock, year, age of dam, and type of birth on daily milk yield (DMY). The year had a highly significant influence (P<0.01) on all milk traits except on fat percentage. The age of dam also had a significant effect (P<0.05) on Somatic Cell Count (SCC). The effects of the flock, age of dam, type of birth and sex of lamb were highly significant (P<0.01) on birth weight (BW), weaning weight (WW), and gain from birth to weaning (GBW). The year had a significant influence (P<0.01) on (WW) and (GBW). There were Positive and highly significant (P<0.01) correlation between milk components, between milk yield and (BW), (WW), and between (BW) and (WW). While it was negative between milk yield and its components.

**Keywords:** Awassi Sheep, Lamb Growth, Milk yield and components, SCC.

# دراسة إنتاج الحليب وبعض مكوناته الكيميائية وعلاقته بنمو حملان الأغنام العواسية

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**المستخلص:** تم تحليل البيانات المسجلة لقطيعين من الأغنام العواسية، الأول قطيع أغنام كلية الزراعة والغابات/جامعة الموصل والثاني قطيع أغنام محطة تربية الحيوان في الموصل (الرشيدية) والتي اشتملت على 799 سجل للنعاج و802 سجل لمواليدها خلال الموسمين 2009 و2010. أظهرت النتائج أن للقطيع والسنة وعمر الأم ونوع الولادة تأثير عالي المعنوية (P<0.01) في إنتاج الحليب اليومي للنعاج. كما أثرت السنة معنوياً (P<0.01) في جميع مكونات الحليب باستثناء نسبة الدهن، وأتضح أن لعمر الأم تأثيراً معنوياً (P<0.05) في أعداد الخلايا الجسمية في الحليب. تبين وجود تأثير عالي المعنوية (P<0.01) للقطيع وعمر الأم ونوع الولادة وجنس المولود في وزن الميلاد والفطام والزيادة الوزنية بين الميلاد والفطام. في حين كان للسنة تأثير عالي المعنوية (P<0.01) في وزن الفطام والزيادة الوزنية (ميلاد- فطام). لوحظ وجود ارتباط موجب ومعنوي (P<0.01) ما بين مكونات الحليب وكذلك بين إنتاج الحليب والوزن عند الميلاد الفطام، وكذلك بين الوزن عند الميلاد والوزن عند الفطام، بينما كان سالباً بين إنتاج ومكونات الحليب.

**الكلمات المفتاحية:** الأغنام العواسية، صفات النمو، إنتاج الحليب ومكوناته، الخلايا الجسمية.

## INTRODUCTION

Milk production is considered one of the important functional traits in sheep due to the high percentage of fat, protein, and total solids, which led to its importance in many industries such as cheese, yogurt, butter, cream, etc., as well as its use as fresh milk or in suckling of lambs (Al-Douri, 2001). The concentration of fat and protein and the somatic cells count in milk have a significant impact on the technical characteristics and coagulation traits of milk and thus affect its suitability for use in the manufacture of dairy products (Nudda et al., 2019). Which led to an increased interest in the safety of milk flocks and their devoid of infections, especially those related to mastitis, because of their importance in reducing the costs of raising animals and increasing production (Al-Dabbagh, 2009). There are a number of physiological and environmental factors that affect the production of milk and its components, such as the age of the dam at birth, the sex of the lamb, type of birth, year, season of birth and production stages. As well as other climatic influences (Haile et al., 2017, Al-Dabbagh, 2019 and Gonzalez-Ronquillo et al, 2021). The growth of lambs reflects their ability to produce meat and milk later, and that body weights at different stages of the animal's life, especially during the lactation stage, are strong indicators for growth and a reflection of dams' ability to mothering and an early evidence for the selection of newborns, especially weight at weaning (Kazzal, 1981 and Al-Samray, 2012). Also, knowing the relationship between milk production and its components and growth characteristics in lambs is very important to identify the pattern of the relationship between these traits. Therefore, the aim of this study was to investigate the effect of some factors affecting milk production and its components, somatic cells count in milk and some growth characteristics in lambs and the relationship among these traits in two flocks of Awassi sheep.

## MATERIAL AND METHODS

The study included 799 records of ewes and 802 records of their born lambs in 2 flocks of Awassi sheep, the first flock belongs to College of Agriculture and Forestry / University of Mosul and the second flock of sheep belonging to animal husbandry station in Mosul (Al-Rashidiya) of the General Authority for Agricultural Research. The ewes in both flocks were fed concentrated fodder at a rate of 500 gm/head/day in the morning and evening with 500 gm/head/day of hay, in addition to green fodder and weeds from natural pastures near the site of the college fields and the station. Mineral salt blocks and water were provided continuously during the study period. The ewes in both flocks were placed under a preventive program that included all vaccinations and immunizations against the spreading epidemic diseases. The measurement of milk yield was started by hand milking method after 30 days of birth. where the lambs are isolated from their dams in the evening and then the measurement is taken the next morning, 12 hours after the isolation, daily milk production was obtained by multiplying the amount of milk produced ×2, these measurements continued every 30 days until the ewes become dry (100 g/day) (ICAR, 1995). A sample of milk was taken at each test to estimate the percentage of fat, protein, lactose and solids not-fat (SNF). The samples were analyzed using the Eko-Milk Analyzer. Somatic Cell Count-SCC were also

calculated using direct microscopic test, as indicated by (Coles, 1986). The weights of lambs at birth and weaning were recorded, the dam age, type of birth and sex of lamb was fixed immediately after birth.

### Statistical analysis

The data were statistically analyzed using the General Linear Model (GLM) method within the ready-made statistical program SAS (2005). To study the effect of the flock, year of birth, age of dam, type of birth and sex of lamb on the characteristics of milk yield and its components, somatic cells count in milk, weights of lambs at birth, weaning and total weight gain (birth-weaning) according to the following mathematical model:

$$Y_{ijklmn} = \mu + F_i + R_j + A_k + T_l + S_m + E_{ijklmn}$$

Where they represent:

$Y_{ijklmn}$: The value of any observation in the experiment.

$\mu$ : Overall mean.

Fi: Effect of flock, where i = 1 for the college and 2 for the rashedia.

$R_j$: Effect of the year, where $_j$=1 for the year 2009 and 2 for the year 2010.

$A_k$: Effect of age of dam, where $_k$ = (2, 3, 4, 5, 6 years and over).

$T_l$: Effect of type of birth, where $_l$=1 for single and 2 for twin births.

$S_m$: Effect of the sex of the lamb, where $_m$ = 1 for males and 2 for females.

$E_{ijklmn}$: Random error associated with each observation.

The correlation coefficient between milk production and components, somatic cells count, and the weights of lambs at birth and weaning was also calculated using the above program.

## RESULTS AND DISCUSSION

### Milk production

The overall mean of daily milk production of ewes in both flocks was 350.94 ± 31.42 g. (Table, 1). The results showed a significant effect of the flock in this trait, the ewes of the Rashidiya outperformed the ewes of the college with a difference of 101.92 g. This superiority may be attributed to the variance in the administrative, nutritional and grazing conditions between the two flocks. in addition to the high genetic capabilities of the Rashidiya flock ewes as they belong to a research station, Selection and genetic improvement programs are applied on an ongoing basis, and ewes with low production are excluded and genetically improved rams are used. These results agreed with the findings of Al-Dabbagh (2009) and Abdul-Rahman and Al-Juwari (2009) in Awassi sheep and Gonzalez-Ronquillo et al. (2021) in the Churra sheep, who noticed that the difference in the method of administration, feeding and genetic makeup led to significant differences in milk yield among the flocks. The results also indicate that the productive year has a highly significant effect on the daily milk yield, as the ewes in the second year gave more milk than they did in the first year by 55.87 g. (Table, 1). This may be attributed to the difference in environmental and

climatic conditions, which in turn affect the quantity and quality of pastures and the abundance of green fodder, as well as the variation in management and health care between productive years. This result was in agreement with the findings of Al-Samarai and Al-Anbari (2009), Al-Dabbagh and Ahmed (2011) and Gonzalez-Ronquillo et al. (2021), who noted significant differences in milk yield in different years. The results also showed high significant differences in the daily milk production due to the different ages of the ewes, it was noted that the milk yield of two-year-old ewes decreased 277.43 g and rose to a maximum of 391.73 g for 6 years ewes (Table, 1). The reason for the increase in production with the age of the ewes may be due to the integration and development of the mammary gland. In addition to the increase in the animal weight, which leads to an increase in the size of the alimentary canal and the maximum benefit from the feed materials, which continues until the sixth season of lactation and then begins to decline gradually as a result of tooth loss and lack of food intake.

**Table (1): Least square means ± standard error of factors affecting test-day milk yield and somatic cell count.**

| Factors affect | Number | Test-day milk yield (g) | Somatic Cell Count/ml milk $\times 3 \times 10^4$ |
|---|---|---|---|
| Overall mean | 799 | 350.94±31.42 | 21.44±3.58 |
| Flock | | ** | N.S |
| College | 359 | 299.98±30.47 b | 22.21±3.47 |
| Rashedia | 440 | 401.90±32.37 a | 20.66±3.68 |
| Year | | ** | ** |
| 2009 | 388 | 323.00±30.65 b | 11.46±3.49 b |
| 2010 | 411 | 378.87±32.13 a | 31.40±3.66 a |
| Age of dam | | ** | * |
| 2 | 109 | 277.43±36.48 c | 19.40±4.15 bc |
| 3 | 169 | 365.56±32.90 b | 21.21±3.74 ab |
| 4 | 213 | 345.33±33.66 bc | 26.17±3.83 a |
| 5 | 201 | 374.65±32.92 b | 23.20±3.75 a |
| 6 ≥ | 107 | 391.73±34.96 a | 17.17±3.98 c |
| Type of birth | | ** | N.S |
| Single | 699 | 311.69±29.09 b | 20.64±3.31 |
| Twin | 100 | 390.19±35.33 a | 22.23±4.02 |
| Sex of lamb | | N.S | N.S |
| Male | 450 | 357.96±30.62 | 21.57±3.48 |
| Female | 349 | 343.92±31.86 | 21.30±3.63 |

*, ** Significantly at levels ($P<0.05$), ($P<0.01$) respectively N.S No Significant.

a, b, c Different letters within the same column mean a significant difference.

These results agreed with the findings of Al-Juwari (2011), Al-Azzawi and Mohammed (2020), Dagdelen and Esenbuga (2022) who confirmed that the age of the ewe had a significant effect on the daily milk yield, the ewes of 2 and 3 years of the lowest yield of milk production. Moreover, differed from with what it was found by AL-Qasimi et al. (2020), who observed no significant effect of ewe age on milk yield. It was found that the type of birth had a highly significant effect on the daily milk yield, which amounted to

311.69 and 390.19 g for ewes that gave birth to single and twin births, respectively (Table, 1). The superiority of milk yield for ewes suckling twin lambs may be because twin lambs empty or suck a larger amount of milk from the udder during the lactation period. That leads to increased stimulation and activation of the lactating cells to secrete a greater amount of milk compared to individual lambs, and the repetition of the suckling process leads to stimulating the secretion of the hormone prolactin, which increases milk yield (Al-Dabbagh, 2009). These results agreed with the findings of Abd Allah et al. (2011) in terms of the significance of the effect of type of birth on milk yield. The results of the study also showed that the effect of the sex of lamb on daily milk yield was not significant (Table, 1). Similar results were reached by Al-Dabbagh (2019) and Al-Juwari (2021), who did not find significant differences in milk yield according to the sex of lamb.

**Somatic Cells Count-SCC**

The overall mean of somatic cells count in milk was $21.44\times3\times10^4\pm3.58$ cell /ml. The results of the study showed that there was no significant effect of the flock on the somatic cells count in milk (Table, 1), While Al-Dabbagh (2009) and Tančin et al. (2017) noticed significant differences in the somatic cells count in the milk of ewes within the same breed raised in different flocks. It was found that the productive year had a highly significant effect on the somatic cells count in milk, their numbers exceeded in the second year than in the first year, with a difference of $19.94\times3\times10^4$ cell /ml (Table, 1). This may be attributed to the lack of care and attention to cleanliness Barns and poor grazing areas, which led to the deterioration of the health status of the ewes and their infection with some diseases, which led to an increase in the somatic cells count in the ewes' milk for the second year. This result was in agreement with the findings of Al-Dabbagh (2009), Gonzalez-Ronquillo et al. (2021), who noted that the year has a highly significant effect on the somatic cells count in milk. Jeromy (2002) reported that the different administrative systems for the flocks, health care and general hygiene for milkers, milking tools and barns, in addition to the animal density inside the pen, are all reasons that lead to an increase in the somatic cells count in the resulting milk. The results also showed significant differences in the milk content of somatic cells according to the ages of the ewes, where a gradual increase in the somatic cell count was observed with the advancing age of the ewe, reaching its maximum in the milk of 4 and 5 years of age $26.17\times3\times10^4$ and $23.20\times3\times10^4$. cell/ml respectively (Table,1), then it decreased significantly in the milk of 6-year-old ewes, possibly due to the susceptibility of ewes of older ages to infection with mastitis microbes and to damage of udder tissues. Most researchers have pointed out that older ewes are characterized by a high rate of somatic cells in their milk due to the longer exposure to bacterial infections, causing various infections, or a case of mastitis (Abdullah and Hassan, 2008, Al-Dabbagh, 2009). Type of birth did not affect somatic cell count in the milk of ewes; their means were $20.64\times3\times10^4$ and $22.23\times3\times10^4$ cell /ml in the milk of ewes that suckling single and twin lambs, respectively (Table, 1). This result was identical to what was found by Ayadi et al. (2014) in terms of the insignificance of the effect of the type of birth on the somatic cell count in milk. Also, the sex of lamb did not have a significant effect on this trait, as close

counts of somatic cells were found in the milk of ewes dams of males and females, which amounted to $21.57\times3\times10^4$ and $21.30\times3\times10^4$ cell /ml respectively (Table, 1). This result agreed with what was found by Ayadi et al. (2014) in their study on Najdi ewes.

### Milk Components

The overall mean of the percentage of fat, protein, lactose and solids not-fat in milk was 4.98 ± 0.38%, 4.54 ± 0.25%, 4.36 ± 0.06% and 9.62 ± 0.33%, respectively (Table, 2). The flock had no significant effect on any of the milk components under study. This result was supported by the findings of Al-Dabbagh and Abbou (2012), who did not find significant differences between the components of milk due to the effect of the flock. (Table, 2) also shows that there was no significant effect of the year on the percentage of fat milk, this result agreed with the findings of Oramari and Hermiz (2012) in their study on Karadi ewes and Shihab et al. (2022) in their study on Local and Turkish Awassi sheep. On the other hand, the productive year had a highly significant effect on the rest of the milk components under study. In the first year, the ewes gave milk containing more protein, lactose and solids not fat than they produced in the second year, with a difference of 0.82%, 0.19% and 1.12% respectively (Table, 2). This may be due to the superiority of milk production for the second year compared to the first year, as the inverse relationship between milk production and its components, which appeared negative and significant in this study (Table, 3). These results are in agreement with what was mentioned by Al-Dabbagh and Abbou (2012), Oramari and Hermiz (2012) who noticed significant differences in the proportions of these components according to the different productive years. It is clear from (Table 2) that there is no significant effect of the dam's age on all the components of the milk under study, This result was in agreement with the findings of Al-Dabbagh (2019) and Shihab et al. (2022), who noted that there was no significant effect of the dam's age in the proportions of these components. Also Al-Qasimi et al. (2020) and Al-Azzawi and Mohammed (2020) did not find Significant effect of dam's age on protein content in milk, and Elia (2018) indicated that there were no significant differences in lactose content according to the different ages of ewes. The results also indicate that there was no significant differences between these components according to the type of birth and the sex of lamb.

**Table (2): Least square means ± standard error of factors affecting milk components.**

| Factors affect | Number | % Fat | % Protein | % Lactose | % SNF |
|---|---|---|---|---|---|
| Overall mean | 802 | 4.98±0.38 | 4.54±0.25 | 4.36±0.06 | 9.62±0.33 |
| Flock | | N.S | N.S | N.S | N.S |
| College | 362 | 4.90±0.37 | 4.62±0.24 | 4.38±0.06 | 9.72±0.32 |
| Rashedia | 440 | 5.07±0.39 | 4.46±0.25 | 4.34±0.06 | 9.53±0.34 |
| Year | | N.S | ** | ** | ** |
| 2009 | 411 | 4.80±0.37 | 4.95±0.24 a | 4.45±0.06 a | 10.18±0.32 a |
| 2010 | 391 | 5.16±0.39 | 4.13±0.25 b | 4.26±0.06 b | 9.06±0.34 b |
| Age of dam | | N.S | N.S | N.S | N.S |

| Factors affect | Number | % Fat | % Protein | % Lactose | % SNF |
|---|---|---|---|---|---|
| 2 | 109 | 4.67±0.44 | 4.42±0.28 | 4.35±0.07 | 9.54±0.38 |
| 3 | 171 | 4.80±0.40 | 4.41±0.26 | 4.31±0.06 | 9.43±0.35 |
| 4 | 214 | 5.03±0.41 | 4.61±0.26 | 4.39±0.07 | 9.70±0.35 |
| 5 | 201 | 5.26±0.40 | 4.58±0.26 | 4.34±0.06 | 9.61±0.35 |
| 6 ≥ | 107 | 5.14±0.42 | 4.67±0.27 | 4.40±0.07 | 9.83±0.37 |
| Type of Birth | | N.S | N.S | N.S | N.S |
| Single | 702 | 5.11±0.35 | 4.60±0.23 | 4.34±0.06 | 9.66±0.30 |
| Twin | 100 | 4.85±0.43 | 4.48±0.27 | 4.38±0.07 | 9.85±0.37 |
| Sex of Lamb | | N.S | N.S | N.S | N.S |
| Male | 452 | 4.90±0.37 | 4.48±0.24 | 4.34±0.06 | 9.54±0.32 |
| Female | 350 | 5.06±0.39 | 4.60±0.25 | 4.37±0.06 | 9.71±0.33 |

** Significantly at levels (P<0.01). N.S No Significant.

a, b, Different letters within the same column mean a significant difference.

## Growth of lambs

The overall mean weight of lambs at birth and weaning and weight gain (birth-weaning) was 4.00 ± 0.14, 20.43 ± 0.73 and 16.44 ± 0.72 kg, respectively (Table, 3). The flock had a high moral effect on these traits, the lambs born in the Rashidiya flock were significantly superior to their counterparts born in the college flock in weight at birth and weaning and weight gain until weaning with a difference of 0.50, 5.78 and 5.28 kg, respectively (Table, 3). This superiority may be attributed to the different methods of management, and feeding, and the availability of green fodder in larger quantities in the Rashidiya flock compared to the college flock.

These results agreed with the findings of Qureshi et al. (2010) and Mohammed et al. (2021), who noted that different environmental and administrative conditions led to Significant lambs weight at birth and weaning, and weight gain until weaning. The year of birth did not show a significant effect on the weight of lambs at birth (Table, 3). This result was in agreement with the findings of Taskin et al. (2012) and Shihab et al. (2022) , while lambs born in the second year were significantly superior to those born in the first year in weight at weaning and weight gain until weaning with a difference of 8.50 and 8.51 kg, respectively (Table, 3). This may be due to the improvement of environmental and nutritional conditions represented in the quantity and quality of fodder and the level of care and attention that the ewes received in the second year compared to the first year, which led to higher milk yield in both flocks. This result was in agreement with the findings of Aktas et al. (2014), Al-Dabbagh (2019) and Mohammed et al. (2021), who noticed significant differences in lambs weight and weight gain in different productive years.

**Table (3): Least square means ± standard error of factors affecting on Birth, Weaning weight, and total gain of weights for lambs (kg).**

| Factors affect | Number | Birth weight | Weaning weight | Gain Birth -Weaning |
|---|---|---|---|---|
| Overall mean | 802 | 4.00±0.14 | 20.43±0.73 | 16.44±0.72 |
| Flock | | ** | ** | ** |

| Factors affect | Number | Birth weight | Weaning weight | Gain Birth -Weaning |
|---|---|---|---|---|
| College | 362 | 3.75±0.13 b | 17.54±0.71 b | 13.80±0.70 b |
| Rashedia | 440 | 4.25±0.14 a | 23.32±0.76 a | 19.08±0.74 a |
| Year | | N.S | ** | ** |
| 2009 | 411 | 4.00±0.13 | 16.18±0.72 b | 12.18±0.70 b |
| 2010 | 391 | 3.99±0.14 | 24.68±0.75 a | 20.69±0.74 a |
| Age of dam | | ** | ** | ** |
| 2 | 109 | 4.03±0.15 a | 18.90±0.85 c | 14.86±0.84 c |
| 3 | 171 | 4.21±0.14 a | 21.23±0.77 a | 17.02±0.76 a |
| 4 | 214 | 3.95±0.14 b | 19.91±0.79 b | 15.96±0.77 b |
| 5 | 201 | 3.95±0.14 b | 21.39±0.77 a | 17.44±0.76 a |
| 6 ≥ | 107 | 3.84±0.15 b | 20.74±0.82 b | 16.90±0.80 b |
| Type of birth | | ** | ** | ** |
| Single | 702 | 4.34±0.12 a | 22.08±0.68 a | 17.73±0.67 a |
| Twin | 100 | 3.65±0.15 b | 18.79±0.83 b | 15.14±0.81 b |
| Sex of lamb | | ** | ** | ** |
| Male | 452 | 4.13±0.13 a | 22.04±0.72 a | 17.91±0.70 a |
| Female | 350 | 3.86±0.13 b | 18.83±0.74 b | 14.97±0.73 b |

**Significantly at levels (P <0.01). N.S No Significant.

a, b, Different letters within the same column mean a significant difference.

It is clear from (Table, 3) that the age of dam had a significant effect on the weights of lambs at birth, weaning and weight gain. As it was noticed that the lambs born to ewes aged 2 and 3 years were significantly superior to their counterparts born from ewes aged 4, 5 and 6 years in their weights at birth. While the lightest appeared lambs weighed at weaning, and the lowest weight gain was for those of two-year-old dams, and higher for lambs from 3 and 5 years old (Table, 3). This may be attributed to the fact that the growth of lambs before weaning is affected by dams' maternal ability, as well as the variation or milk produced and its direct impact on the mean of growth of lambs until the age of weaning. These results agreed with the findings of Aktas et al. (2014), Al- Dabbagh (2019), Kramarenko et al. (2021) and Kelman et al.(2022) in terms of the significant effect of dam age on the weight of lambs at birth and weaning and weight gain until weaning. The results of the study also showed that the single births were significantly superior to their twins in terms of birth weight, weaning and weight gain, with a difference of 0.69, 3.29 and 2.59 kg, respectively (Table, 3). The superiority in birth weight may be attributed to the fact that the presence of one fetus inside the dam's limited womb allows it to grow to a relatively greater degree than if there were two in the same field. In addition, the amount of nutrients that a sheep can provide to its fetuse during pregnancy is relatively more available for a single lamb than if two compete for it (Al-Hadithi, 1988). Also, the arrival of single lambs with a higher weight at weaning and their superiority in weight gain may be due to the single lambs consuming a proportionally greater amount of milk than the amount consumed by the twin lambs and to the amount of care provided by the dams of single lamb compared to twins (Abdul-Rahman and Al-Barzinjy, 2007). This finding is consistent with that of Elia

(2018) and Torres et al. (2021). Male lambs outperformed female lambs in their weight at birth and weaning, and weight gain by 0.27, 3.21 and 2.94 kg, respectively (Table, 3). The superiority of males over females in weight at birth may be attributed to the fact that the total weight of the cotyledons in males is 10.5% heavier of females, although there was no difference in the number of cotyledons between them (Rhind, 1980). The difference between the sexes in weight at weaning because males have the ability to withdraw a greater amount of milk from the dam's udder during the lactation period, compared to females, which helps to excel in growth, which was reflected in the weaning weight. In addition to the difference in physiological functions in both sexes, as male hormones have a structural effect on protein (Al-Hadithi, 1988). This result was in agreement with the findings of Obeidat et al. (2019), Mohammed et al. (2021), Bansal et al. (2022) and Kelman et al. (2022) in terms of the significant effect of the sex of lamb on the weights of lambs at birth, Weaning and weight gain until weaning age.

**Relationship between milk yield, components, SCC and weight of lamb**

The results of the study showed that the correlation values between milk yield, SCC and the percentage of lactose were negative and not significant, and amounted to -0.03 and -0.05, respectively (Table 4). While the correlation between milk yield and the percentage of fat, protein and solids not fat was negative and highly significant and reached -0.26, -0.17 and -0.15, respectively, this is the result of the inverse relationship between milk yield and these components. Oramari and Hermiz (2012) obtained a negative and significant correlation coefficient between the milk production and percentage of fat, protein, lactose and solids not-fat were -0.16, -0.08, -0.01 and -0.08, respectively. A negative and highly significant correlation was observed between SCC and all components of milk except for the fat percentage it was not significant. All the correlation values between milk components with each other were positive and highly significant, and ranged between 0.21 and 0.93 between the percentage of fat and lactose and between protein and solids not fat respectively. Taha et al. (2011) observed a positive and significant correlation between milk components that ranged between 0.120 and 0.525 in Awassi and Hamdani ewes. Al-Juwari (2011) recorded positive correlation values between the four milk components (fat, protein, lactose and solids not fat) in Awassi and Hamdani ewes that ranged between 0.168 and 0.981 except for fat with lactose, which was negative.

The results of this study showed that the correlation between birth weight and milk yield was positive and significant and amounted to 0.14, while all values of the correlation between birth weight and other milk traits were insignificant. On the other hand, the correlation values of weaning weight with all other traits appeared significant, but it was positive with milk production, SCC and fat percentage, and negative with the percentage of protein, lactose and solids not fat. A positive and significant value of the correlation between birth weight and weaning weight of this study, which amounted to 0.38 and this, is an indication of the relationship between these two traits. Al-Juwari (2011) and Mohammed et al. (2021) confirmed the existence of a positive and significant relationship between birth weight and weaning weight of 0.53 and 0.46, respectively.

**Table (4): Relationship between milk yield, composition, Somatic Cell Count-SCC and weight of lambs.**

| traits | SCC | % Fat | % Protein | % Lactose | % SNF | Birth weight | Weaning weight |
|---|---|---|---|---|---|---|---|
| Milk yield | -0.03 N.S | -0.26 ** | -0.17 ** | -0.05 N.S | -0.15 ** | 0.14 ** | 0.26 ** |
| SCC | | 0.03 N.S | -0.17 ** | -0.12 ** | -0.17 ** | -0.06 N.S | 0.13 ** |
| % Fat | | | 0.47 ** | 0.21 ** | 0.45 ** | 0.02 N.S | 0.08 * |
| % Protein | | | | 0.58 ** | 0.93 ** | 0.03 N.S | -0.15 ** |
| % Lactose | | | | | 0.70 ** | -0.01 N.S | -0.12 ** |
| % SNF | | | | | | -0.01 N.S | -0.18 ** |
| Birth weight | | | | | | | 0.38 ** |

***, ** Significantly at levels (P<0.05), (P<0.01) respectively N.S No Significant.**

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