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Feed intake and social interactions in dairy goats—The effects of feeding space and type of roughage

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Abstract

The aim of this experiment was to examine how an increased number of animals per feeding place and type of roughage affected feeding time, feed intake and the level of aggressive competition in groups of dairy goats. We conducted a 3 × 2 factorial experiment with type of roughage (hay or grass silage) and number of goats per feeding place (1, 2 or 3) as the main factors. A total of 48 female goats in mid lactation was randomly divided into eight groups of six animals (mean age 3.7 years). The goats were video recorded for 24 h at the end of each experimental period, and activity variables such as feeding, queuing, standing/walking and lying were scored using instantaneous sampling with 10 min intervals. All incidents of social interactions were scored continuously for 6 h between 09:00 and 15:00 h. Individual goats from each group were ranked as high, medium or low according to the number of times they were displaced (physically or passively) from the feed barrier by another goat.

Percentage of total observations spent feeding decreased ($P < 0.0001$) and % of total observations spent queuing ($P < 0.0001$) increased with increasing number of goats per feeding place. Silage intake also decreased with 16.2% from one to three goats per feeding place ($P < 0.001$), but no such effect was found on hay. The reduced feeding space resulted in more than 80% reduction in feeding time for some individuals. The number of displacements at the feed barrier ($P < 0.05$) and aggressive interactions ($P < 0.05$) increased with an increasing number of goats per feeding place, and the aggression level was higher when offered hay than silage ($P < 0.0001$). Low ranked goats spent significantly less % of total observations feeding ($P < 0.01$) and more % of total observations queuing ($P < 0.05$) than goats in medium and high rank categories, and this effect became more pronounced as the number of goats per feeding place increased.

In conclusion, an increased number of goats per feeding place resulted in a lower % of feeding observations, a larger % of total observations spent queuing, and an increased number of aggressive interactions for both types of roughages. The level of aggressive competition was higher on hay than silage, suggesting a preference for hay. Although the actual feed intake of hay was not reduced by restricting the

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feeding space as opposed to silage, the dramatic reduction in % of total observations spent feeding for some individuals suggests that more than one goat per feeding place can not be recommended.

Keywords: Dairy goats; Social interactions; Feeding space; Roughage; Feed intake

1. Introduction

Dairy goats in Norway are commonly housed and fed indoors for seven to eight months during winter. Traditionally the goats are fed *ad libitum* with a feeding space of 0.33–0.40 m per goat and grouped according to their individual need for feed (Bøe, 2002). Recently there has been an increased interest in simplifying feeding routines by the use of *ad libitum* feeding of roughage in feed racks. These feeding systems may often involve a reduced number of feeding places per animal or a restriction in feeding space and hence competition for access to feed may increase.

Feed can be a limited resource either because the amount of feed is restricted or because the feeding space is not accessible for all individuals in the group. This may not only reduce the average feeding time, but as the competition increases the difference between high and low-status individuals is likely to increase (e.g. Milinski and Parker, 1991; Andersen et al., 1999). Research on housing of goats in general and competition at feeding is scarce. Recent work by Loretz et al. (2004) showed that the proportion of time the animals spent feeding was significantly reduced when the animal/feeding place ratio was increased from 1.0 to 2.0, but surprisingly there was no effect on the number of aggressive interactions. Whereas Henderson (1985) showed that feeding time was reduced and aggressive incidents and queuing increased as 'face size' was reduced in ewes fed *ad libitum* on silage, Sveinbjörnsson (1999) did not find any effects of reducing feeding space on feed intake. To maintain a constant level of feed intake as the competition increases, individuals may increase consumption rate or eat at other times of the day, and low-status animals may for example feed when the others are resting. For dairy cows fed *ad libitum*, several experiments have shown no effect on milk yield or feed intake of reducing the feeding space (e.g. Friend et al., 1977; Collis et al., 1980), but DeVries et al. (2004) documented an increased feeding time and a decreased aggression level when feeding space was increased from 0.5 to 1.0 m. Furthermore, an increased number of cows per feeding station resulted less time feeding, increased consumption rate and an increased number of displacements (Olofsson, 1999). A similar change in eating strategy towards fewer but longer visits to the feeder and a quicker feeding rate when the level of competition increases, is also documented in pigs (Nielsen et al., 1995).

When feed quality is improved, the goats behave as specialists and become more selective (Aldos and Escos, 1987; Barroso et al., 2000). Type of roughage also influences feed intake. Voluntary dry matter intake in dairy goats is significantly higher on hay than on high-quality silage, and lowest for goats fed poor quality silage (Hussain et al., 1996). Goat farmers report that hay may be more attractive for goats than silage, but to our knowledge there is no scientific documentation to support this. We would expect the level of aggressive competition to be higher for the most attractive type of roughage.

Compared to other female ungulates, goats are reported to have a significantly higher rate of aggressive interactions (Fournier and Festa-Bianchet, 1995). Although some researchers have found a clear, linear dominance structure in groups of goats (Addison and Baker, 1982; Barroso et al., 2000), others claim that the hierarchic system may be less clear and more dynamic (Scott, 1948; Fournier and Festa-Bianchet, 1995; Andersen and Bøe, unpublished). Age, body size and