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Studying the relationship between a number of carcass traits and their regression on live weight in sheep

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Abstract

This study was conducted in Suq Al-Shuyoukh district, south of Thi Qar province, for the period from 5/11/2021 to 8/5/2022 on a sheep sample consisting of 49 local Iraqi sheep (Arabi) from one of the private sector herds.The study included slaughtering sheep in a butcher's shop, recording the traits of the carcass and the weight of the thigh inside the shop, and then taking a sample of the thigh meat to study some of its chemical traits .Chemical tests were conducted on the meat sample in the laboratories of the Faculty of Agriculture and the Marshes of the University of Thi Qar, and the genetic material was extracted and genetic analysis was done in the laboratory of the Marsh Research Center at the University of Thi Qar. We reached the following results: The traits of hot carcass weight, carcass length, carcass diameter, and thigh weight showed a highly significant and positive correlation among them, while the rest of the traits differed in their correlations in terms of morality or in terms of being negative or positive. Through the results of the statistical analysis, it was found that the value of the regression coefficient for the characteristics of hot carcass weight, carcass length, thigh weight, dressing percentage, pH of meat, and muscle fiber diameter on the live weight of the animal was positive (except for the dressing percentage) and highly significant ($P \leq 0.01$).

I. INTROCUCTION

Sheep is one of the sources of livestock in Iraq and many countries of the world and contributes a great deal to solving the problem of animal protein deficiency and represents a large part of the agricultural national income (Ministry of Agriculture, 2012). The importance of sheep is highlighted where being one of the farm animals with productive qualities in Iraq, as well as cows, buffaloes and goats as a source of meat, wool and milk. The Iraqi sheep are of the genus of Asian sheep with a broad mechanism and include three breeds: Awassi, Arabi and Karadi, whose numbers have decreased from what it was in the past few years, due to the unstable conditions in which Iraq lived (FAO, 2019), It is raised and lives on the margins of agriculture and natural pastures and feeds on what is left behind in the cultivated lands, so its production and fertility are low, which requires promoting and developing the means of breeding and developing them using scientific methods and modern technologies (Salman and Abdallah, 2014). Improving the productive performance of the sheep

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breed in southern Iraq, under the conditions of traditional breeding, faces difficulties resulting from lack of nutrition, due to the deterioration and lack of natural pastures, drought and the spread of diseases, or due to heat stress resulting from high temperatures, as well as the difficulty of using means of genetic and physiological improvement and modern technologies. Which led to a decline in their performance (Ishaq and Ajil, 2013). In recent years, significant progress has been made in sheep breeding, but it is too slow to improve the quality of production performance before genetics and molecular markers applications become an accessible technology with wide applications that increase the accuracy and quantity of genetic improvement in breeding methods (Gao et al., 2007 and Pareek et al., 2011 and Jaayid, 2013).Softness, juiciness and flavor are among the qualitative traits that affect consumer acceptance of meat and its products, and it is one of the most important qualities that make meat more palatable.

II. MATERIALS AND METHODS

This study was conducted in Suq Al-Shuyoukh district, south of Thi Qar provainc, for the period from 5/11/2021 to 8/5/2022 on a sample of 49 animals taken from one of the local herds in the region and from local Iraqi sheep (Arabi).The slaughtering process was coundected (according to the Islamic method used in Iraq), taking into account the measurement of the weight of the live animal before slaughter and recording it as one of the traits included in the study, then the weights of slaughter residues were taken and the characteristics of the carcass were recorded. The carcasses of the experimental animals were weighed after the animal was slaughtered, the head and legs were separated from the carcass, the skin and wool were flayed, and all the contents of the carcass were empty, including the digestive system, reproductive system, lungs, heart, kidneys, spleen and bladder.

The dressing percentage was calculated by dividing the weight of the hot carcass after slaughter by the weight of the live animal at slaughter

dressing percentage = (hot carcass weight / live animal weight) x 100

The thigh weight of the carcass was measured after the slaughter process and the separation of the thigh from the other parts by a digital electronic scale.

The length of the carcass was taken from the shoulder joint to the end of the pin bone by means of a tape measure.

The diameter of the carcass was measured at the anterior ribs of the chest by turning around the ribs using the included measuring tape.

pH measurement

The weight of 2 g of meat sample was calculated using a sensitive balance with 20 ml of distilled water and then the pH was estimated using a Korean-made PB-11 Sartorius digital pH meter. This method was performed according to A.P.H.A. (1984). Attken et al. (1967)

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Measurement of water holding capacity

A sample of meat with a weight of 10 g was taken and 20 ml of distilled water was added to it. The sample was mixed with water well and left for 5 minutes, then it was placed in a beaker containing filter paper and left for 30 minutes until it was completely dried, and then the remaining water was calculated.

$$\text{water holding capacity}=\frac{Weight\ of\ initial\ solution - weight\ of\ final\ solution}{Meat\ sample\ weight}\times 100$$

III. RESULTS AND DISCUSSION

Table (1) indicates the average of the important studied traits on Al-Arabi sheep in southern Iraq, as well as the value of the standard deviation for each trait, with a statement of the lowest and highest values for each trait to clarify the extent to which these traits appeared in this study ,We may notice a high range between the highest and lowest reading due to the difference of the experimental animals in terms of age and gender, which are the two factors that were entered into the mathematical model of the experiment to reduce the experimental error.

Table (1) The general average of the study traits in the Al-Arabi sheep

highest reading	less reading	standard deviation (SD)	Average	number	traits
٢٧,٠٠	٧,٠٠	٤,٠٨	١٦,٨٦	٤٩	hot carcass weight (kg)
١١٠,٠	٦٠,٠٠	١٠,٥٦	٨٢,٣٢	٤٩	carcass length (cm)
١١٩,٠	٦٤,٠٠	٤,٠٨	٧٩,٨٥	٤٩	carcass diameter (cm)
٧,٠٠	١,٠٠	١,١٣	٢,٩٠	٤٩	thigh weight (kg)
٠,٥٦	٠,٤١	١٣,٧٦	٤٣,٨٣	٤٩	dressing percentage (%)
٦,٥١	٥,٠٢	٠,٣١	٥,٩٠	٤٩	pH
١٧٠,٠	١١٠,٠	١٤,٦٧	١٣٣,٦٧	٤٩	

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					water-holding capacity
٠,٦١	٠,١٥	٠,٠٩	٠,٣٣	٤٩	**Muscle fiber diameter (µm)**
٢,٩٦	١,٠٢	٠,٥٠	١,٩١	٤٩	**Myofibril Fragmentation index**

Through the results of the correlation coefficient of the economically important traits in this study (Table 2), we note that the hot carcass weight was significantly (P≤0.01) and positively correlated with each of the traits of carcass length and diameter and thigh weight at varying rates (0.63, 0.36 and 0.59).respectively While the correlations of hot carcass weight with each of the dressing percentage and fiber breakage index were negative and not significant, and it was positive and insignificant with each of the pH of meat, water holding capacity in the muscle and the diameter of the muscle fiber. As for the traits of carcass length, it was highly, positively and morally correlated (P≤0.01)) with each traits of carcass diameter (0.60) and thigh weight (0.47), and it was not significant and negatively associated with the two traits of the dressing percentage (0.19) and fiber fracture index (-0.05) and not significant and positive with the rest of traits (pH, water holding capacity and muscle fiber diameter).The traits of carcass diameter is highlighted in the same table as being the most significantly correlated trait (P≤0.01) with all studied traits, with medium to high values, which reached the highest in its association with dressing percentage trait (0.61) and the lowest with the traits of muscle fiber diameter (-0.36), except for its insignificant association with Low and negative fiber breakage index (-0.20).With the exception of traits of carcass weight, length and diameter, the values of the correlations of thigh weight with the rest of the studied traits were not significant (negative and positive) and ranged from -0.2 to 0.12. As for the traits of the dressing percentage, it showed a high and significant correlation (P≤0.01) and it ranged between negative and positive with each of the traits of the carcass diameter (0.61) pH (- 0.60), water holding capacity (0.49), muscle fiber diameter (- 0.66) and muscle fiber fracture index (0.47) were not significant with the other studied traits.Also, from following the correlation table, we refer to the significant correlation (P≤0.01) for the pH traits with the two traits of water holding capacity, which amounted to -0.43, and the diameter of the muscle fiber, which amounted to 0.41 and also to the highly significant (negative) correlation of the traits of water holding capacity with the diameter of the muscle fiber, as well as the highly significant correlation of the characteristic of the diameter of the muscle fiber with the fracture index of muscle fibers, which is -0.39.In a study on Awassi sheep, Al-Nadawi (1991) mentioned that most of the correlations between traits of the carcass he studied (including the hot weight of the carcass, the percentage of dressing and the carcass cuts) were positive and significant, and ranged between 0.24 to 0.88, and they agreed at that time with many other studies (Khan and Bhat, 1980). Al-Hilali,

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1982).In general, the correlation between traits is due either to the phenomenon of the multiple effect of a gene (pliotropic), by the influence of one gene or a group of genes on more than one trait at the same time or to short the crossing distance between genes that affect more than one trait, which increases the linkage.The importance of the relationship between traits is highlighted to their role in the process of genetic improvement and selection for more than one trait (Jalal and Karam.1986).

Table (2): Pearson's simple correlation between the important traits in the study

Myofibril Fragmentation index	Muscle fiber diameter (µm)	water-holding capacity	pH	dressing percentage (%)	thigh weight (kg)	carcass diameter (cm)	carcass length (cm)	carcass weight (kg)	traits
ns ٠,٢٠ -	٠,٢٦ ns	n٠,٠٨ s	٠,٢ ns ١	ns ٠,٠٩-	٠,٥٩ **	*٠,٣٦ *	٠,٦٣ **	١,٠٠	**carcass weight (kg)**
ns ٠,٠٥ -	٠,٢٢ ns	٠,٠٠ ns	٠,٠ ٠٥ ns	٠,١٩ - ns	٠,٤٧ **	*٠,٦٠ *	١,٠٠	-	**carcass length (cm)**
ns ٠,٢٠ -	- *٠,٣٦ *	*٠,٣٨ *	- ٠,٥ ** ٠	** ٠,٦١	٠,٥٠ **	١,٠٠	-	-	**carcass diameter (cm)**
ns ٠,٠٢-	٠,٠٧- ns	٠,٢٥ ns	- ٠,٠ ns ٨	ns٠,١٢	١,٠٠	-	-	-	**thigh weight (kg)**
**٠,٤٧	٠,٦٦ - **	*٠,٤٩ *	- ٠,٦ ** ٠	١,٠٠	-	-	-	-	**dressing percentage (%)**
ns ٠,٢٦ -	٠,٤١ **	٠,٤٣ - **	١,٠ ٠	-	-	-	-	-	**pH**
ns٠,٢٤	٠,٤١ - **	١,٠٠	-	-	-	-	-	-	**water-holding capacity**
** ٠,٣٩-	١,٠٠	-	-	-	-	-	-	-	**Muscle fiber diameter (µm)**

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١,٠٠	-	-	-	-	-	-	-	-	**Myofibril Fragmentation index**

It is clear from Table 3 that the value of the regression coefficient for six of the traits under study on the live weight of the animal was positive (except for the dressing percentage) and highly significant ($P \leq 0.01$), and it included both traits of hot carcass weight and carcass length and thigh weight, dressing percentage, pH of meat and muscle fiber diameter, whose regression values on the live weight of the animal were 0.45 kg/kg, 0.87 cm/kg, 0.08 kg/kg, -1.0%/kg, 0.012/kg, and 0.004 microns/kg, respectively.The remaining three traits had a non-significant regression and included the traits of carcass diameter, water holding capacity and muscle fiber fracture index. These values of the regression coefficient can be used in prediction equations by predicting the traits of the carcass studied above through the trait of the live weight of the animal before slaughter. We can also conclude from these values that we can predict an increase in the hot carcass weight (0.45 kg), the length of the carcass (0.87 cm), the thigh weight (0.08 kg), the dressing percentage (1.0%), the pH (0.012) and the diameter of the fiber (0.004 microns).) for each increase of one kilogram in the weight of the live animal at slaughter, depending on the definition of the regression coefficient, which states that: the average change in the dependent variable (Y) (here are the characteristics of the carcass studied) that accompanies the change by one unit in the independent variable (X) (This is the description of the weight of a live animal at slaughter) (Jalal and Karam, 1986)

Table (3): Regression coefficient of the studied traits on the trait of live weight at slaughter (kg)

Coefficient of determination (R^2)	**intercept**	**Regression coefficient on live weight (b)**	**Variables**
0.82	٠,٢٠٨	0.450**	**hot carcass weight (kg)**
0.47	٤٩,٨٨	0.877**	**carcass length (cm)**
0.06	64.10	0.426 NS	**carcass diameter (cm)**
0.34	- 0.119	0.081**	**thigh weight (kg)**
0.12	61.14	- 1.00**	**dressing percentage (%)**
0.11	5.434	0.012**	**pH**
0.001	131.08	0.070 NS	

			water-holding capacity
0.14	0.178	0.004**	**Muscle fiber diameter (µm)**
0.06	2.511	- 0.016 NS	**Myofibril Fragmentation index**
: (P≤0.01) ,** : : Not significant NS			

We conclude that the traits of carcass dimensions, weight and thigh weight showed a highly significant and positive correlation among them, while the rest of the traits varied in the significance of their correlations.Also, the value of the regression coefficient for the characteristics of hot carcass weight, carcass length, thigh weight, dressing percentage , pH of meat and muscle fiber diameter over the live weight of the animal was positive (except for the dressing percentage) and highly significant (P≤0.01).

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