Mesopotamia Journal of Agriculture

https://magrj.mosuljournals.com

PERFORMANCE OF KARADI SHEEP IN KURDISTAN REGION/IRAQ: A REVIEW

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Article information
Article history:
Received:28/11/2022
Accepted:17/12/2022
Available:31/12/2022

Keywords:
Fattening, Karadi sheep, Milk production.

DOI:
https://10.33899/magrj.2022.137141.1207

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ABSTRACT

The Karadi sheep which comprises about 18-20% of the country sheep population is native to the northern mountain villages and undulating dry-farming plains of Kurdistan region. Rams and ewes are polled, and it is fat tailed animal with an excessively large tail that ends in a thin nonfat terminal extended beyond the fat lobs. The sheep are white with black open face and pendulous ear. The black color often extends to the shoulders and other parts of the body. All Iraqi sheep including Awassi, Arabi and Karadi were exposed over a long period of time to the rigorous and sever semi-dry condition, drought, feed shortage and prevailing disease. Hence their adaptation to the conditions of the country was at the expend of important economic traits. Karadi sheep is hardy with potentials for improvement, their weight and milk display over whelming ranges. In addition, hormonal treatment have improved their reproduction performance, as well as crossing them with other native and exotic breeds is promising. Nevertheless, this breed is not well characterized and much work is needed to explore the potential of this breed for economic traits.

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INTRODUCTION

Sheep are considered the most important livestock in Iraq, and the greatest portion of income comes from the sale of lambs and mutton. Moreover, sheep production in the country will be continued to maintain its importance in the future due to the increasing the human population, and the increasing the demand for meat production (Juma and Alkass, 2000). The Karadi (Kurdi) breed of sheep which comprise about 18-20% of sheep population is native to the north eastern mountain villages and undulating dry-farming plain of Kurdistan region of Iraq (Alkass and Juma, 2005).

Unfortunately, this important genetic resources breed is uncharacterized well until recently. Therefore, the present review was prepared to provide some basic information in this breed. Such information of importance to research workers, genetic resources and student of animal production.

Appearance

Karadi sheep are white with black open face with no Roman profile and pendulous ears. The black color often extends to the shoulders and other parts of the body. Rams and ewes are polled. Occasionally, two wattles are found under the throat. It is a fat tailed animal with an extensively large tail that ends in a thin nonfat terminal

extended beyond the fatty lobes (Alkass and Juma, 2005).

Birht and weaning weight

It is well known that growth is considered a very important characteristics of animal for meat production, and the survival and growth of young lambs depends largely on their birth weight and the milking ability of their dams (Eliya and Juma, 1970). Birth weight of Karadi sheep vary between 3.96 and 4.99 kg in males and 3.70 and 4.42kg in the female (Table 1). Similarly, weaning weight varied between 17.1 and 26.9 kg in males and 16.2 and 24.4 kg in the females. Differences in birth and weaning weights could be due to sex, lamb type of birth age of dam and season of lambing.

Table (1): Birth weight and weaning weight (kg) of Karadi ewes.

Birth weight Kg				**Weaning weight Kg**				Reference
Male		Female		Male		Female		
No	weight	No	weight	No	weight	No	weight	
28	4.99	33	4.42	22	26.9	30	24.4	Kutaibani , 1981
33	4.36	32	3.70	32	23.6	26	21.2	Al-Hassan, 1985
31	4.55	43	4.29	31	19.5	43	22.2	Imam and Mohammed, 1986
53	3.96	45	3.82	40	17.1	32	16.2	Mohammed *et al*, 1987
57	4.63	45	4.33	45	21.6	52	19.7	Mohammed, 2008
127	4.72	130	4.35	101	19.8	94	18.4	Oramari, 2009

Fattening characteritics

The daily gain in weight as well as carcass traits is considered the most important traits of feedlot performances and is clearly desirable husbandry and economic objective in lamb production.

Daily gain in weight and some carcass traits are summarized in Table 4. It seems from the table that daily gain ranged between 0.140 to 0.267 kg/day, which is attributed to genetic differences between individuals, and to several other influencing factor including different fattening periods, rations and regimes, as well as the different ages and initial weight of lambs.

Work carried out by Alkass *et al.* (1987) on crossing Awassi (A), Karadi (K), A×K, K×A, Hamdani (H) H×A, H×K, Chios (C) C×A and C×K demonstrates some of the advantages of crossbred lambs over their parent, including an improvement in daily gain in weight. Dressing percentage was depressed among progeny of Chios ram and Awassi and Karadi ewes, but this cross yielded higher percentages of major carcass cuts and lower percent of fat tail.

An experiment was undertaken to study the growth performance and carcass composition of Awassi (n=8), Karadi (n=8) and their crossbred (n=8), raised under two feeding level (Ad-libitum vs, 4%of their body weight) and slaughtered at 45 kg. Results revealed that neither breed nor level of feeding affect daily gain, dressing percentage and rib eye area. However, Awassi lambs had significantly thicker fat than Karadi and crossbred lambs, which shows that crossbred carcasses were significantly leaner than Awassi and Karadi (Table 2). In a fattening trail using two rations for 138 days and encountering Awassi and Karadi crossbred lambs, 17 weeks of age, obtained from reciprocal crossing, daily gain in weight, dressing percentage

and body dimensions cannot appreciably different between crossbred (Abou-Hussein *et al.* 1976).

Table (2): Some fattening and carcass traits of Karadi ewes.

No.	Slaughter Wt.kg	Daily gain Kg	Dressing %	Rib eye area cm^2	Fat thickness mm	Lean %	Fat %	Bone %	Refence
27	37.9	0.250	48.6	11.2	2.6	62.5	18.6	18.7	Sefdeen and Alkass, 2009
20	45.8	0.20	53.6	14.7	3.9	n. a.	n. a.	n. a.	Al-Rubeii and Zahir, 2012
A*8	45.2	0.210	50.2	12.5	3.3	57.7	22.4	19.8	Alkass and Hassan, 2014
K*8	45.9	0.230	49.6	12.3	2.2	61.0	19.1	19.7	Alkass and Hassan, 2014
AxK8	45.9	0.210	49.2	13.7	2.2	61.8	18.2	19.9	Alkass and Hassan, 2014
14	35.3	0.140	44.4	12.0	0.37	n. a.	n. a.	a. n.	Dosky *et al.*, 2014
9	42.1	0.230	52.9	11.6	2.4	59.8	19.7	20.3	Alkass and Kak 2015
14	35.0	n. a.				63.9	14.8	21.2	Alkass *et al.*, 2015
16	37.7	0.168	46.4	13.0	2.0	55.3	20.1	24.2	Mohammed *et al.*, 2018
15	40.2	n. a.	47.2	12.3	2.01	59.4	20.1	20.3	Mahmood *et al.*, 2018
12	26.8	n. a.	49.0	10.0	5.0	n. a.	n. a.	n. a.	Omar *et al.*, 2019
32	38.2	n. a.	44.9	13.9	1.79	n. a.	n. a.	n. a.	Karym *et al.*, 2019
12	30.0	0.256	45.6	11.5	1.7	62.7	14.0	23.1	Al-Sherwany and Alkass, 2021
13	39.8	0.21	41.2	11.6	2.4	59.2	17.8	21.7	Khalaf and Oray, 2021
16	39.9	0.267	45.7	15.1	2.4	n. a.	n. a.	n. a.	Al-Sherwany and Alkass, 2021
16	30.0	n. a.	45.9	11.2	2.0	61.3	13.9	24.7	Al-Sherwany and Alkass, 2022

n. a. Not available *A: Awassi, K: Karadi

Milk production

Ewes lambing are allowed to suckle their lambs for 3 months, after which they are milked once a day until weaning at four months, and thereafter are milked until dry off. The milk is partially consumed by farmers, the remaining milk being sold after manufactured as in the form of ghee, yogurt and cheese.

Milk production from Karadi ewes displays considerable variation among different limited studies which are carried out. The range being between 59.2 to 126.3 kg during a period of 84 to 168.7 days (Table 3). Such variation could be due to differences in genetic makeup of ewes, management practices and specially availability of feed as well as method of estimating milk. Hence, it was found that estimates of daily milk yield by hand milking and suckling (HS) was significantly higher by suckling and hand milking (1128.24 gm) and concluded that depending only on milking will not express the genetic potential of Karadi ewes (Baker *et al.*, 2009).

Table (3): Milk yield and lactation period of Karadi ewes.

No.	Milk yield (kg)	Lactation period (days)	Reference
45	91.6	105	Kutaibani, 1981
68	59.2	112	Mohammed, 1982
29	96.1	112	Al-jalili and Alwan, 1988
40	61.08	52	Dosky, 2008
206	61.1	n. a.	Oramari, 2009
12	105.5	90	Baker *et al*, 2009
87	49.4	87	Al-Samarrae, 2009
32	126.3	168.7	Alkass and Akreyi 2016
24	98.3	87	Alkass *et al*, 2017

n. a. Not available

Udder measurements

The udder width, udder length, udder circumference, udder high from the floor, left teat diameter, right teat diameter, left teat length, right teat length and distance between teats averaged 10.02, 12.16, 36.28, 32.47, 1.95, 1.97, 3.03, 307 and 10.75 cm, respectively. None of the correlation between milk yield and udder measurement were significant in Karadi ewes (Akreyi, 2015).

To predict total milk yield from daily test-day milk, based on multi regression equation by using maximum R-square improvement the following equation is: recommended.

TMY = 44763 79.7 TDMY3 (Alkass *et al.*, 2016).

Milk composition

Milk components are varies according to numerous factors the most important include genetic and nutrition, milk fat , protein, lactose, total solids and solid non-fat of Karadi milk range between (4.8-7.2%), milk protein (4.9-5.7, 4.3- 4.7, 16.4-17.0 and 9.8 and 15.9% such variation could be due to genetic makeup, feeding practices, and how sample were taken during lactation (Table 4).

Table (4): Milk composition of Karadi ewes.

No	Fat %	Protein%	Lactose %	TS %	SNF%	Reference
107	4.8	5.4	4.3	16.4	n. a.	Ridha, 1979
68	7.2	n. a.	n. a.	17.0	9.8	Mohammed, 1982
40	3.84	4.99	4.77	n. a.	n. a.	Dosky, 2008
644	5.2	5.7	4.5	16.4	11.2	Oramari, 2009
12	5.3	4.9	4.7	10.5	15.9	Baker *et al.*, 2009
12	5.0	5.4	4.4	15.8	10.7	Alkass and Merkhan, 2012

n. a. Not available

Grease fleece weight and the physical properties of wool

Wool production is used in the carpet industry, and it is of minor importance to farmers. Wool produced by Karadi sheep is considered the coarsest wool as compared to other native sheep (i.e. Awassi and Arabi). Wool production, expressed

as average grease fleece weight from Iraqi sheep is low, yet average fleece weight in Karadi sheep ranged between 1.37 and 2.43 Kg (Table 5). The wide range displayed by the various physical traits of Karadi wool are illustrated in Table 5.

It is worth to note that percent wool wax in Karadi wool is very low (4.17%) as compared to other fine and medium wool types. Hama (2007) in her study demonstrated that sex, age of animal and flock and the ewe status affect significantly the grease fleece weight, clean wool percentage, staple and fiber length and fiber diameter.

Table (5): Fleece weight and some physical properties of wool in Karadi sheep.

No.	Staple length Cm	Fiber length cm	Fiber diameter µm	% kemp	% Clean wool	Crimp /cm	Fleece Wt. Kg	References
168	19.3	23.5	48.1	19.5	19.5	2.4	n. a.	Ghoneim *et al*, 1974
32		22.9	30.7	9.5	46.1	n. a.	1.45	Al-Azzawi 1977
22	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	2.43	Al-Nidawi 1980
32	n. a.	22.92	30.70	n. a.	n. a.	n. a.	n. a.	Ashmawy and Al-Azzawi, (1982)
69	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	1.37	Fahim 1985
53	n. a.	n. a.	n. a.	n. a.	n. a.	n. a.	2.10	Sabbagh *et al*, 1986
12	n. a.	14.83	40.69	n. a.	n. a.	n. a.	n. a.	Guirgis *et al.*, 1987
173	9.06	12.8	30.8	8.15	78.4	1.41	1.71	Hama, 2007
12	`9.89	n. a.	n. a.	6.13	57.79	n. a.	2.26	Khoshnaw and Hussein, 2014
n.a.	n. a.	18.3	36.1	n. a.	67.9	n. a.	1.64	Zinalabidin and Öztürk, 2017

n. a. Not available

Wool follicle numbers was determined in 15 Karadi ewes by Hama (2007). The examination of skin specimen from 4 region (anterior side, mid side, posterior side and mid of the back) revealed that wool follicles are arranged in groups of one, two or three primary follicles, and the average number of primary and secondary follicles and S/P ratio is 4.30, 13.26, and 3.20 respectively, and mid side could be considered as represented due to high correlation ($P<0.01$) with overall mean.

Some reproductive aspects of karadi sheep

Puberty of ram and ewe lambs

To investigate the effect of two dietary protein levels (12 vs 16%) and age on testicular development and ultrastructure in Karadi ram lambs, Alkass *et al*, (2013) demonstrated that body weight gain and testicular growth rate was increased significantly ($P<0.05$) linearly between 6 to 11 months of age. Sperm was observed

in the lumen of the testicular seminiferous tubule for the first time when the ram lambs were 6 months old. However, the physiological puberty was attained approximately at the age of 10 months.

When 30 Karadi ewe lambs, 6 months old were divided randomly into two groups and allocated two dietary protein level (12 vs 16%), Pedawy and Alkass (2011) demonstrated that age and body weight at puberty averaged 235 days and 35.46 kg, respectively, and both of them were not affected significantly by protein level.

Previously, it was noted that age at puberty of Karadi ewe lambs was 286.2 day (Al-Hassan, 1985). It appears that glucose was positively correlated with weight at puberty (0.247) ($P<0.05$) and insulin was positively correlated with body weight (0.328) ($P<0.05$), but negatively with age at puberty (-0.439).

Unfortunately, very limited work has been carried out on the reproductive aspects in female Karadi sheep.

Semen quality

Assessment of semen quality in Karadi ram has been undertaken and results obtained are given in Table 6.

Although, native rams manifest libido throughout the year, libido and semen quality vary with season and usually semen quality is best during May to June.

Table (6): Semen characteristics of Karadi lambs.

Ram	Barwary, 2008	Karym, 2014
Live sperm %	77.59%	75.9
Volume ml	1.53 ml	0.97
Mass activity. %	4.32 *	77.60 **
Individual motility %	76.1	82.60
pH	6.81	9.07
Concentration	2.669×10^7 ml	9.262×10^6 ml

* The score is 0-5

** As a percent of one hundred.

Muhammed, (2016) demonstrated that a significant improvement in fertility rate, conception rate, lambing rate and litter size resulted from synchronized estrus of Karadi ewes and injected with eCG or kisspeptin as compared to control group. (Table 7).

Furthermore, in a survey study of Karadi sheep flocks it was noted that fertility rate, conception rate, lambing percent and litter size was amounted to 84.5%, 90.2% , 86.5% and 1.02, respectively (Alkass and Mayi, 2011).

Table (7): Reproductive performance of Karadi ewes treated with eCG and kisspeptin.

Traits	Control	eCG	Kisspeptin
Fertility rate (%)	30	80	90
Conception rate (%)	30	80	90
Lambing rate (%)	30	80	90
Litter size	1.00	1.25	1.10

Gentic studies of economic traits

Limited studies on genetic variations of quantitative traits of Karadi sheep are available. The estimates reported by Shukor (1989) and Oramari (2009) based on small numbers of observations are presented in the Table 8.

Table (8): Genetic variations of quantitative traits of Karadi.

Traits	Shukor, 1989		Oramari, 2009	
	No.	h^2	No.	h^2
Birth Wt.	257	0.52	245	0.18
Weaning Wt.	195	0.25	100	0.10
Wt. at six month	155	0.18	51	0.03
Daily weight gain (birth–weaning)	n. a.	n. a.	100	0.17
Daily weight gain (birth–6 month)	n. a.	n. a.	51	0.10

CONCLUSION

Since characterization of this important breed is not well documented, therefore, much work is needed in the different aspects including new technologies such as accelerated lambing, more effective reproduction management, improved feeding system and low cost health management as well as the use of genetically improved animals to produce more meat and milk.

ACKNOWLEDGMEN

The authors are very grateful to the University of Duhok, College of Agricultural Engineering Sciences for their provided facilities which helped to improve the quality of this work.

CONFLICT OF INTEREST

The authors certify that they have no affiliations with any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

أداء النعاج الكرادية في إقليم كوردستان / العراق

جلال إيليا القس كمال نعمان سيف الدين مصطفى إبراهيم اسود بكر

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الخلاصة

تشكل الأغنام الكرادية حوالي ١٨-٢٠٪ من مجمل الأغنام العراقية وتتواجد في المناطق الجبلية والسهول الواقعة في أقليم كوردستان وتعود الى اغنام ذات الذيل العريض (الالية) كما تصنف ضمن اغنام صوف السجاد، وتتصف هذه الكباش والنعاج بانعدام القرون في كلا الجنسين وذات الية كبيرة الحجم ورأس هذه الأغنام اسود واذان طويلة. وقد يمتد اللون الأسود الى منطقة الكتف وبعض أجزاء الجسم الأخرى. والاغنام العراقية (العواسي والكرادي والعرابي) قد تعرضت على مدى السنين ولفترات طويلة الى ظروف بيئية قاسية كالجفاف ونقص الغذاء والامراض وهذا التأقلم لمثل هذه الظروف كان على حساب الصفات الاقتصادية الهامة.

تتصف الأغنام الكرادية في كوردستان العراق بمقاومتها للظروف البيئية القاسية ولها القابلية على التحسين أذ أن مديات أنتاقها من اللحم والحليب واللحم واسعة، كما أن المعاملة الهرمونية قد أدت الى تحسين أدائها التناسلي أضف الى ذلك بان التضريب مع السلالات المحلية أو الأجنبية ذات نتائج مشجعة. وعلى اية حال فأن خصائص هذه الأغنام غير مدروسة جيدا والأمر يتطلب الى مزيد من العمل لتوصيفها.

الكلمات الدالة: اغنام الكرادي, الأداء التناسلي, انتاج الحليب

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