



Effect of Different Management Systems on Growth and Carcass traits of Post Weaned Male Kachhi Lambs

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Abstract | The experiment was performed to evaluate the effect of different management systems on growth traits and carcass characteristics of male Kachhi lambs. A total of 18 post weaned male lambs having three months of age were distributed into two groups (A & B), comprising nine lambs in each group. The lambs of group A & B were kept under intensive and semi-intensive management systems respectively. Initially the lambs were provided 15 days adaptation period, followed by 12 weeks experimental period. The average final body weight was recorded higher ($P < 0.05$) in group B lambs as compared to group A lambs. Moreover, the higher ($P < 0.05$) significant difference was also observed in body conformation with regards to body girth, length, and height of lambs in group B as compared to lambs of group A. The carcass weight and weights of neck, shoulder, thorax, loin and flank, legs, kidneys, and weight of liver of lambs in group B was recorded significantly ($P < 0.05$) higher than the lambs of group A managed under intensive and semi-intensive management systems respectively. Based on the present study, it was concluded that weight gain, body length, chest girth and height at withers were significantly increased in the lambs of group B kept under a semi-intensive management system as compared to lambs in group A reared under intensive management system.

Keywords | Kachhi lambs, Management Systems, Growth traits

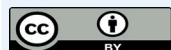
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INTRODUCTION

Pakistan ranked 11th in the world with the population of 31.6 million sheep (FAO, 2019). The national economy benefits from 60,837 thousand skins and 765 thousand tons of mutton meat produced by these animals each year (GOP, 2020-21). Sheep are one of the earliest meat-domesticated animals and have been raised for food and subsistence for (Haque et al., 2013). In Pakistan, as a part of large farm operations sheep frequently are reared under intensive, semi-intensive and extensive production systems of small to medium size flocks (Farooq et al., 2017). The extensive

production system also called as a nomadic system which prevails in the Thar desert and Kohistan regions depends mainly on native rangelands as the principal feed resources, mostly in winter and spring seasons (Isani and Baloch, 1996). Appropriate diet and management are essential for a healthy animal's optimal growth and development, higher weight growth and good feed intake are well-known influences on rapid return in sheep farming (Daskiran et al., 2010). For optimal growth response and better economic returns, a balanced ration with the proper feeding schedule is required. Small ruminants need more frequent feeding than large ruminants due to their high basal metabolic rate (Farooq et al., 2017). In Pakistan as a part of large farm

operations, lamb meat is growing more popular due to its lower fat level when compared to beef, and the consumer market is rapidly seeking healthier meals. The lamb red meat is considered as a major source of high-quality proteins, vitamins, minerals, essential amino acids and marbling fat as compared to other meats (Moreno et al., 2015). The lamb meat is naturally tendered and mild in flavor. The carcass represents that portion of the animal which is left after the separation of the head, feet, skin and viscera except for the kidney and kidney fat (Johnson and McGowan, 1998). In most of the technologically and socially advanced countries of the world, lamb meat is preferred over any other meat, because of its nutritionally complete protein diet and amino acids in proper ratio and naturally tendered and mild in flavor (Johnson and McGowan, 1998). Sheep comparatively have six months age fed high energy diets and sufficient quantity of better-quality meat may be quite limited to produce finished carcass (Ahmed and Cheema, 1982). In Pakistan two types of sheep breeds are mostly found (fat-tailed and thin-tailed). More than one dozen sheep breeds are present in Sindh province, among which Kachhi sheep is thin tailed multipurpose (mutton, milk, and wool) type sheep breed mostly found in the District Tharparkar and adjoining desert areas of Sindh. They are medium sized with a white body coat and a brown or blackish face, neck, legs, and stumpy head (Tahir, 2005). The description of the Kachhi breed available in the literature, researchers have done is very shallow and limited studies. The valuable traits of Kachhi sheep breed are not investigated so far and very little information is available in the scientific literature. The strategies for feeding the growing and finishing lambs generally vary with the available feed resources (Carrasco et al., 2009). In the modern world concept, integration of all possible resources is gaining more importance and commercially prepared feeds proved to be more efficient and effective in boosting the growth rate of the growing animals. Thus, the present research was conducted on the growth and carcass traits of male Kachhi lambs under two management systems, so that appropriate management system could be advised for improved sheep production.

MATERIALS AND METHODS

Eighteen male Kachhi lambs having approximately three months of age were kept on fattening trial under two different management systems (intensive and semi-intensive). Before the start of experiment, the lambs were provided 15 days adaptation period, thereafter the lambs were kept for 12 weeks of the experimental period. The selected Kachhi lambs were distributed into two groups (A & B). Group A comprising of nine male Kachhi lambs were reared under the intensive management system. They were provided green fodder in the morning and concentrate supplement

in the evening time (Zero grazing). While, nine male Kachhi lambs were kept in group B and reared under the semi-intensive management system and were offered grazing in the morning and concentrate ration at evening time. The fresh and clean drinking water was provided *ad libitum* to lambs of both groups. After completion of the fattening trial three lambs from each group were slaughtered to assess carcass characteristics.

GROWTH TRAITS OF MALE KACHHI LAMBS

Initial, weekly, and final body weights of all male Kachhi lambs were taken by using electrical weighing machine (Yameto, China). Chest girth, body length and height at withers were measured with the help of plastic measuring tape.

CARCASS CHARACTERISTICS

Pre-slaughter weight of all male Kachhi lambs kept in group-A and B was taken by using electrical weighing balance (Yameto, China). For recording the carcass parameters after slaughtering of lambs, carcass weight, weights of neck, shoulder, thorax, loin, flank, and legs were taken with the help of an electrical weighing machine. Moreover, weight of edible organs; liver and kidneys were also recorded.

DATA ORIENTATION AND STATISTICAL ANALYSIS

The collected data regarding the live body weight, body conformation and carcass characteristics were analyzed by using Statistix statistical software (version 8.1) to evaluate the significant difference among various variables under descriptive statistics and One-way analysis of variance.

RESULTS

GROWTH TRAITS OF KACHHI LAMBS

BODY WEIGHT

Significant influence of management systems and time interval has been observed on the weekly basis and final body weight of Kachhi lambs under both intensive and semi-intensive management systems. Average final body weight of male Kachhi lambs in group B (semi-intensive) provided open grazing and concentrate supplements were recorded higher ($P < 0.05$) as compared to the lambs in group A managed indoor (intensive) and fed with green fodder and concentrate supplement (zero grazing) (Table 1).

BODY CONFORMATION

Significant ($P < 0.05$) interactive influence of management systems has been observed on body conformation traits of Kachhi lambs (Table 2). Chest girth, body length and height of male Kachhi lambs in group B (semi-intensive management system) was recorded significantly ($P < 0.05$) increased than lambs of group A retained under (intensive management system).

Table 1: Body weight of male Kachhi lambs reared under two different management systems

Parameter (Kg)	Group A Intensive	Group B Semi-intensive	P- Value
Initial Body weight (x)	09.26±0.928	08.95±0.581	0.407
Final Body weight (y)	15.16±0.798	17.86±0.628	0.035
Total Weight gain (y-x)	05.90±0.403	08.91±0.478	0.023

Table 2: Body conformation of Kachhi lambs managed under two management systems

Parameter (Cm)	Group A Intensive	Group B Semi-intensive	P Value
Initial Chest Girth (x)	49.26±1.344	48.85±0.747	0.434
Final Chest Girth (y)	56.95±0.897	60.34±1.249	0.028
Total Girth gain (y-x)	7.69±0.582	11.49±1.098	0.023
Initial Body Length (x)	38.58±1.462	38.08±0.920	0.498
Final Body Length (y)	45.96±1.068	48.9±0.837	0.034
Total Length gain (y-x)	7.38±0.692	10.82±0.656	0.032
Initial wither height (x)	40.40±0.921	40.0±0.692	0.394
Final wither height (y)	47.02±0.729	49.24±0.608	0.043
Total wither height gain (y-x)	6.622±0.645	9.24± 0.638	0.029

Table 3: Carcass characteristics of male Kachhi lambs reared under two management systems

Parameter (Kg)	Group A Intensive	Group B Semi-intensive	P Value
1. Initial body weight	9.26±0.93	8.95±0.58	0.407
2. Pre-slaughter weight	15.16±0.72	17.86±0.50	0.037
3. Carcass weight	8.03±0.38	9.75±0.28	0.043
4. Weight of neck	0.85±0.07	1.01±0.06	0.033
5. Weight of shoulder	1.62±0.09	1.94±0.04	0.039
6. Weight of thorax	1.58±0.05	1.83±0.04	0.043
7. Weight of loin & flank	1.33±0.04	1.77±0.06	0.031
8. Weight of legs	2.02±0.07	2.45±0.05	0.035
9. Weight of Kidneys	0.29±0.02	0.34±0.01	0.039
10. Weight of Liver	0.32±0.03	0.38±0.01	0.025

Table 4: Economics of rearing of Kachhi lambs under intensive and semi-intensive management systems

Sr. No.	Particulars	Group A*	Group B*
1.	Quantity of concentrate feed offered (kg/animal)	23	23
2.	Rate of concentrate feed (Rs/kg)	40	40
3.	Total Amount of concentrate Rs/animal (1x2)	920	920
4.	Quantity of green fodder (kg/lamb)	360	-
5.	Rate of green fodder (Rs/kg)	4.00	-
6.	Total Amount of green fodder (4x5) Rs/lamb	1440	-
7.	Total feed cost (Rs. /lamb)	2360	920
8.	Labor cost/lamb	250	250
9.	Labor cost for grazing/lamb	-	500
10.	Cost of medication/ Vaccination/lamb	100	100
11.	Misc. cost/lamb	100	150
12.	Initial cost/lamb	4200	4200

13.	Total Costs/lamb	7010	6120
14.	Sale price/lamb	8600	9100
15.	Net profit (14-13) Rs/lamb	1590	2980

A* = Lambs reared on green fodder + concentrate

B* = Lambs reared on concentrate + grazing

CARCASS CHARACTERISTICS

The pre-slaughter body weight of male Kachhi lambs in group B (semi-intensive) was recorded higher ($P < 0.05$) as compared to lambs of group A (intensive). Similarly, the weight of carcass, weight of neck, shoulder, thorax, loin and flank, legs, kidneys and liver of animal in group B (semi-intensive) were observed statistically ($P < 0.05$) greater than animals retained under group A (intensive) (Table 3).

ECONOMICS

The total cost per lamb in group A was recorded higher than group B. The maximum net return was earned more in group B (semi-intensive) as compared to for the group A (intensive) (Table 4).

DISCUSSION

Management plays a significant role in body growth and carcass characteristics of small ruminants. Growth is an important characteristic of farm animals and may be defined as an increase in body size per unit time (Topal et al., 2004). The findings of the present research agreed in many aspects with the studies from the different parts of the world (Bushara, 2015), but feeding and management patterns adopted in Pakistan are not showing great advancements as compared to feeding and management patterns adopted in many parts of the world. Semi-intensive management system proved to be more economical and profitable among different management systems.

The results indicated that the average final body weight of male Kachhi lambs in group B offered concentrate supplement with open grazing was remarkably improved than the lambs in group A retained under stall feeding (green fodder+ concentrate supplements), this might be due to provision of both concentrate feed mixture and grazing which significantly increases live body weight as reported by Hossain et al. (2013) that the live body weight of kids could be improved by offering supplemental energy diet with grazing and for optimizing high growth level of dietary energy may be suggested. The high-energy diet combined with open grazing elevate growth traits in small ruminants rather than animals offered grazing only, or indoor feeding without grazing (Faftine and Zanetti, 2010). Sheep can utilize shrubs and other plant species superiorly, feed efficiency and weight gain are much better in sheep fed in open grazing as compared to confinement situations (Karim et al., 2014). The results of the current study also

agree with Vargas et al. (2015); Saghi et al. (2015); Huma et al. (2016); and Zayed et al. (2019) concluded that higher bodyweight gain was observed in lambs provided open grazing and concentrate supplements than those managed indoor (stall feeding). Proper look after and management in context to supply of quality feed stuffs, nature of concentrates and management significantly improved growth rate and live weight in fattening kids (Francesco et al., 2019). In the current study lower weight gain in lambs reared in intensive system might be due to the physiological factors, dearth of free movement and exercise in the restricted area produced stress which decreased feed intake resulting in low nutrient absorption and slower growth as stated by Aplocina & Spruzs, (2012). Thus, it could be concluded that combined feeding (concentrate supplement + grazing) proved to be a more beneficial feeding management system than the animal grazed only without high diet energy supplements or nourished on stall feeding management system (Belewaund and Olajide, 2010).

The present study further showed that chest girth, length, and height of male Kachhi lambs in group B reared under semi-intensive management system was recorded significantly ($P < 0.05$) higher than lambs of group A kept under an intensive management system. In the current study the animals offered grazing moved with freedom, which emphasized the significance of grazing of these lambs, though this welfare atmosphere was not available for lambs kept indoors in group A, so therefore for this reason their growth performance significantly improved as compared to animals managed indoors. Similar findings have been reported by Carrasco et al. (2009); and Huma et al. (2016) that in terms of girth, height, and length the average body conformation of lambs offered grazing and concentrate feeding was considerably ($P < 0.05$) greater than lambs kept indoor and provided green fodder and concentrate ration, results are further supported by consequences of (Memisi et al., 2012) revealed that management systems with different feeding strategies remarkably affected the growth and conformation of domestic Balkan goats. Same observations were recorded by Mourad et al. (2001) stated that heart girth, length, and height were significantly affected by different feeding and management systems. Iqbal et al. (2013) stated that for live body weight body length, withers height and heart girth were found best fit indicators. Yakubu et al. (2011) noted that for the conformation of live body weight of the animal the heart girth body measurement was the best indicator. Hassen et al. (2014) con-

cluded that better performance was observed in kids provided open grazing and concentrate supplements in terms of body weight gain and conformation traits.

In the current study carcass characteristics of Kachhi lambs showed linear relationship between feeding management system and growth performance and development of internal organs. The growth, pre-slaughter weight, carcass yield and weight of internal organs of Kachhi sheep lambs were recorded statistically ($P < 0.05$) higher in group B than in group A. However, grazing and concentrate supplements showed a relatively positive effect on body growth and carcass characteristics, probably grazing may give access to a variety of nutritious grasses *ad libitum* and grazing on free ranges which in turn improves physiological functions and digestibility which might resulted in improved growth and weight gain under a semi-intensive system (Herrera et al., 2011). Moreover, the outcomes of the present research are in resemblance with the observations (Daskiran et al., 2010; Vargas et al., 2007; Haddad, 2005; Johnson and McGowan, 1998) who found that fattening performance and carcass characteristics were significantly improved in those animals which were kept under semi-intensive feeding system. In a similar experiment, Ogan, (2000) investigated the daily weight gain growth performance and carcass traits were recorded as highly significant in Karayaka male lambs provided high energy diet and grazing. However, Karaoglu et al. (2001) found that high protein commercial feeding was remarkably more profitable when supplemented with grazing. Management systems of animals rearing and feeding patterns played a vital role in the production potential to enhance fattening performance, carcass yield and dressing percentage (Gaully et al., 2014).

CONCLUSIONS

Semi-intensive management system showed a significant effect on the growth and carcass traits of male Kachhi lambs. Grazing combined with concentrate supplement resulted in remarkably better impact on the growth performance and weight gain of male Kachhi lambs under semi-intensive management system over intensive management system.

CONFLICT OF INTEREST

No conflict of interest to declare

NOVELTY STATEMENT

This is the first study conducted to explore the valuable growth and carcass traits of Kachhi sheep breed which were not investigated and earlier very little information was reported in the scientific literature regarding this

sheep breed.

AUTHORS CONTRIBUTION

All authors performed the experiment, analyzed the data, interpreted the results and drafted the manuscript.

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