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Growth response and agonistic behaviour of cockerel chickens to feeding trough shapes

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Abstract
This study was conducted to determine the effect of feeding trough shapes on growth performance and agonistic behaviour of cockerels. A total of 240 eight weeks old Hacro black cockerels were used in the experiment which lasted for four weeks. The birds were divided into 3 treatments based on circular, rectangular and square-shaped feeding troughs of 80 birds per treatment and 20 birds per replicate of four in a Completely Randomized Design. Daily weight gains and the frequency of agonistic behaviour at both feeding and non-feeding periods were recorded. The final weight, weight gain and feed intake of the cockerels were significantly ($P<0.05$) influenced by the feeding troughs with birds on square-shaped feeding trough recording the highest values. Feeding trough shapes had no effect on the mean agonistic behaviour during the feeding and non- feeding periods though the frequency of agonistic acts was more prominent during the feeding period. The study revealed that in terms of growth response and for reduced agonistic behaviour, the square-shaped feeding troughs could be adopted for cockerel production.
Keywords: Feeding troughs, cockerels, head pecks, chases, pushes, weight gain.

1. Introduction

Practical methods for improving poultry welfare are already available, particularly in the areas of catching, handling and slaughter (Mench and Duncan, 1998). Today, however, economics drive everything and research is needed to provide information for the public on what they will accept (and pay for) before the poultry industry can justify making costly sweeping changes to current production practices. Despite potential for immediate improvement in some areas, Mench and Duncan (1998) listed a number of areas requiring additional efforts by the poultry industry among which are equipment designs for new facilities, breeding of stocks that do not require beak trimming, workable alternative production systems for laying hens and identification of human factors responsible for welfare problems. However, establishing a common set of standards for animal welfare in the poultry industry is made more difficult because facilities, management, and personal opinions differ between various poultry producing regions of the country and even within regions (Whay, 2003). It is of note that the precise ethogram of agonistic behaviour is species-specific and, for nearly all species, a full cataloguing and understanding of the behaviours carried out during an agonistic encounter are lacking. Considering the importance placed upon the aggressive components of agonistic interactions and their impact on an individual's welfare, this gap in knowledge is worthy of further study.

Consumers' choice, low chick price, lower mortality and morbidity, reduced management cost, lower initial investment, better market demand, lower abdominal fat, more organoleptic preference, family labour utilization and easy management are the strategic advantages for cockerel rearing. In addition, they are raised for a longer period than broiler chicken which has permitted the study on their agonistic behaviour. The experiment therefore sought to determine the effect of feeding trough shapes on the performance and agonistic behaviour of cockerel chickens.

2. Materials and methods

2.1 Experimental Site

The experiment was carried out at the poultry unit of the Teaching and Research Farm Directorate, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. This area is situated in the rainforest vegetation zone of South-western Nigeria on Latitude 7°13´49.46´´N, Longitude 3° 26´ 11.98´´ E and altitude of 98m above sea level. The climate is humid with a mean annual rainfall of 1003mm annual mean temperature and humidity ranges from 31.9 to 34.8^{0}C and 79.7 to 90.1%, respectively.

2.2 Experimental Birds and Management

A total of 240, eight weeks old cockerels of Harco Black strains were used for the study. They were sourced from a reputable commercial farm in Abeokuta and managed intensively on deep litter system. Feeds and water were supplied *ad libitum*. Growers mash which contained 14.48 % CP and 10.80 MJ/kg ME was supplied to the birds throughout the study .

2.3 Experimental Design

The birds were randomly divided into 3 treatments of 80 birds per treatment which was further sub-divided into four replicates of 20 birds per replicate. Then, three different shapes of locally fabricated feeders such as circular (conventional), rectangular and square with a surface area of 900m^2 was introduced for the feeding of the birds till the end of the study. The birds were weighed and allotted to the three different feeder shapes in a one-way analysis of variance. The three different shapes of locally fabricated metal feeding troughs such as circular (conventional shape), rectangular and square with a surface area of 900 m^2 each was introduced for feeding of the birds for 4 weeks (see diagram on square and rectangular feeding troughs below).

2.4 Data Collection

The weight gain and feed intake were measured daily while the feed conversion ratio was calculated.

2.5 Agonistic Behaviour

The agonistic behaviour that was observed include head pecks, pushes, threats, chases and submission during feeding and non-feeding periods as defined by Stone *et al.* (1984) and O'keefe *et al.* (1988). Observations on agonistic behaviour were on daily basis. On each day, the feed was supplied to each replicate and at the moment of the "feeding" observations which lasted for 10 minutes in the morning were made. Thus a total of two hours was spent observing the twelve groups. In the afternoon the birds were observed for agonistic interaction during the "non-feeding" period. For this observation, the door was closed when the observer entered and the birds were given a five-minute adjustment period to adjust to the presence of the observer with the camcoder. Four replicates of each group were observed simultaneously for 10minutes.

2.6 Statistical Analysis

The data collected were subjected to Completely Randomized Design while significantly ($P<0.05$) different means were compared using Duncan's Multiple Range Test, as contained in SAS (1999) package. The frequencies of agonistic behaviours at feeding and non-feeding periods were presented in bar charts.

3. Results

3.1 Effect of feeding trough shape on performance of cockerels

Table 1 shows the effect of feeding trough shape on performance of cockerels. There were significant ($P<0.05$) differences on parameters such as final weight, weight gain and feed intake. The final weight, (g/bird/day) in the square shape feeder has the highest value of 149.33g , followed by 1390.00 g for the circular while the rectangular had the least value of 1293.33g. Also the weight gain was highest in square shape feeder compared to others, it value ranges from 18.21g to 12.74 g. The feed intake of birds on circular feeding trough recorded 27.57 g which was the highest, followed by square with 25.73 g and rectangular (23.20 g). There was no mortality (0 %) recorded in the course of the experiment.

3.2 Effect of feeding trough shape on Agonistic behaviour of cockerels during feeding and non-feeding periods

The effects of feeding trough shape on agonistic behaviour of cockerels during feeding and non-feeding periods are presented in Tables 2 and 3. The parameters measured on agonistic behaviour of cockerel were not significantly ($P>0.05$) affected by the feeder during the feeding and the non-feeding periods. Frequency of head peck had the highest value of 6.33 in the square feeder followed by 5.00 and 4.33 on circular and rectangular feeders, respectively during the feeding periods. Chases also had the highest value in square feeder during both feeding and non-feeding period with 4.00 and 0.67, respectively. Likewise submission had the highest value of 3.00 on square shape while the rectangular has the lowest value of 2.00 during the feeding period

Figure 1 showed the frequency of head pecking during feeding and non-feeding periods. Head pecking was more frequent in square shape trough during the feeding and non-feeding periods while it was least in rectangular feeder during the feeding period and circular trough during the non-feeding period.

In Figure 2, the frequency of pushes was prominent in rectangular trough followed by circular trough while pushes was recorded for square trough during the feeding period. There was no pushes on all the feeder shapes during non-feeding period.

Figure 3, revealed the frequency of threats during the feeding and non-feeding periods. Threats were more frequent in rectangular troughs, followed by circular and the least in square trough. There was no threat during the non feeding period.
In Figure 4, frequency of chases was highest in square trough during both the feeding and non-feeding periods. Circular trough showed the least chases during feeding period while rectangular trough had the least chases during the non-feeding period.
Frequency of submission was more prominent in square trough during the feeding period, followed by circular and rectangular trough respectively as shown in Figure 5. There was no submission in all the trough shapes during the non-feeding periods.

4. Discussion

The significant effect of the feeding trough shapes on the final weight, weight gain and feed intake confirmed the fact that feeding trough shapes do affect performance characteristics in cockerels which thereby contrasted with the findings of Leksrisompong (2010) that feeder space is not a contributing factor to weight gain of broiler chicken. The increased final weight and weight gain in birds on the square feeding trough may be related that the fabricated feeder allows birds' higher access to feed with efficient utilization than the conventional feeder.

In this study, frequency of agonistic behaviour in terms of head-pecking, threats, pushes chases and submission were more prominent during the feeding periods compared to non-feeding periods which supported Olukosi *et al.* (2001) who reported that agonistic acts were highest when birds were feeding and that there was no effect of feeder space allowance on agonistic acts during the non-feeding period. It also supported the findings of Mench and Keeling (2001) who reported that most aggression is seen at the feed trough, where there is some competition among chickens. This may be attributed to increased tension when the birds are competing for feed and less tension during the non-feeding periods which is in accordance to Mauldin (1992) who described that most birds are engaged in "comfort" behaviour during their non-feeding times.

Headpecks, chases and submission were more prominent during the feeding and non-feeding periods in the square feeder shape which may be due to wider space allowance of the feeder. This contradicted the reports by Cunningham (1981) that with a greater feeder space allowance birds initiated fewer numbers of aggressive head pecks per hour than when the feeder space allowance was smaller. Moreso, Ylander and Craig (1980) reported that lack of space for threat displays may be associated with a reduction in agonistic behaviour.

4.1 Conclusion

It could be concluded that
The differences in the feed intake showed that the fabricated feeding troughs (square and rectangle) allow for easy access to feed. Frequency of agonistic acts was more prominent during the feeding period compared to non-feeding periods. Hence, in order to reduce agonistic behaviour to the barest minimum, feeding trough having more space and allowed easy access of birds to feed should be used.

5.0 References

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Table 1: Effect of feeding trough shape on growth performance of cockerels

	Feeding trough shapes		
Parameters	Circular	Square	Rectangular
Initial weight (g/bird/day)	1020.00±69.28	983.33±28.48	936.67±61.19
Final weight (g/bird/day)	1390.00±49.32^{ab}	1493.33±35.28^{a}	1293.33±40.96^{b}
Weight gain (g/bird/day)	13.21±0.70^{b}	18.21±2.17^{a}	12.74±3.20^{b}
Feed intake (g/bird/day)	27.57±0.37^{a}	25.73±0.73^{a}	23.20±0.86^{b}
Feed conversion ratio	2.10±0.14	1.45±0.17	2.06±0.52
Mortality (%)	0.00±0.00	0.00±0.00	0.00±0.00

$^{a, b}$: means in the same row by factor with different superscripts differ significantly ($P < 0.05$)

Table 2: Effect of feeding trough shape on agonistic behaviour of cockerels during feeding period

	Non-Feeding Period		
Parameter	**Circular**	**Square**	**Rectangular**
Head peck	0.67±0.33	1.33±0.88	1.00±0.00
Pushes	0.00±0.00	0.00±0.00	0.00±0.00
Threats	0.00±0.00	0.00±0.00	0.00±0.00
Chases	0.33±0.33	0.67±0.33	0.33±0.33
Submission	0.00±0.00	0.00±0.00	0.00±0.00

Values are means of four replicates

Table 3: Effect of feeding trough shape on agonistic behaviour of cockerels during non-feeding period
Values are means of four replicates

	Feeding Period		
Parameter	**Circular**	**Square**	**Rectangular**
Head peck	5.00±0.58	6.33±1.20	4.33±0.33
Pushes	0.67±0.33	0.00±0.00	1.00±1.00
Threats	1.33±0.67	1.00±0.00	1.67±0.33
Chases	2.00±0.58	4.00±0.58	3.33±1.33
Submission	2.33±0.33	3.00±0.58	2.00±0.00

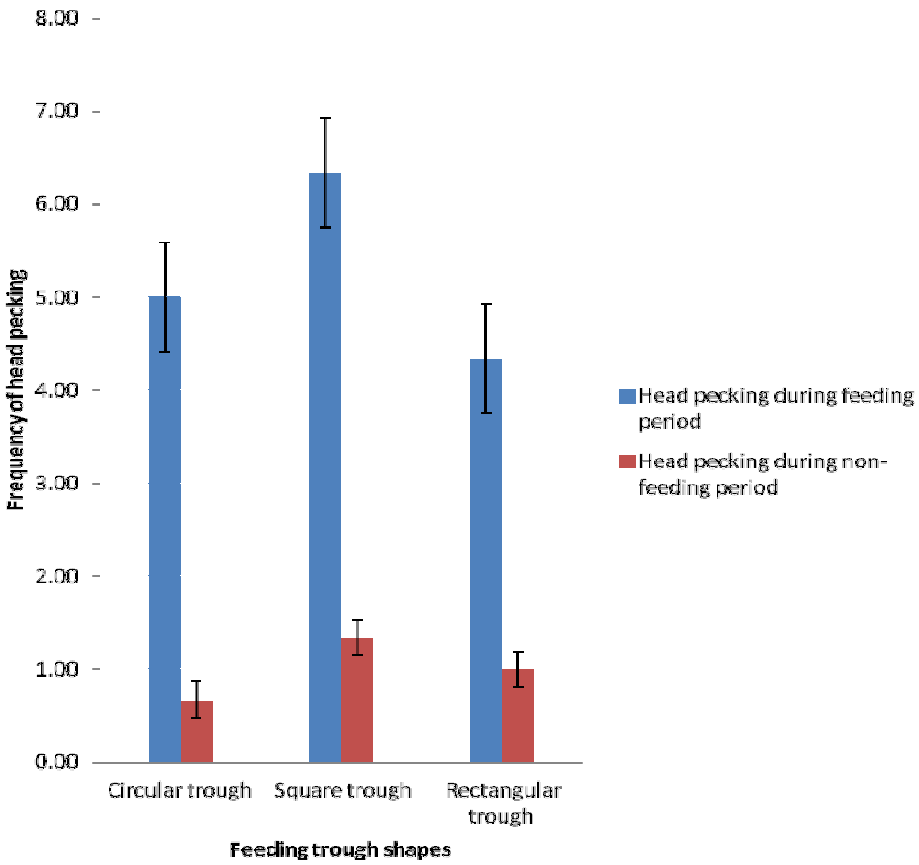


Fig. 1: Frequency of head pecking during feeding and non-feeding periods

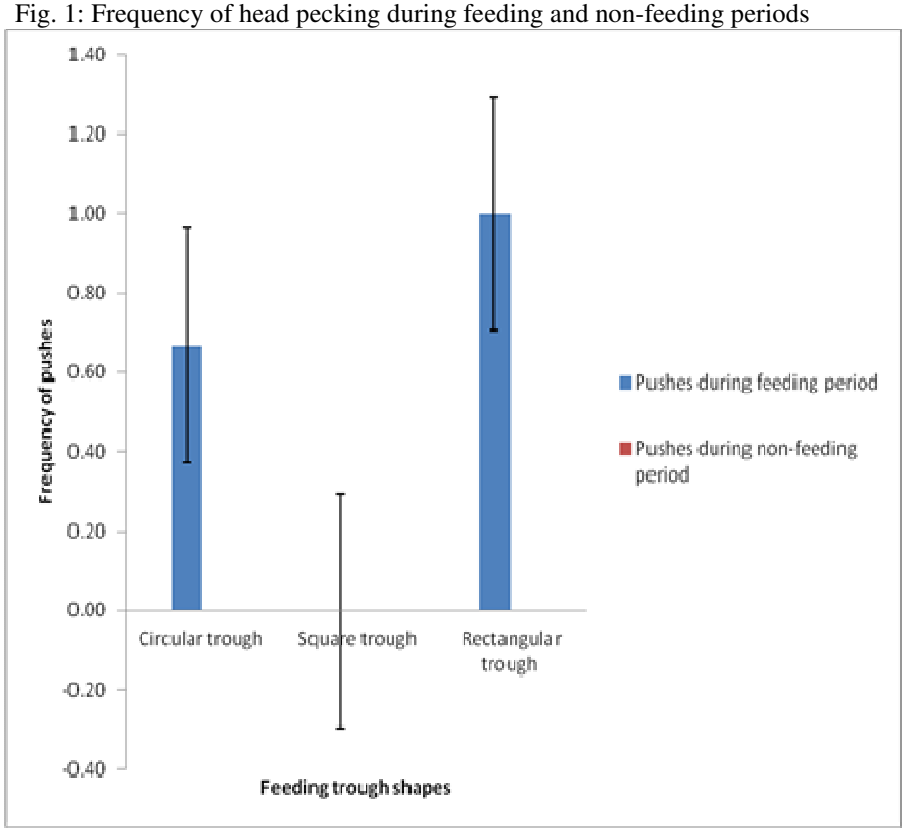


Fig. 2: Frequency of pushes during feeding and non-feeding periods

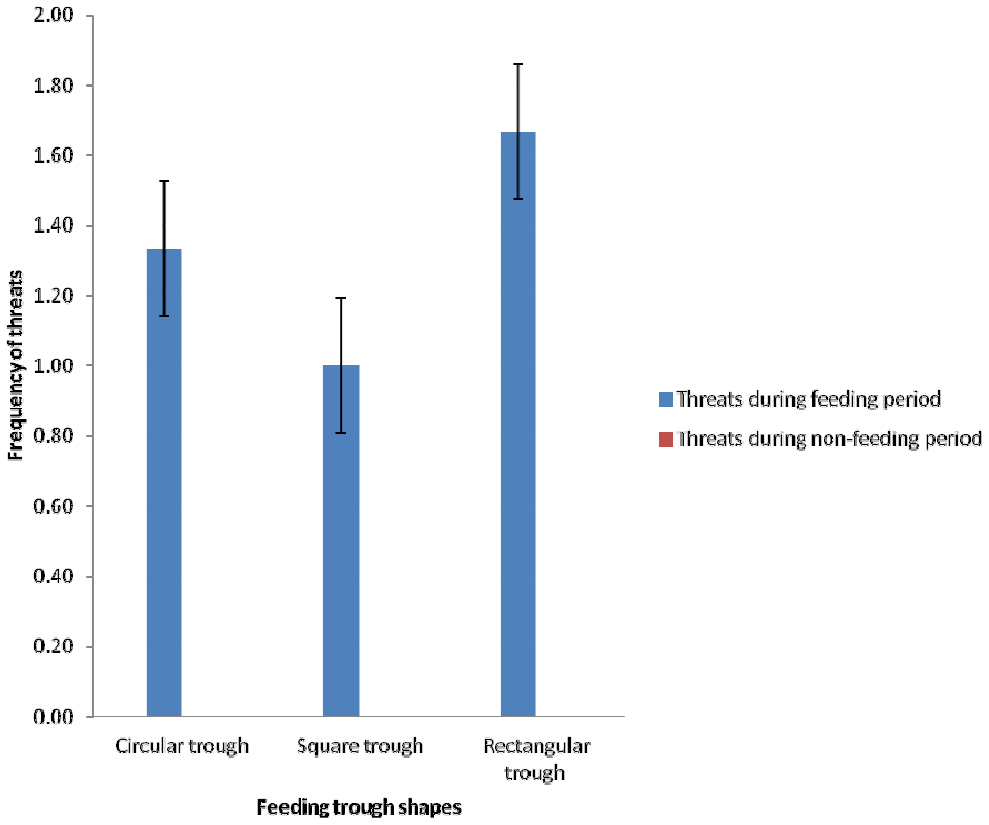


Fig. 3: Frequency of threats during feeding and non-feeding periods

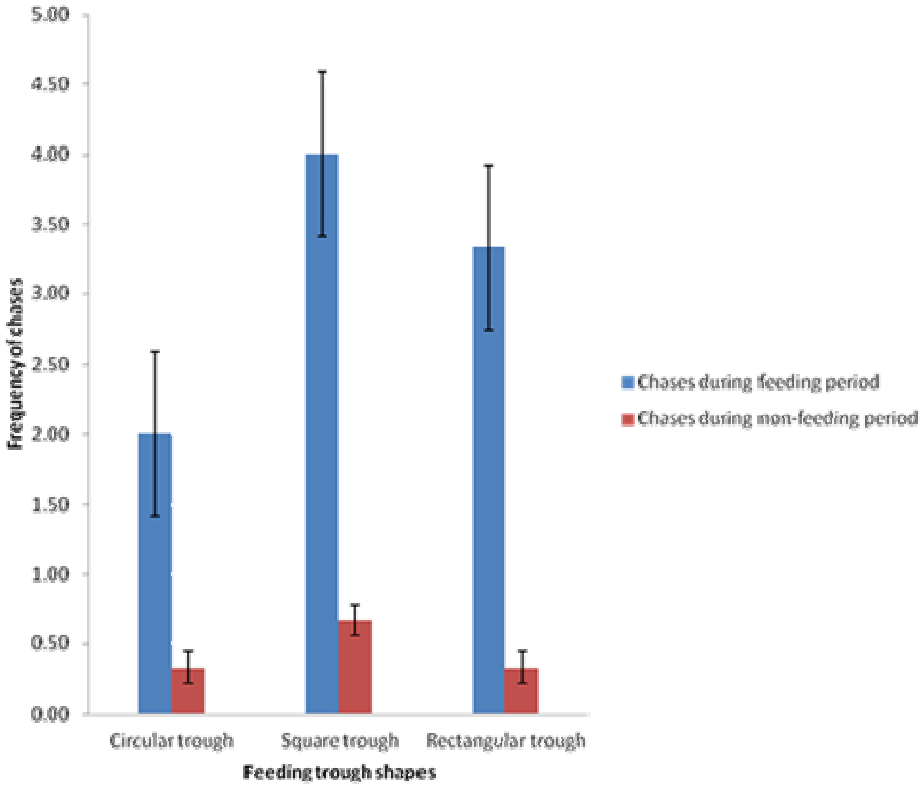


Fig. 4: Frequency of chases during feeding and non-feeding periods

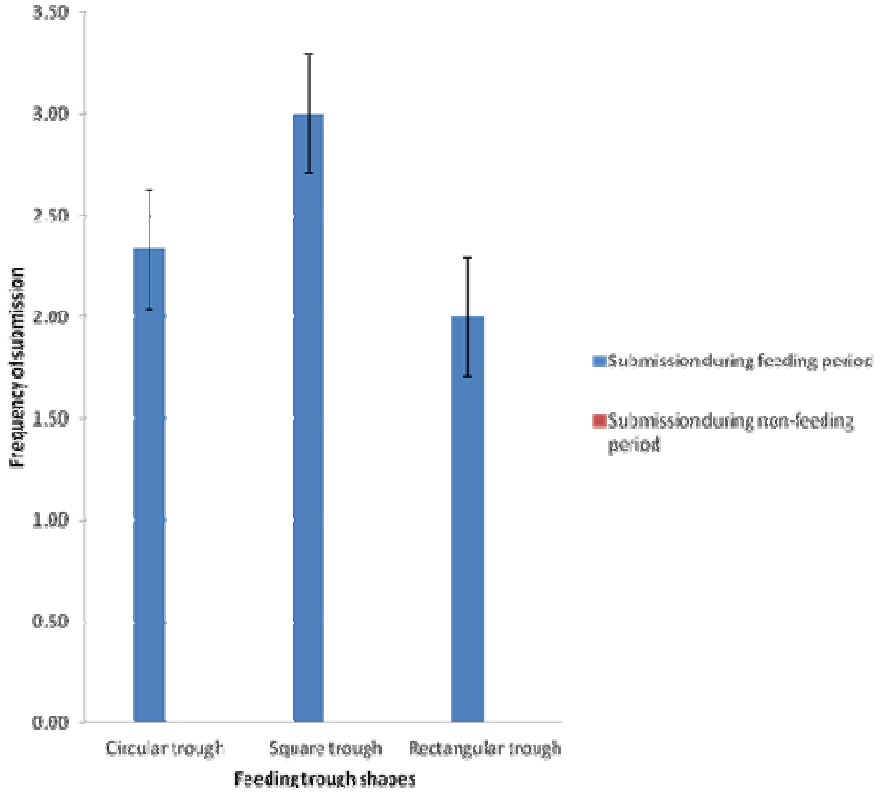
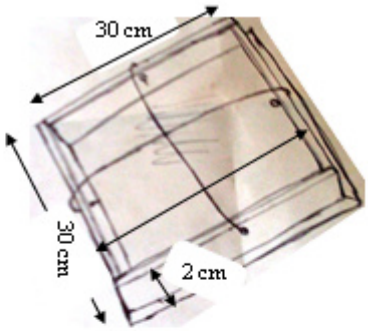
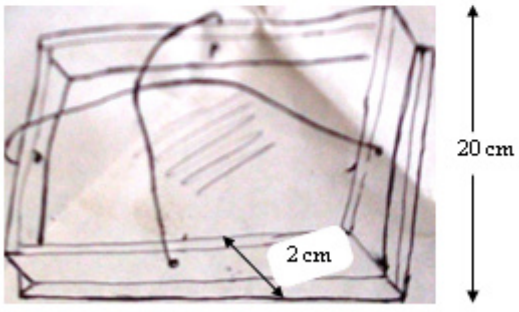


Fig. 5: Frequency of submission during feeding and non-feeding periods



Square-shaped feeding trough



Rectangular-shaped feeding trough

Circular feeder (commercially available)

Rectangular feeder

Square feeder