

Research Article

Study on effect of grouped and individual housing system on growth performance and feeding behaviour of post weaned buffalo calves

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Abstract

The study was conducted at the Department of Livestock Management, Sindh Agriculture University, Tandojam, to observe the influence of various types of housing systems on the growth and behaviour of post-weaned buffalo calves. For this study, a total of ten male buffalo calves, 12 months old, were randomly selected and distributed into two separate groups. Group A consisted of individual housing systems, and Group B consisted of grouped housing systems with five animals in each group. The findings of the study revealed that the initial and 1st fortnight body weights of buffalo calves were non-significant between groups A and B. However, during the 2nd and 6th fortnight observations, values significantly differed between groups A and B. The results showed that the highest daily weight gain was observed in Group A (463g) compared to Group B (366g). Similarly, the highest total weight gain was observed in Group A (41.7 kilograms) compared to Group B (32.97 kilograms). The initial, 1st, and 2nd fortnight body heights of buffalo calves were non-significant ($p > 0.05$) between Groups A and B. However, a significant difference ($p < 0.05$) in fortnight body heights of buffalo calves between Groups A and B was observed from the 3rd to the 6th fortnight of observations. Total rumination time was significantly higher in Group A (216 ± 3.14 min/day) compared to Group B (172.8 ± 2.35 min/day). The duration of lying bouts was significantly higher in Group B (144 ± 1.63 min/day) compared to Group A (144 ± 1.63 min/day). Feeding bouts time was significantly higher in Group A (216 ± 2.78 min/day) compared to Group B (100.8 ± 1.88 min/day).

Keywords: Housing system; Feeding behaviour; Growth; Post weaned; Buffalo calve

Introduction

Contemporary dairy farming practices often face criticism for certain on-farm methods, such as separating calves from their mothers within 24 hours of birth and individually housing pre-weaned heifer calves, rather than in pairs or groups [1]. A recent study revealed that 78.9% of participants indicated they housed pre-weaned heifer calves individually, with 42.1% kept outdoors, 10.5% indoors with heating, and 26.3% indoors without heating. In comparison, only 15.9% of those surveyed said they used any type of group housing for pre-weaned animals. Calves that are housed in groups prior to weaning had an easier time adjusting to automated feeding systems, as shown by research by [2]. They spend more time at the feeder and eat more food than chickens raised separately. This indicates that pre-weaning isolation may have a negative impact on calves' behavioural flexibility and their ability to respond to novel circumstances and environments. However, social interactions may have a detrimental effect on the wellbeing of individual calves since they might lead to undesirable behaviours such as cross-sucking. According to [3], cross-sucking is an aberrant behaviour in which a calf focuses its non-nutritive sucking on different regions of another calf's body [4]. Jersey calves kept in groups or pairs have not been studied extensively to identify the prevalence of cross-sucking. Since there are documented breed-specific behavioural

variations in other species, such as pig aggressiveness [5], assuming that all dairy calf breeds would respond the same way in similar housing situations is a dangerous assumption to make. The purpose of this research was to compare Jersey heifer calf behaviour, growth performance, and health while kept alone vs in pairs. Since Jersey calves are more likely to cross-suck than Holstein calves, we reasoned that calves kept in pairs would also engage in this behaviour. We also hypothesised that compared to calves kept in isolation; calves housed in pairs would exhibit better growth performance.

Materials and Methods

Experimental plan

The proposed study was carried out during the 2021 at livestock experimental station, at department of livestock management, Sindh Agriculture University Tandojam to evaluate the effect of different types of housing systems on growth performance and behaviour of post-weaned male buffalo calves. For this purpose, 10 post-weaned buffalo calves (12 months of age) were selected and randomly divided into two groups A & B, each group was comprises of 5 male calves and feed separately under hygienic, properly disinfected and well-ventilated conditions. Animals were kept for three months research trial all the groups were fed (wheat straw+ green fodder+ concentrates) and water was provided ad libitum (Table 1).

Table 1. Experimental design

Groups	No. of animals	Housing system
A	5	Individual housing system
B	5	Grouped housing system

Following parameters were studied during research work

Growth parameters

Initial body weight of calves (kg)

Weight machine was used to take the initial body weight of calves in kilograms.

Fortnightly total weight gain of calves (kg)

Weight machine was used to take the fortnightly body weight of calves in kilogram.

Usually, weight gain was recorded based on increase in fortnightly live body.

Final body weight of calves (kg)

Total live body weight of calves was recorded at the end of experiment in kilograms Body

Conformation parameters

Girth of calves (cm)

Girths of calves were fortnightly measured by measuring tape in centimetres around the heart of calves in centimetres.

Height of calves (cm)

The body height of calves was fortnightly measured by measuring tape from toe to shoulder of each calf in centimetres.

Length of calves (cm)

The body lengths of the experimental calves were fortnightly measured by measuring tape from shoulder to ox-coxae (pin) of the calves in centimetres.

Feeding Behaviour

The behaviour of calves was fortnightly observed with the help of camera for the period of 24 hours.

- Sitting time
- Standing time
- Standing rumination
- Sitting rumination
- Total rumination
- Duration of lying bouts
- Feeding bouts

Statistical design

The obtained data was analyzed statically by standard method of analysis, [4].

Results

Body weight of buffalo calves (kg)

Effect of individual and grouped housing systems on body weight of intensively managed buffalo calves on fortnight basis was recorded and the outcome is mentioned in (Table 2). The body weight of buffalo calves was linearly increased from 1st to 6th fortnight of experiment in both A group and B group. At the end of experiment (6th fortnight) the final body weight of buffalo calves was higher (184.01±0.67 kg) in A group than the body weight of buffalo calves (175.31±0.67 kg) in B group.

Daily weight gain and total weight gain in 90 days

Effect of individual and grouped housing systems on average daily gain (g) and total gain (kg) of buffalo calves is presented in (Table 3). Data indicates that maximum daily gain was recorded from A group (463g) compared to B group (366g). Similarly, maximum average total gain was recorded from A group (41.7kg) compared to B group (32.97kg).

Table 2. Effect of individual and grouped housing systems on body weight (kg) of intensively managed buffalo calves on fortnight basis

Fortnights	Group A	Group B	P-Value
	Individual housing system	Group housing system	
Initial	142.31±0.64a	142.34±0.64a	0.9814
1 st	146.31±0.64a	145.54±0.64a	0.4187
2 nd	153.83±0.61a	150.79±0.61b	0.0079
3 rd	161.35±0.61a	156.98±0.61b	0.0010
4 th	169.08±0.67a	163.11±0.67	0.0003
5 th	176.62±0.62a	169.31±0.62	<.0001
6 th	184.01±0.67a	175.31±0.67	<.0001

Table 3. Effect of individual and grouped housing systems on average daily gain (g) and total gain (kg) of buffalo calves

Variables	Group A	Group B
	Individual housing system	Grouped housing system
Average daily gain (g)	463	366
Total gain (kg)	41.7	32.97

Body height of buffalo calves (cm)

Effect of individual and grouped housing systems on body height of intensively managed buffalo calves on fortnight basis was recorded and the outcomes is mentioned in (Table 4). The body height of buffalo calves was linearly increased from 1st to 6th fortnight of experiment in both A group and B group. At the end of experiment (6th fortnight) the final body height of buffalo calves was higher (124.64±1.83 cm) in A group than the body height of buffalo calves (119.77±1.72 cm) in B group.

Body length of buffalo calves (cm)

Effect of individual and grouped housing systems on fortnight basis was recorded and the outcomes are mentioned in (Table 5). The body height of buffalo calves was linearly increased from 1st to 6th fortnight of experiment in both A group and B group. At the end of experiment (6th fortnight) the final body length of buffalo calves was higher (113.57±1.29 cm) in A

group than the body length of buffalo calves (109.30±0.43 cm) in B group.

Body girth of buffalo calves (cm)

Effect of individual and grouped housing systems on body girth of intensively managed buffalo calves on fortnight basis was recorded and the outcome is mentioned in (Table 6). The body girth of buffalo calves was linearly increased from 1st to 6th fortnight of experiment in both A group and B group. At the end of experiment (6th fortnight) the final body girth of buffalo calves was higher (134.85±0.50 cm) in A group than the body girth of buffalo calves (129.13±0.10 cm) in B group.

Behaviour of buffalo calves**Sitting time (min/day)**

Result on the effect of individual and grouped housing systems on sitting time of intensively managed buffalo calves is shown in (Fig. 1). Sitting time was significantly higher (288±5.32 min/day) in A group compared to B group (259.2±2.71 min/day).

Table 4. Body height (cm) of intensively managed buffalo calves on fortnight basis

Fortnights	Group A	Group B	P-Value
	Individual housing system	Group housing system	
Initial	113.02±1.65a	112.99±1.62a	0.9777
1 st	114.16±1.67a	113.90±1.63a	0.8105
2 nd	116.85±1.71a	115.05±1.65a	0.1307
3 rd	119.84±1.76a	116.22±1.65b	0.0103
4 th	121.42±1.78a	117.39±1.69b	0.0063
5 th	123.02±1.80a	118.57±1.70b	0.0039
6 th	124.64±1.83a	119.77±1.72b	0.0025

Table 5. Effect of individual and grouped housing systems on body length (cm) of intensively managed buffalo calves on fortnight basis

Fortnights	Group A	Group B	P-Value
	Individual housing systems	Group housing systems	
Initial	103.32±0.33a	102.66±1.16a	0.2571
1 st	104.15±0.33a	103.70±1.17a	0.4280
2 nd	105.16±0.29a	104.74±1.18a	0.4618
3 rd	106.18±0.29a	105.80±1.20a	0.5070
4 th	109.07±1.24a	107.21±0.31b	0.0115
5 th	111.30±1.26a	108.25±0.36b	0.0009
6 th	113.57±1.29a	109.30±0.43b	0.0001

Table 6. Effect of individual and grouped housing systems on body girth (cm) of intensively managed buffalo calves on fortnight basis

Fortnights	Group A	Group B	P-Value
	Individual housing systems	Group housing systems	
Initial	122.27±1.04a	121.81±0.22a	0.3597
1 st	123.50±0.46a	122.79±0.10a	0.1719
2 nd	126.41±0.47a	124.03±0.20b	0.0012
3 rd	129.65±0.48a	125.29±0.10b	<.0001
4 th	131.36±1.10a	126.56±0.23b	<.0001
5 th	133.09±0.49a	127.83±0.10b	<.0001
6 th	134.85±0.50a	129.13±0.10b	<.0001

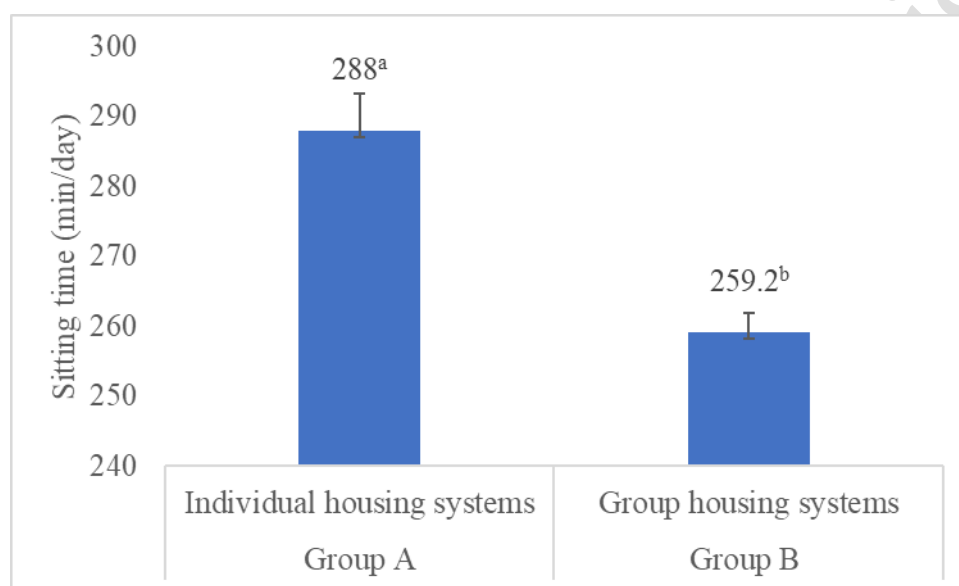


Figure 1. Effect of individual and grouped housing systems on sitting time of intensively managed buffalo calves

Standing time (min/day)

Results on the effect of individual and grouped housing systems on standing time of intensively managed buffalo calves is shown in (Fig. 2). Standing time was significantly higher (705.6±4.49 min/day) in B group compared to A group (576±3.87 min/day).

Standing rumination time (min/day)

Results on the effect of individual and grouped housing systems on standing rumination time of intensively managed buffalo calves is shown in (Fig. 3).

Standing rumination time was significantly higher (144±2.41 min/day) in A group compared to B group (115.2±1.73 min/day).

Sitting rumination time (min/day)

Results on the effect of individual and grouped housing systems on sitting rumination time of intensively managed buffalo calves is shown in (Fig. 4). Sitting rumination time was significantly higher (72±1.88 min/day) in A group compared to B group (57.6±1.13 min/day).

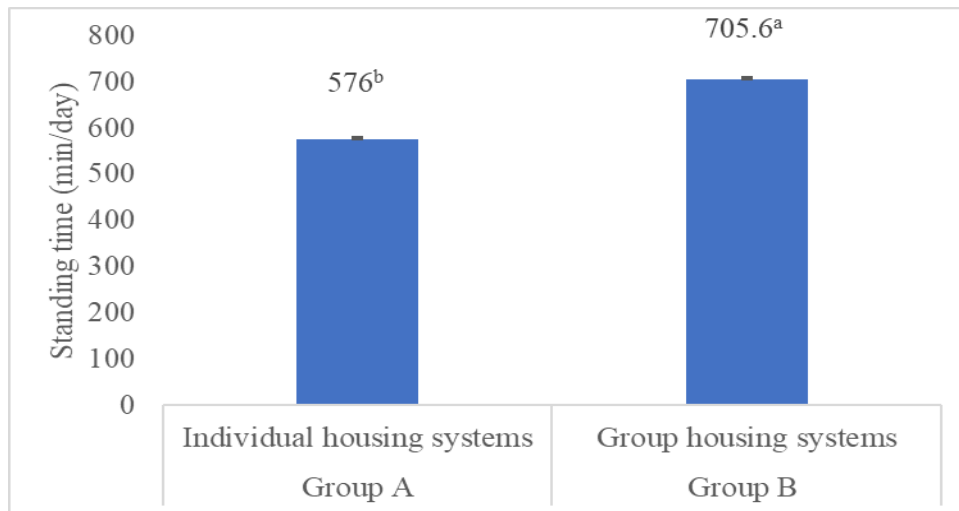


Figure 2. Effect of individual and grouped housing systems on standing time of intensively managed buffalo calves

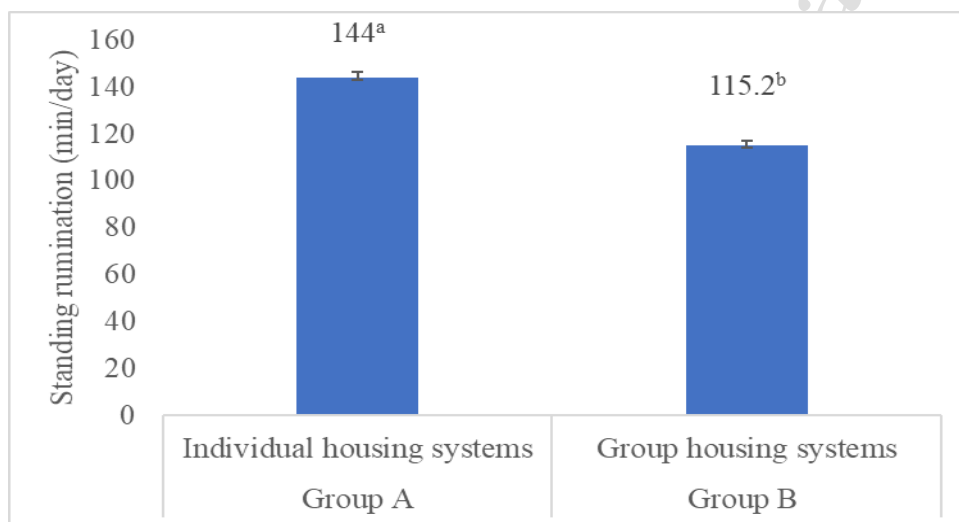


Figure 3. Effect of individual and grouped housing systems on standing rumination time of intensively managed buffalo calves

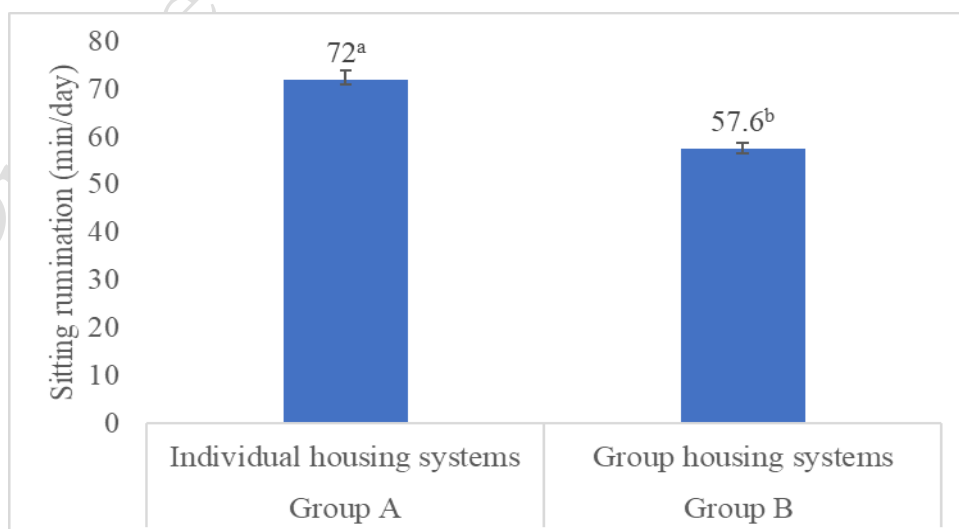


Figure 4. Effect of individual and grouped housing systems on sitting rumination time of intensively managed buffalo calves

Total rumination time (min/day)

Results on the effect of individual and grouped housing systems on total rumination time of intensively managed buffalo calves is shown in (Fig. 5). Total rumination time was significantly higher (216 ± 3.14 min/day) in A group compared to B group (172.8 ± 2.35 min/day).

Duration of laying bouts (min/day)

Results on the effect of individual and grouped housing systems on duration of laying bouts of intensively managed

buffalo calves is shown in (Fig. 6). Duration of laying bouts was significantly higher (144 ± 1.63 min/day) in B group compared to A group (201.6 ± 1.63 min/day).

Feeding bouts time (min/day)

Results on the effect of individual and grouped housing systems on feeding bouts time of intensively managed buffalo calves is shown in (Fig. 7). Feeding bouts time was significantly higher (216 ± 2.78 min/day) in A group compared to B group (100.8 ± 1.88 min/day).

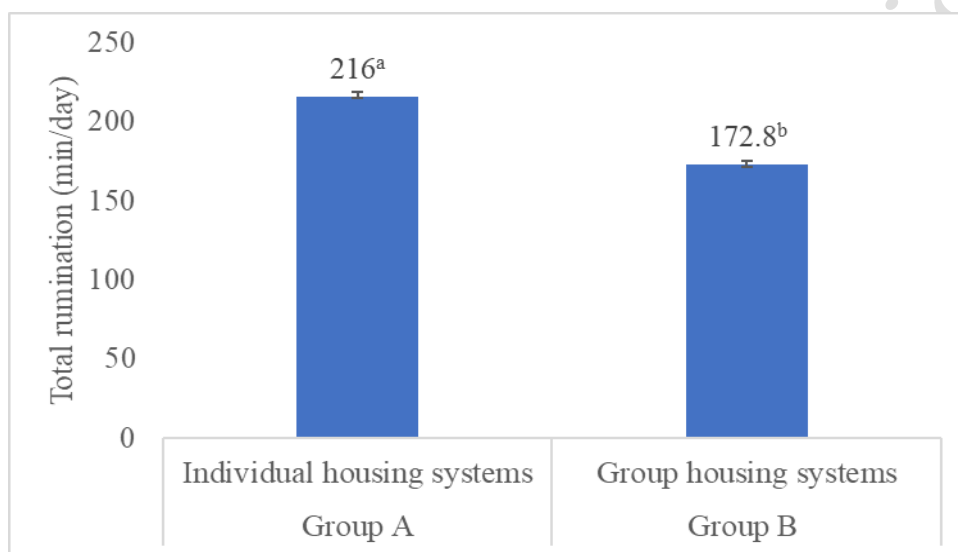


Figure 5. Effect of individual and grouped housing systems on total rumination time of intensively managed buffalo calves

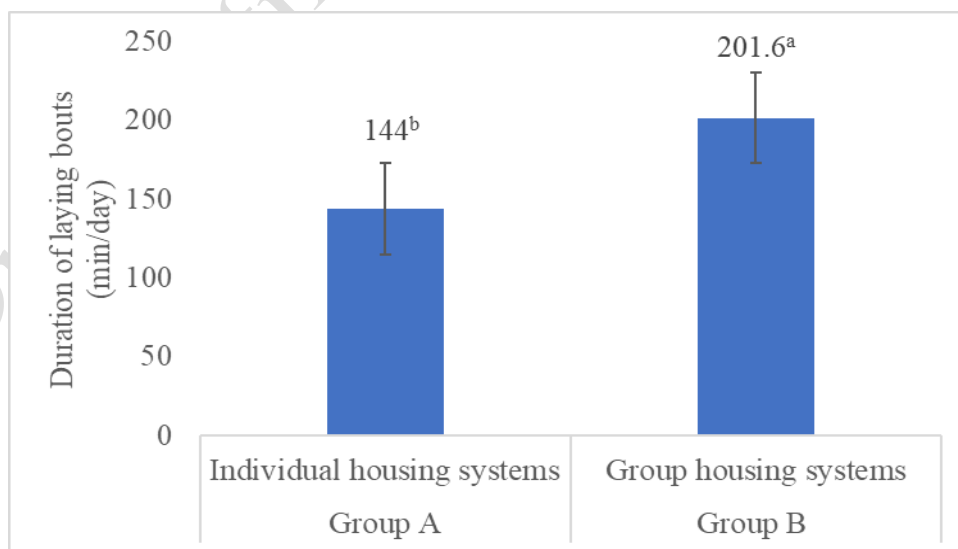


Figure 6. Effect of individual and grouped housing systems on duration of laying bouts of intensively managed buffalo calves

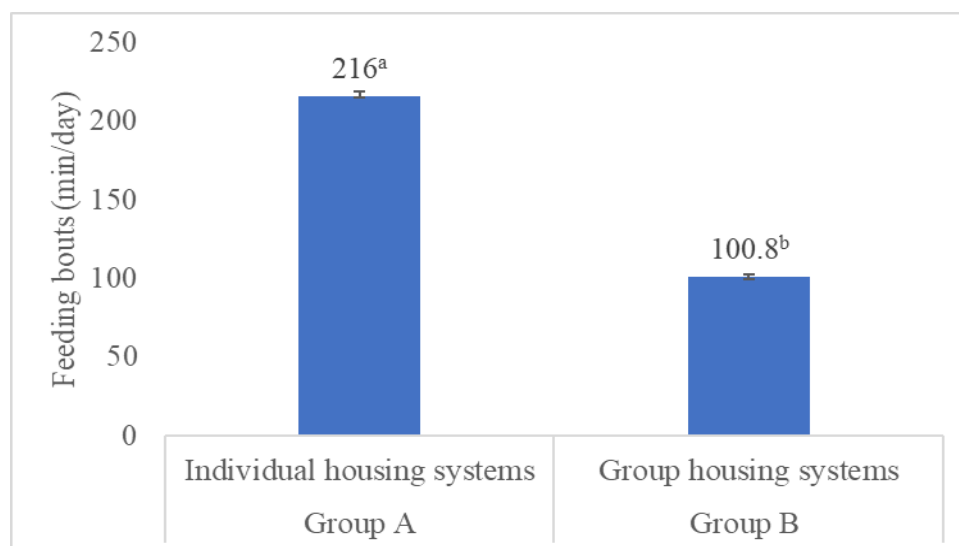


Figure 7. Effect of individual and grouped housing systems on feeding bouts time of intensively managed buffalo calves

Discussion

Study conducted by [4], who reported that growth percentage of single and grouped housed buffalo calves, suggested that the calves gain maximum growth rate as compared with those who were kept in grouped housing system. [7] performed study to compare body weight of buffalo calves managed under single and grouped pens. Author reported that calves have higher body weight raised under grouped housing system as compared with single pen housing system. Similar study was performed by [8] who compared with growth rate of calves raised under grouped and individual housing system and reported that calves raised under grouped housing system has higher growth rate as compared with calves which were raised under single housing system. The variation among the findings might be due to availability of healthy green fodder, concentration ration, breed differences, better management environment and grouped living has also better influence on the body and mental health of calves as compared with individual living. The results of [9] were in agreement with present study who has reported that grouped housed calves gain more body weight and body growth rate as compared with those who were raised in individual

housing system, but the variation was non-significantly differed between groups. [10] conducted study to evaluate the effect of different housing system on body confirmation and body growth of buffalo calves under single and multiple housing systems. Who reported that animals were kept under grouped housing system has higher body weight and body confirmation values as compared with those which were kept in individual housing system during the study. The difference might be because single housing system influence mental approach of calves and feel alone and required higher attention and care as compared with grouped one which cause better health care and nutrition values. The results of [11], are controversial with findings of our study, who reported that calves were housed in individual pen gain more body weight as compared with those who were kept in grouped housing system. The variation among findings may be due to more availability of water, food and more attention from owner which cause better growth rate, body weight. It has also real fact that in grouped housing system provide opportunity of calves to social interaction that has better influence on their body which cause improved muscle growth. [12, 13], performed study on Holstein and Brahman cattle calves to

compare with effect of individual and grouped housing system on the body growth and body parts of calves. They reported that individual housing system has better effect on calves' body weight, growth, width and has significantly higher effect on body weight as compared with grouped housing system.

Conclusion

It was concluded that buffalo calves kept under single housing method gain more body weight as compared with single housing system from 1st to 6th fortnight experiment.

Authors' contributions

Conceived and designed the experiments: AA Khan, H Rizwana, MF Hassan.

Performed the experiments: AA Khan, HA Janyar, MA Memon & MA Memon.

Analyzed the data: RR Kaleri, IA Cheema.

Contributed materials/ analysis/ tools: R Bughio, AJ Khan, I Ahmed & S Akhlaq.

Wrote the paper: RR Kaleri & MA Khosa.

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