

Some genetic and non-genetic factors affecting a number of carcass characteristics in sheep

¹Zaman Ali Munshid Al-Zayadi , ²Abdullah Hameed Salim

^{1,2}Department Of Animal Production , College Of Agriculture And Marches University Of Thi Qar - Iraq

¹Email: zaman.m@utq.edu.iq

²Email: Abdallah@utq.edu.iq

Abstract

This study was conducted in one of the animal islands stores (private sector) in Suq Al-Shuyoukh district, south of Dhi Qar Governorate, for the period from 5/11/2021 to 8/5/2022 on a sample of 49 local Iraqi sheep (Orabi). The experiment included Slaughtering sheep in the butcher's shop and studying some characteristics of the carcass and taking a sample of meat for the purpose of calculating some of the chemical properties of the meat samples. It was found that the age of the animal had a significant and clear effect on most of the studied traits, while the animal's sex had no significant effect in all the studied traits. A significant effect was observed in the color of the wool In each of the characteristics of the percentage of dressing, water carrying capacity and the index of fiber breakage in meat. The results showed the selection of red and black sheep for the characteristics of water carrying capacity and the evidence of fiber breakage, and the selection of sheep of black and white colors for the characteristic of the clearing ratio.

Key words: genetic and non-genetic factors, local sheep, carcass traits

I. INTRODUCTION

Sheep play an important role in the rural economy as they provide income to the rural population through the sale of meat, manure and animals, thus they contribute significantly to the livelihoods of resource-poor rural farmers. The profitability of sheep breeding is mainly affected by growth traits and reproductive performance (Momoh et al., 2013). Characteristics of small ruminant production are strongly influenced by genetic and non-genetic factors. Non-genetic factors, especially season of birth, year, sex, and weight of the ewe at conception, have a significant impact on growth traits (Mahala et al., 2010). 2019). Sheep are considered one of the most important farm animals in Iraq, and the number of sheep and goats, according to the International Organization of Agriculture and Food, amounted to 9.350 million heads (FAO, 2010). The Iraqi sheep breeds include Al-Karadi, Al-Arabi, Al-Awassi and Al-Nuaimi. Tolerance to difficult environmental conditions and disease resistance compared to other breeds that lack the fat tail (Majid et al., 2003). The Arabi sheep are one of the most important breeds of Iraqi sheep that are found in the southern provinces of Iraq, where they constitute about 20% of the total number of Iraqi sheep, but they are considered the smallest in size, but they are more resistant to difficult environmental and climatic conditions. , where the weight of the carrot (1,250) kg (Jaid, 2008).



II. MATERIALS AND WORKING METHODS

This study was conducted during the period from 5/11/2021 to 10/5/2022 in Suq Al-Shuyoukh district, south of Dhi Qar Governorate, and included the slaughter of a sample of Arabi sheep (49 heads), males (14) and females (35) in a butcher's shop and from one herd. (to ensure equal conditions for all breeding conditions such as feeding, shelter and health care) and studying some characteristics of the carcass and then taking a sample of meat for the purpose of calculating some chemical characteristics of the meat samples. As for the chemical tests that were conducted on samples taken from the thigh muscle, they were implemented in the laboratory of Dhi Qar University \ College of Agriculture and the Marshes immediately after taking it.

The weight of the live animal was measured before the slaughtering process was carried out, and then the weight of the hot carcass was measured after the animal was slaughtered, the head and legs were separated from the carcass, the skin and wool were peeled off, and all the contents of the carcass were unloaded (the digestive system, reproductive system, lungs, heart, kidneys, spleen and bladder). The netting ratio was calculated by calculating the weight of the hot carcass after slaughter to the weight of the live animal at slaughter, as in the following equation:

$$\text{Clearance Ratio} = \frac{\text{Slaughter after warm carcass weight}}{\text{Live animal weight at slaughter}} \times 100$$

The thigh weight of the carcass was measured after the slaughter process and the separation of the thigh from the other parts by means of a digital electronic scale, and the length of the carcass was also calculated using a tape measure inserted from the point of the shoulder joint to the end of the pin bones. The measuring tape was used to measure the diameter of the carcass at the front ribs of the chest by turning around the ribs. The pH was measured by A. P. H. A. (1984) and Attken et al. (1967) by homogenizing 2 g of meat with 10 ml of distilled water and then estimating it using a Korean-made PH-11 Sartorius digital pH meter. Water carrying capacity was estimated according to Denhertog's method (1997). Jeremiah and Martin (1977) method was used to estimate the diameter of muscle fibers and the method described by Davis et al. (1980) was used to measure muscle fiber fracture index.

The data of the experiment were statistically analyzed using the ready-made statistical program (SAS) (2012) Statistical Analysis System, the complete random design (CRD) was used, and the significant differences between the means were compared using Duncan's polynomial test (Duncan, 1955) by applying the mean of least squares method (LSM).

Mathematical model:

$$Y_{ijklm} = \mu + A_j + T_k + C_L + E_{ijklm}$$

whereas:

Y_{ijklm} : observational value m due to age J , sex k , and wool color l .

μ : the general average of the adjective.

A_j: the effect of animal age (less than 1 year, 1-2 years, 2-3 years, 3-4 years, more than 4 years).

T_k: Influence of animal sex (male or female.)

C_L: effect of wool color (white, red and black, black and white, black.)

E_{ijklm}: the random error that is normally distributed with a mean equal to zero and a variance of its value.

III. RESULTS AND DISCUSSION

The results of the statistical analysis in Table (1) showed that there were highly significant differences ($P \leq 0.01$) between the age groups studied for the characteristics of live animal weight at slaughter, hot carcass weight and thigh weight, where sheep aged 3-4 years (58, 27.00 and 17.00 kg) outperformed the respectively) compared to other age groups, the lowest of which was in the age group less than one year for the same three characteristics mentioned above. This study agrees with what Abdullah (2017) indicated that there is a significant effect ($P \leq 0.05$) of animal age on live animal weight, hot carcass weight, empty body weight and dressing ratio, where there was a clear difference with age, where the highest value for them was at the age of 12 month as it reached (63.37, 31.55, 56.87 and 54.21), respectively.

While there were no significant differences for the effect of animal age in the character of the dressing ratio, despite the arithmetical superiority of animals more than 4 years old (47.66%). And this result does not agree with what was found by Kremer et al. (2004), where he noticed a highly significant effect ($P \leq 0.01$) of age on the dressing ratio of the sheep of Coreydel, South Down, Hampshire Down, Sue Volk, Texel, East Friese Yan, born in two years. As for the sex of the animal, we did not find any significant differences in the characteristics of live animal weight, hot carcass weight and thigh weight, and this result agrees with Pena and (Cano2005) in that there was no significant effect of both sexes on live animal weight, hot carcass weight and empty carcass weight. It also agrees with Vergara et al. (1999) in his study on the Spanish Manchega sheep breed, and sex had no effect on carcass weight. As for wool color, we did not find any significant differences in the characteristics of live animal weight, hot carcass weight and thigh weight. The simple arithmetic superiority of black color was noted with an average of 39.33 kg for live weight. As for the hot carcass weight, black, white and white color recorded the highest value. Its values were 17 kg for the two colors, respectively, while the thigh weight recorded the highest value (2.97 kg) for white sheep. And these results do not agree with what was found by Tiesnamurti et al. (2021) in his study on the Indonesian sheep, where he noticed significant differences ($P \leq 0.05$) for the average live animal weight, which amounted to 22.3 kg with the animal's color and gender, as well as the age of the animal.

From the results of the current study, significant differences ($P \leq 0.05$) were observed between wool colors in their effect on the character of the fineness ratio, where the highest value was in the black and white animals (49.85%) and the lowest average clearance was for the red and black animals (40 %).



Table (1) The mean ± standard error of the factors affecting live weight, carcass weight, thigh weight and dressing ratio

Adjective Influencing factors	number	mean ± standard error			
		live weight (kg)	carcass weight (kg)	thigh weight (kg)	clearing percentage %
animal age (year)					
less than one year	39	b30,00 ±1.14	b10,89±0.55	c2,08±0,10	44.61±0.91
2-1	5	b40,40±2.11	b18.20 ± 0.20	bc2,94 ± 0,39	45.00±2.84
3-2	1	ab 50.00 ± 3.10	ab23,00±1,20	a 6,00±2,06	46,0±0,80
4-3	1	a08,00 ± 4,39	a 27.00 ± 2.99	a7,00±1,90	46,0±3,40
more than 4	3	±4.66 ab46,66	ab22,00±3.27	b4,33± 0,83	47,66±3.84
Significant	49	**	**	**	n.s
animal sex					
Mention	14	37,14±1,60	16,70±0,81	2,62±0.21	44,6±1,42
Feminine	30	37,00± 1,02	16,96±0,70	2,99±0,20	40,0±0,98
Significant	49	n.s	n.s	n.s	n.s
wool color					
White	36	37.19 ± 1.53	17,00±0,78	2,97±0,21	44,0±0,90 a9
Red and black	3	39.00 ± 0.57	10,66±0,88	2,80±0,36	40,0±2,00 b0



black and white	٧	34.42±2.34	١٧,٠٠±٠,٧١	٢,٧٨±٠,٢٣	٤٩,٨±٢,١٠ ab °
Black	٣	39.33±1.33	١٦,٦٦±٠,٦٦	٢,١٦±٠,١٦	٤٢,٠±٠,١٠ b•
Significant	٤٩	n.s	n.s	n.s	*

The averages carrying different letters within the same column differ significantly among themselves.

* (P≤0.05), ** (P≤0.01), N.S: Not significant.

The results of the statistical analysis in Table (2) showed highly significant differences (P≤0.01) between the age groups for the characteristics of carcass length and carcass diameter, where the age of 2-3 years showed the highest averages, amounting to 110 cm and 119 cm for both carcass length and diameter.

As for wool color, we did not find any significant differences between the different colors of the two traits, and only the arithmetic superiority of carcass length and carcass diameter was observed in white sheep (83.33 and 80.83 cm), respectively.

Table (2) - The relationship of the influencing factors with the dimensions of the body.

Adjective Influencing Factors	the number	mean ± standard error	
		carcass length (cm)	carcass diameter (cm)
animal age (year)			
less than one year	39	a٨٠,١٧±١,٤١	c٧٧,١٠±١,٦٩
٢-١	5	b٨٦,٨٠±0.96	77.20c±٢,٠٣
٣-٢	١	a١١٠,٠٠±٠,١٨	119.00 ± 0.711a
٤-٣	1	ab١٠١,٠٠±1.81	ab١١٢,٠٠±١,٢٩
more than 4	3	b٨٦,٦٦±12.41	bc٩٥,٣٣±١٢,٢٥
Significant		**	**
animal sex			



Mention	١٤	٨٣,٩٢±٢,٦٧	٧٧,٢٨±٢,٨١
Feminine	٣٥	٨١,٦٢±١,٨٢	80.80 ±٢,٤٧
Significant		n.s	n.s
wool color			
White	٣٦	٨٣,٣٣±١,٨٨	٨٠,٨٣±٢,٤٧
Red and black	٣	٧٣,٠٠ ±٦,٥٥	٧٦,٦٦ ±٩,١٧
black and white	٧	٨٠,٧١±٢,٥١	٨٠,٤٢±2.31
Black	٣	٨٢,٦٦±١,٤٥	٦٩,٠٠±٢,٠٨
Significant		n.s	n.s

The averages carrying different letters within the same column differ significantly among themselves.

* (P≤0.05), ** (P≤0.01), N.S: Not significant.

The results of the statistical analysis in Table (3), which shows the relationship between the influencing factors and the chemical properties of meat, showed significant differences (P≤0.05) in the effect of animal age on the pH, with the highest value reaching at the age of 1-2 years (6.07) and the lowest was at the age of 2. -3 years (5.02). (This study agrees with what Ibrahim (2017) found, where he recorded significant differences (P≤0.05) according to the different ages of the sheep sample studied.

While there was no significant relationship for the age of the animal with water carrying capacity, fiber diameter and fiber breakage index, where the arithmetic superiority of water carrying capacity recorded the highest value at 2-3 and 3-4 years old (150.00), respectively. While the diameter of the fiber recorded the highest value at the age of 1-2, as it reached (0.40), as for the index of fiber breakage, the highest value was at the age of less than one year (1.93). Also, the sex of the animal did not record any significant differences for the above traits for both sexes.

As for the color of the wool, no significant differences were seen between the colors under study for the pH and the fiber diameter, while significant differences (P≤0.05) were recorded for each of the water carrying capacity and the fiber breakage index, where the two highest values were recorded in the red and black sheep. (140.00 and 2.11 respectively).

Table (3): The relationship of factors affecting the chemical properties of meat.

Adjective Influencing Factors	number	mean ± standard erro			
		PH	water carrying capacity	loofah diameter	fiber breakage guide
animal age (year)					
less than one year	۳۹	a۰,۹۰±۰,۰۴	۱۳۲,۸۲±۲,۳۲	۰,۳۴±۰,۰۱	۱,۹۳±۰,۰۸
۲-۱	۵	a۶,۰۷±۰,۰۸	۱۲۶,۰۰±۲,۴۴	۰,۴۰±۰,۰۳	۱,۰۹±۰,۲۲
۳-۲	۱	۵,۰۲±۳,۱۰ b۰	۱۵۰,۰۰±۰,۹۷	۰,۲۴±۱,۷۲	۱,۶۲±۱,۹۵
۴-۳	۱	a۰,۷۴±۰,۶۲	۱۵۰,۰۰±۰,۹۱	۰,۲۷±۳,۷۱	۱,۵۵±۱,۹۰
more than 4	۳	a۶,۰۶±۰,۰۹	۱۴۶,۶۶±۱۲,۰۱	۰,۲۷±۰,۰۱	۲,۴۲±۰,۱۴
Significant	۴۹	*	n.s	n.s	n.s
animal sex					
Mention	۱۴	۵,۹۲±۰,۱۰	۱۳۲,۱۴±۴,۵۹	۰,۳۷±۰,۰۲	۱,۹۱±۰,۱۴
Feminine	۳۵	۵,۹۰±۰,۰۴	۱۳۴,۲۸±2.32	۰,۳± ۰,۰۱ ۲	۱,۹۱±۰,۰۸
Significant	۴۹	n.s	n.s	n.s	n.s
wool color					
White	۳۶	۵,۸۷±۰,۰۵	ab۱۳۵,۵۵±۲,۵۳	۰,۳۴±۰,۰۱	b۱,۹۸±۰,۰۸
Red and black	۳	۶,۰۳±۰,۱۶	a۱۴۰,۰۰±۱۱,۵۴	۰,۳۱±۰,۰۵	± ۰,۲۷ a۲,۱۱
black and white	۷	۵,۹۱±۰,۱۲	ab۱۲۷,۱۴±۲,۸۵	± ۰,۰۲ ۰,۳۲	ab۱,۷۸±۰,۱۷
Black	۳	۶,۱۹±۰,۱۶	b۱۲۰,۰۰± ۰,۱۵	۰,۳۲±۰,۰۵	b۱,۲۰±۰,۰۸
Significant	۴۹	n.s	*	n.s	*

The averages carrying different letters within the same column differ significantly among themselves.



* ($P \leq 0.05$), N.S: Not significant.

Through the results obtained from this study, we can point out that the age of the animal had a significant and clear effect in most of the studied traits, but the animal's sex had no significant effect in all the studied traits, and it was found that there was a significant effect of the color of the wool in each of the characteristics of netting ratio, water carrying capacity and fracture index. fiber in meat.

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