



COMPARISON STUDY OF MILK COMPONENTS AND EFFECT OF SOME FACTORS ON THE PRODUCTION OF MILK IN AL-AWASSI AND LOCAL IRAQI (ARABI) SHEEP

Adnan Jawad Ahmed*, Rafid Jawad Kadhim and Qayssar Abdulhussein Obaid

College of Agriculture, University of Sumer, 64005, Rifai Dhi Qar, Iraq.

Abstract

The study was conducted at the research station of sheep and goats belonging to General Authority for Agricultural Research in Al-Shatrah for a period of two months from (1/2/2017, 1/4/2017), where ten Al-Awassi strain sheep and ten local sheep (Arabi strain) were taken to study the proportions of milk components for each strain, as well as to note the effect of some factors on the amount of daily and totally milk production and the length of milking season. The results showed that there was a significant difference ($p \leq 0.05$) for whey proteins, where it was observed that its percentage for Al-Awassi sheep (0.775 ± 0.083) and for the local sheep (1.181 ± 0.109), There is also a significant difference ($p \leq 0.05$) for Lactose, where it was observed in Al-Awassi sheep (3.683 ± 0.104) and for local sheep (4.321 ± 0.103). The Casein protein of Al-Awassi sheep (3.680 ± 0.095), for local sheep (3.400 ± 0.077) Where significant difference was observed ($p \leq 0.05$) for Al-Awassi sheep compared with local sheep. The solids of milk for Al-Awassi sheep were (11.148 ± 0.786) and for local sheep (9.060 ± 0.286), indicating a significant difference for the two strains ($p \leq 0.05$) while the other milk components showed no significant difference between them. when study of some factors affecting the amount of daily and totally milk production and the length of milking season it was observed that (strain, mother age, type of birth, lamb genus, state of birth, mother weight) has a significant effect ($p \leq 0.05$) on the amount of daily and totally milk production and the length of milking season, except for the month of birth, showed no significant effect ($p \leq 0.05$) in the two strains.

Key words: Comparison, sheep, Al-Awassi, local, milk production.

Introduction

Sheep come after cows in terms of economic importance among farm animals, Sheep are the most important sources of animal protein in bridging part of the people's need for food by providing milk (5%), meat (40%), As well as wool (50%), leather 40%). Therefore, sheep and goat breeding stations have been established in many countries of the Arab world, especially in the Middle East, including Iraq and attention has been paid to the sheep strain producing of milk, especially Al-Awassi and East Freisian sheep, due to their ability to cope in different circumstances (Meunier-Goddik and Nashnush, 2006). The composition of sheep's milk is different from the milk of other agricultural animals. It is rich in fat, lactose, solid materials, minerals and vitamins, although of the low amount of milk produced for each ewe (Alichanidis and Polychroniadou, 1996) is important in

the Cheeses industry. The fat of sheep milk consists of fatty acids (Posati and Orr, 1976), which contribute to the distinctive flavor of cheese and the high content of solids in milk led to an increase in the amount of cheese produced (Wendorff, 2003). The curves for the milk production and milk components during any season are affected by several factors, mainly the strain, the production and feeding stage and the milking system (Bocquier and Caja, 1993). The correlation between the quantity of milk produced and the percentage of milk components of fat, protein and Casein is negative. In previous studies conducted comparing milk production and its components, as well as some blood traits of the ewes lactated for twin and single Lambs, It was found that the milk production of ewes lactated for twin was significantly exceeded those with single births, as well as a significant difference in some blood traits between them and the difference in the level of milk production and some of its components by changing the level of a number

*Author for correspondence : E-mail: adnanjawad@yahoo.com

of blood traits, especially fat and protein (Wendorff, 2003). Local sheep are characterized by low production of meat and milk due to genetic and environmental factors due to the likelihood of their ability to live in harsh environmental conditions at the expense of productive traits. Therefore, the productive efficiency of ewes is low Which requires attention to the latest developments in modern science in the management and care and improvement of herds (Al-qus *et al.*, 1993). The total number of sheep in Iraq is 5 million, most of them are Al-Awassi sheep, which are mainly raised for meat and milk production. Al-Rawi *et al.*, (2000) reported that the sheep breeding in Iraq continues to take the traditional pattern, which depends on transport and pastoralism in poor grazing areas, where their production is low, especially milk production, which is an important source of nutrition and growth of new borns in the herd, so must follow the modern methods of management and nutrition and improve environmental conditions and follow known genetic improvement methods. Al-Jumaili, (2001), Peana *et al.*, (2007) and Abdullah *et al.*, (2008) showed that the age of the mother at birth, the season of birth, the time of milking and the number of milking, as well as the strain are the most important factors affecting the production of milk and the length of the production season, While Al-Khalisi, (1996) and Al-Azzawi *et al.*, (1997) attributed the difference in milk production to the type of birth, lamb genus and the genotype. Al-Awassi sheep can respond to genetic improvement to increase milk production. The current study aims to study the milk components of local sheep (the strain of Al-Awassi and Arabi) and examined the percentage of fat, protein, Whey Protein, casein protein, ash, solid materials, also examined the percentage of blood components in the two strains and note the effect of some factors represented by the strain, Mother's age, type of birth, state of birth, mother's weight, lamb genus and birth month in a number of productive traits (daily and totally milk production and length of milk season) for Local Al-Awassi sheep and local Iraqi sheep.

Materials and Methods

The study was conducted at the research station of sheep and goats belonging to General Authority for Agricultural Research, Ministry of Agriculture. The station was established in 2006 in Al-Shatrah district (45 km north of Nasiriyah). Ewes are raised in semi-open Barns (35% closed and 65% open). The herd is managed according to a program that includes nutrition, preparation for the season of the Insemination, preparation for pregnancy and birth as well as health and veterinary care. The amount of feed and its type varies with different seasons and also depending on availability. Green feed is

provided represented by Alfalfa or other coarse feeds. The concentrated feed is Offered with amount of (500 g / day / animal). This amount is increased before and during the reproductive season of the ewes, with the provision of mineral salts molds and there is no animal grazing. As for lamb feeding, they are left with their mothers to breast-feed. Lambs start with two weeks of eating low amounts of green feed and up to (100 g/day) of concentrated feed. The weaned lamb, up to the age of one year, provides concentrated feed at 3% of body weight and coarse feed freely. The babies are weaned at a rate of 120 days at an average weight of 28 kg. The season begins at mid-August and ends in mid-October. The Insemination program use, where the introduction of a ram with a number of ewes and then the ewes isolate with the Inseminated ram in boxes for 24 hours, then transferred to Inseminated barns ewes discharged, this process continue until the completion of the cycles of Libido and after the end of the Insemination season. Kits are used to detect Insemination of all ewes, although there is no time to use vaginal sponge saturated with progesterone or others. The Insemination date and the number of inseminated ram is recorded, as well as the weight of the ewe at the insemination. In the final days of pregnancy, ewes are placed in individual boxes for this purpose. The lambs are weighed and counted after 24 hours of Birth. The Colostrum is given from the first hour of birth and the lamb continues to breast-feed until the age of weaning (120) days. The aim of the station is to produce genetically modified rams that are selected based on animal records and exterior appearance of animal for distribution to breeders as well as production of ewes with twin births, The animals of the station are subject to a health and preventive program that usually begins in the insemination season and involves dipping the animals using the Zeta-cypermethrin solution at a concentration of 10% four times a year to eliminate the parasites and vaccinations against the Sheep pox and FMD, pregnant mothers and adult and newborn animals have vaccinated with the Civabex Enterotoxamia annually in the last month of pregnancy for ewes and a month of birth, return after a month of the first insemination and vaccinate Lambs and the Weaning (3-6 month) with the prophylactic abortion vaccine (Brucellosis) one dose and for 5 years, the treatment of animals with a substance to protect against worms of liver and intestinal in March and April and returned after 21 days of the first dose. As well as spraying barns with pesticides and antiseptics to combat parasites. Twenty samples of Al-Awassi sheep and local sheep (Arabi strain) were taken with (10) heads for each type. Laboratory tests were conducted on milk samples taken from both species. The percentage of protein, whey

Table 1: The Arithmetic average for the percentage of milk components to the two strains ± standard error.

Type of examination	Strains	
	Al-Awassi	local (Arabi)
Protein	4.549±0.980 Ns	4.569±0.030 Ns
Casein Protein	3.680±0.095 A	3.400±0.077 B
Whey Protein	0.755±0.083 B	1.181±0.109 A
Fat	6.545±0.157 Ns	6.472±0.623 Ns
Lactose	3.683±0.104 B	4.321±0.103 A
Ash	0.574±0.061 Ns	0.394±0.057 Ns
Total solid	11.148±0.786 A	9.060±0.286 B

Ns = No significant differences between the two strains.

proteins, the percentage of fat, casein proteins, the percentage of lactose, ash and solid materials were measured. The amount of milk produced from mothers with age of 4-5 years was examined. The amount of milk for mothers for those born a male from those born females was also examined. The amount of milk was also measured by type of birth (twin, single), state of birth (naturally, Difficulty), mother’s weight (less than 50 kg, 50-60 kg, more than 50 Kg) as well as the birth month (January, February).

Results and Discussion

The physical and chemical traits of milk

Table 2: Shows the milk production in Al-Awassi sheep (average ± standard error).

Influential factors	Average		
	Daily milk production(kg)	Total milk production(kg)	Length of milking season (day)
General average	0.84±0.02 A	98.07±0.03 A	101.08±0.04 A
Al-Awassi			
Mother’s age (years)			
4	0.81±0.014 A	81.63±1.229 A	86.10±1.183 A
5	0.85±0.008 A	109.17±1.260 A	115±1.211 A
Type of birth			
Individual	0.75±0.020 A	90.38±1.103 A	99.82±1.110 A
Twinning	0.90±0.012 Ns	100.72±1.105 Ns	102.69±1.060 A
lamb genus			
Males	0.72±0.016 Ns	83.28±1.324 B	101.71±1.054 A
females	0.93±0.013 Ns	107.62±2.164 A	100.78±1.102 A
Birth state			
Naturally	0.90±0.011 Ns	98.68±1.090 A	105.64±1.050 A
Difficulty	0.79±0.018 Ns	92.50±1.103 A	96.86±1.122 A
Mother’s weight at birth			
Less than 50 kg	0.64±0.016 Ns	66.35±2.279 A	91.15±1.105 A
60-50 kg	0.96±0.006 Ns	108.16±2.260 A	115.23±1.211 A
More than 60 kg	0.88±0.016 Ns	112.14±1.374 A	97.38±1.019 A
Birth Month			
January	0.88±0.016 Ns	96.59±1.107 A	100.47±1.101 A
February	0.82±0.016 Ns	94.71±1.115 A	102.23±1.132 A

Ns = No significant differences between the two strains.

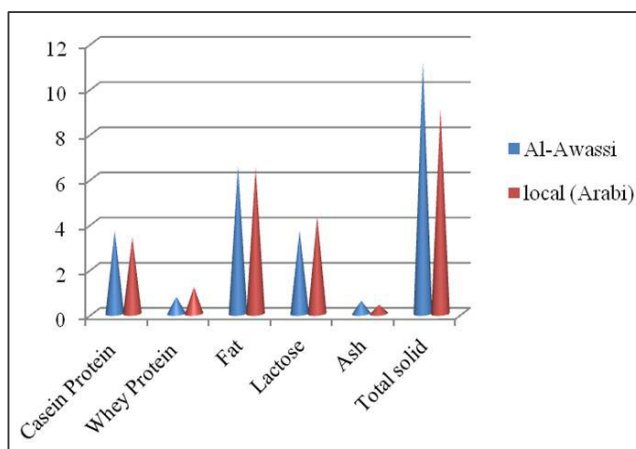


Fig. 1: Statistical chart of milk components for the two strains, (average ± standard error).

Table 1, indicates that the total averages for the percentage of fat, protein, whey proteins, casein proteins, lactose, ash and solid materials for two strain of Al-Awassi and Arabi (6.47, 6.54) (4.569, 4.549) (0.083, 0.755) (3.680, 3.400) (4.321, 3.683), 0.574) (9.060, 11.148), respectively. The percentage of fat.

The overall average of fat in Al-Awassi sheep (6.54) and local sheep (6.47) was amounted. It was noted that there was no significant difference between the two strains. In comparing the results with other studies, it was agreement with the results of (Nejim, 1963) (6.88%), (Fadel, 1988) (6.64%), in addition to the results of (Tolimat, 1996) and (Todorvsci, 1980) where the percentage of fat (7.73%) and (Fadel, 1988) were (6.64%). While it was higher than the percentage of fat recorded in (Eliya *et al.*, 1972) (5.25%) because the percentage of fat in sheep’s milk is affected by many external and nutritional factors may be due to these different values in the researchers to the different conditions of grazing and nutrition and other environmental factors.

The percentage of protein

The percentage of protein was (4.549, 4.569), respectively in Al-Awassi sheep and local sheep, where there is a significant difference ($P \leq 0.05$) between the two strains and comparing this study with the results of other studies, which agree with the results of (Tulayhat, 1996) (4.5%) with ratio slightly below than the results of (AL-Hilaly, 1995). The percentage of protein was (5.51%) for adoption in genetically modified sheep for

a period exceeding the level of improvement in the study ewes, as well as different feeding conditions and method of breeding, in addition to the high temperatures that characterize the study areas.

The percentage of Lactose

The average lactose in the two strains of Al-Awassi and local amounted (3.683%, 4.321%), respectively. There was a significant difference ($P \leq 0.05$) between the two strains and compared these results with the results of other studies and found that its approach to what Tulayhat, (1996) found. Where it was (4.7%).

The percentage of total dry matter

The average total of dry matter for Al-Awassi and local sheep was (11.148%, 9.060%), respectively. It was observed that there was a significant difference ($P \leq 0.05$) between the two strains. The results of this study are lower than previous studies (Fadel, 1988, AL-Hilaly, 1995, Tulayhat, 1996). The results were similar to those of (Elya *et al.*, 1972) (about 11.55%).

Study the factors that affect the daily and total milk production and the length of the milking season

The factors affecting the daily and total milk production and length of the milking season (strain, age

of the mother, type of birth, lamb genus, state of birth, Mother’s weight at birth, month of birth) were studied.

- **Strain:** The average daily and total milk production and the length of the milking season for Al-Awassi sheep and local sheep (Arabi) amounted to (0.84 kg, 98.07 kg, 101.08 days) and (0.77 kg, 87.72 kg, 95.04 days). It was noted that there was a significant superiority ($P \leq 0.05$) between the daily and total production and the length of the milking season for Al-Awassi sheep compared to local (Arabi). The results agree with (Tulayhat, 1996) where reported that the daily production of milk in Al-Awassi ewes was (0.92 kg), the highest average milk production recorded then (Eliya and Juma, 1970, Tulayhat, 1996). The previous differences in the productivity of Al-Awassi sheep from milk are due to a number of factors affecting the production of sheep’s milk even within the same strain. These including genetic factors (Hassan, 1995, Peeters *et al.*, 1992, Climp *et al.*, 1991), the production of milk (Mavrogenis and Louca, 1980, Boros *et al.*, 1985, Voutsinas *et al.*, 1990, Fadel *et al.*, 1989), Age of ewes (Godfrey *et al.*, 1997), The body weight (Maria and Gabina, 1993), Time of morning and evening milking (Ploumi *et al.*, 1998), number of milking (Fadel, 1988),

Table 3: Shows the milk production in local sheep (Arabi strain) (average \pm standard error).

Influential factors	Average		
	Daily milk production(kg)	Total milk production(kg)	Length of milking season (day)
General average	0.77 \pm 0.01 B	87.7 \pm 0.02 B	95.04 \pm 0.03 B
Local			
Mother’s age (years)			
4	0.68 \pm 0.016 B	75.63 \pm 2.124 B	80.10 \pm 1.224 B
5	0.70 \pm 0.015 B	99.17 \pm 1.143 B	107 \pm 2.013 B
Type of birth			
Individual	0.70 \pm 0.015 B	84.38 \pm 1.129 B	90.82 \pm 1.006 B
Twinning	0.88 \pm 0.014 Ns	96.72 \pm 1.183 Ns	97.69 \pm 1.086 B
lamb genus			
Males	0.70 \pm 0.015 Ns	97.28 \pm 1.121 A	95 \pm 1.078 B
females	0.90 \pm 0.011 Ns	98.62 \pm 1.231 B	98.78 \pm 1.054 B
Birth state			
Naturally	0.88 \pm 0.013 Ns	91.68 \pm 1.050 B	97.64 \pm 1.030 B
Difficulty	0.76 \pm 0.010 Ns	87.50 \pm 1.102 B	91.86 \pm 1.132 B
Mother’s weight at birth			
Less than 50 kg	0.61 \pm 0.016 Ns	61.35 \pm 1.452 B	86.15 \pm 1.183 B
60-50 kg	0.93 \pm 0.013 Ns	98.16 \pm 1.103 B	109.23 \pm 2.260 B
More than 60 kg	0.85 \pm 0.015 Ns	102.14 \pm 1.154 B	92.38 \pm 1.176 B
Birth Month			
January	0.86 \pm 0.015 Ns	91.59 \pm 1.056 B	94.47 \pm 1.031 B
February	0.79 \pm 0.018 Ns	89.71 \pm 1.034 B	97.23 \pm 1.028 B

Ns = No significant differences between the two strains.

The number of infant lambs (Snowder and Climp, 1991, Peeters *et al.*, 1992), Nutrition level during pregnancy and milk production (Ramsey *et al.*, 1994), the birth date (Mavrogenis, 1996), The birth season (Hassan, 1995, Ploumi *et al.*, 1998) and the method of estimation of milk production (Izadifard and Zamiri, 1997). This agree with (Al-Jumaili, 2001, Peana *et al.*, 2007, Abdullah *et al.*, 2008) that the strain is one of the most important factors affecting the production of milk and the length of the production season. In addition, local sheep are characterized by low production of meat and milk, which is due to genetic and environmental factors due to the likelihood of their ability to live in aggressive environmental conditions at the expense of productive traits. Therefore, the productive efficiency of ewes is low, which requires attention according to the latest developments in modern science in the management, care and

improvement of herds (Pastor *et al.*, 1993).

- **Mother's age:** Tables 2-3, show that Mother's age has no significant effect on the studied production traits. This may be due to the health and nutritional status of the ewes in different ages which may negatively affect the milk traits in them. Other studies (Al-Jumaili, 2001, Peana *et al.*, 2007, Abdullah *et al.*, 2008) showed that Mother's age at birth, the season of birth, the time of milking and the number of milking, as well as the strain, which are the most important factors affecting the production of milk and the length of the production season.
- **Birth state:** Table 2-3, shows that the birth state affects the daily and total of milk production, where it was observed that sheep which give birth naturally have a significant effect and outperform the sheep that give birth difficulty in milk production (Abdullah *et al.*, 2008).
- **Mother's weight at birth:** The weight of the mother at birth had a significant effect ($P \leq 0.05$) in the daily and total milk production. Where ewes with a weight of 60-50 kg achieved the best performance from ewes with weighing less than 50 kg, because the increase in body weight to a certain extent accompanied by the development of the milk system as well as the increase in consumption of fodder, thus increasing the daily and total milk production. This is reflected positively on the length of milking season and these results agree with (Al-Zobaie, 1999).
- **Type of birth:** Table 2-3, show that the type of birth has an effect on the production of milk in ewes. It was observed that ewes with twins births had significantly excelled ($P \leq 0.05$) in milk production than those with single births. This is due to the increased stimulation of production with an increase in the number of breastfed births and this agree with (Al-Azzawi *et al.*, 1997).
- **Lamb genus:** Ewes with female birth were significantly excelled ($P \leq 0.05$) on ewes with male birth in the daily and total milk production. Lamb genus has a significant effect on milk production. This results agree with (Al-Khalisi, 1994).
- **Mother's weight at birth:** The weight of the mother at birth had an effect on the daily and total of milk production. Ewes with 60-50 kg weight achieved better performance than ewes weighing less than 50 kg. The increase in weight of the body to a certain extent (50-60 kg) was accompanied by the development of the milk system as well as an increase in the amount of

feed consumed so increase the daily and total of milk production. This is positively reflected on the length of milking season, when compared to less-weight ewes (below 50 kg) and higher weight (more than 60 kg).

References

- Al-Jumaili, Muwafaq Hussein Ali (2001). Study of some traits of growth and production of commercial milk. MA. College of Agriculture. University of Baghdad.
- Al-Rawi, Abdul Razzaq Abdul Hamid, Hermaz, Hani Nasser, Salman and Muzaffar Hussein (2000). Interaction between genotypes and hereditary factors of pre and post weaning weights of pure and crossing Al-Awassi lambs. *Iraqi Agriculture Journal.*, **5(1)**: 71-80.
- Al-Zobaie, Hamoud Mzhour Ajil (1999). The Effect of Contrasting in the Performance of Ewes in Commercial Herds, Master Thesis, College of Agriculture, University of Baghdad.
- Al-qus, Jalal Ilya and al-Jalili, Zuhair Fakhri and Aziz, Da'ibIshaq. (1993). Mainly producing sheep and goats and raising them. National Library, Dar al-Ketub for printing and publishing - Baghdad.
- Al-Sayegh, Muzaffar Nafie Raho and the priest, Jalal Elia. (1992). Production of sheep and goats. Dar al-Hikma Press - University of Basra.
- Abdullah, Radi Khatab, Aref and Qasim Hussein (2008). Effect of age and milking stage on the quantity of milk produced and some of its components in Al-Awassi sheep, *Iraqi Journal of Veterinary Sciences.*, **2(1)**: 53-57.
- Al-Azzawi, W.A. and A.A. Al-Rawi (1997). Repeatability estimates of some economic productive traits in Awassi sheep. *I.P.A. J. Agric. Res.*, **7(1)**: 74-86.
- Al-Hilaly, M.EL. (1995). Cheese making from sheep and goat milk applying new technologies. A thesis submitted to the University of Aleppo in partial Fulfillment of the requirements for the Degree of Diploma in Higher Studies in Food Sciences.
- Alichanids, E. and A. Polychroniadou (1996). Special features of dairy products from ewe and goat milk from the physicochemical and organoleptic point of view. In Proc. Of IDF/ CIVRAL Seminar on production and Utilization of Ewe and Goat milk, Crete, Greece. Inter. Dairy Federation, Brusse, Belgium.
- Al-Samrai, F.R. and N.N. Al-Anbari (2009). Genetic evaluation of rams of total milk yield in Iraq Awassi sheep. *APPN Journal of Agricultural Biological Science.*, **4(3)**: 54-57.
- Bocquier, F. and G. Caja (1993). Recent advances on nutrition and feeding of dairy sheep, Proceed. 5th Int. Symp. on Machine Milking of Small Ruminants, Budapest, May 14-20. *Hungarian J. Anim. Prod.*, **1 (Suppl.)**: 580-607.
- Boros, V., Z. Krcal and E. Stevonkova (1985). Changes in the composition of goat and sheep milk in the course of lactation. *Anim. Breed. Abstr.*, **53**: 884.

- Carneiro, H., H. Louvandini, S.R. Pava, F. Macedo, B. Mernies and C. McManus (2010). *Donkey populations, livestock Science.*, **141**: 232-241.
- Carneiro, H., H. Louvandini, S.R. Pava, F. Macedo, B. Mernies and C. McManus (2010). Morphological characterization of Sheepbreeds in Brazil, Uruguay and Colombia, *Small Ruminant Research.*, **94**: 58-65.
- Eliya, Z. and K.H. Juma (1970). Birth weight, weaning weight and milk production in Awassi sheep. *Trop. Agric.*, **47**: 321- 324.
- Fadel, I., J.B. Owen, R. Kassem and H. Juha (1998). A note on the milk composition of Awassi ewes. *Anim. prod.*, **48**: 606-610.
- Gizaw, S., H. Komen, O. Hanote, J.A.M. vanArendonk, S. Kemp, A. Haile, O. Mwai and T. Dessie (2011). Characterization an Hoffman, I, 2010 Climate change and the characterization, breeding and conservation of animal genetic resources. *Animal Genetics.*, **41**: 32-46.
- Godfrey, R.W., M.L. Gray and J.R. Collins (1997). Lamb growth and milk production of hair and wool sheep in a semi- arid tropical environment. *Small Rumin. Res.*, **24**: 77-83.
- Hassan, H.A. (1995). Effects of crossing and environmental factors on production and some constituents of milk in Ossimi and Saidi sheep and the crosses with Chios. *Small Rumin. Res.*, **18**: 165- 172.
- Hoffman, I. (2010). Climate change and the characterization, breeding and conservation of animal genetic resources. *Animal Genetics.*, **41**: 32-46.
- Izadifard, J. and M.J. Zamiri (1997). Lactation performance of two Iranian fattailed sheep breeds. *Small Rumin. Res.*, **24**: 69-76.
- Kefena, E., A. Beja-Pereira, J.L. Han, A. Haile, Y.K. Mohammed and T. Dessie (2011). Eco-geographical structuring and morphological diversities in Ethiopian donkey populations, *livestock Science.*, **141**: 232-241.
- Legaz, E., I. Cervantes, M.A. Perez-Cabal, L.F. de la Fuente, R. Martinez, F. Goyache and J.P. Gutierrez (2011). Multivariate characterization of morphological traits in Assaf (Assae. E) Sheep, *small Ruminant Research.*, **100**: 122-130.
- Mavrogenis, A.P. and A. Louca (1980). Effects of different husbandry systems on milk production of purebred and crossbreed sheep. *Anim. Prod.*, **31**: 171- 176.
- Mavrogenis, A.P. (1996). Estimates of environmental and genetic parameters influencing milk and growth traits of Awassi sheep in Cyprus. *Small Rumin. Res.*, **20**: 141- 196.
- Maria, G. and D. Gabina (1993). Non- genetic effects on milk production of Latxa ewes. *Small Rumin. Res.*, **12**: 61- 67.
- Meunier-Goddik, L. and H.J. Nashnush (2006). Oregon State University. Extension Service. Producing Sheep Milk Cheese EM. 8908. [http:// extension.oregon state.edu/catalog/html/me.Morphological characterization of Sheep breeds in Brazil, Uruguay and Colombia](http://extension.oregonstate.edu/catalog/html/me.Morphological%20characterization%20of%20sheep%20breeds%20in%20Brazil,%20Uruguay%20and%20Colombia), *Small Ruminant Research.*, **94**: 58-65.
- Nejim, H.T. (1963). The composition of Iraqi sheep's milk. *J. Dairy Res.*, **30**: 81-86
- Peana, I.C., M. Dimauro, M. Carta, G. Gaspa, A. Fois and M. Cannas (2007). Effect of heat stress on milk yield in Sardinian dairy sheep farms. *Italian J. Sci.*, **6**: 581- 590.
- Peeters, R., N. Buys, L. Robijns, D. Vanmontfort and J. Van Isterdae (1992). Milk yields and milk composition of Flemish milk sheep, Suffolk and Texel ewes and their crossbreds. *Small Rumin. Res.*, **7**: 279-288.
- Ploumi, K., S. Belibasaki and G. Triantaphyllidis (1998). Some factors affecting daily milk yield and composition in flock of Chios ewes. *Small Rumin. Res.*, **28**: 89-92.
- Posati, L.P. and M.L. Orr (1976). Composition of Foods. Dairy and Egg Products. USDA-ARS. Consumer and Food Economics Inst., Agr. Handbook, Washington D.C, No. **8-1**: 77-109.
- Ramsey, W.S., P.G. Hatfield, J.D. Wallace and G.M. South Ward (1994). Relationships among ewe milk production and ewe and lamb forage intake in Targhee ewes nursing single or twin lambs. *J. Anim. Sci.*, **72**: 811-816.
- Rodero, E., A. Gonzalez, M. Luque, M. Herrera and J.C. Gutierrez-Estrada (2011). Classification of Spanish autochthonous bovine breeds: Morphometric study using classical and heuristic techniques, *Livestock Science.*, **143**: 226-232.
- Snowder, G.D. and H.A. Glimp (1991). Influence of breed, number of suckling lambs and stage of lactation on ewe milk production and lamb growth under range conditions. *J. Anim. Sci.*, **69**: 923-930.
- Tulayhat (1996). Encyclopedia of the Arabian sheep. XAD/H/ S.
- Thornton, P.K. (2010). Livestock production: recent trends, future prospects, Philosophical Transactions of the Royal Society B. *Biological Sciences.*, **365**: 2853-2867.
- Voutsinas, L.P., C. Pappas and M.C. Katsiari (1990). The composition of Alpine goats milk during lactation in Greece. *J. Dairy Res.*, **57**: 41-51.
- Wedorrf, B. (2003). Milk composition and cheese yield. Accessed August 21, 2005.
- Yakubu, A. and M.O. Akinyemi (2010). An evaluation of sexual size dimorphism in Uda sheep using multifactorial discriminant analysis, *Acta Agriculture Scandinavia, Section A-Animal Science.*, **60**: 74-78.