EFFECTS OF COATS AND DISEASE STATUS ON PERFORMANCE OF LACTATING DAIRY GOATS DURING WINTER

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SUMMARY

An investigation to assess effects of coats and caprine arthritis and encephalitis virus (CAEV) on milk yield and composition and liveweight change of dairy does was conducted during winter in the Yass district of New South Wales. A positive effect \((P < 0.01)\) on liveweights of lactating does occurred due to the wearing of woven polythene coats during winter, while infection with CAEV had a negative effect on liveweights \((P < 0.05)\). An interaction between CAEV and coat status \((P < 0.05)\) was evident for rate of change in liveweight during early winter. However, significant effects on lactational performance over the duration of the investigation were not apparent \((P > 0.05)\). These findings indicate that coats may provide benefits in cold environments to producers of goat milk.

Keywords: cold exposure, coats, caprine arthritis and encephalitis virus, goats.

INTRODUCTION

Goat milk production declines during autumn and winter in New South Wales (N.S.W.), only 40% of total annual production occurring between March and August (Greenwood 1988). In cold environments energy requirements and hence feed intake or mobilization of body reserves increase to maintain survival, liveweight and productivity. However, it has been demonstrated that coats may reduce heat loss (Panaretto et al. 1968) and protect against cold stress (Ellis et al. 1985) in sheep.

Some 60% of goats in NSW dairies are infected with caprine arthritis and encephalitis virus or CAEV (Greenwood 1990). This virus is a lenti-virus associated with slowly-developing multisystemic disease syndromes in goats (Zink et al. 1987). Various production effects of the virus have been demonstrated, and evidence suggests utilization of nutrients and energy metabolism may be impaired in infected animals (Greenwood 1990).

In order to obtain information on effects of coats and CAEV on liveweights and lactational performance of dairy goats during winter, a study was undertaken in a goat dairy enterprise in the Southern Tablelands region of N.S.W.

MATERIAL AND METHODS

The property was located at Murrumbateman \((34°58'\ S., 149°02'\ E.,\ altitude \ 500\ m)\) in the Yass district of NSW. The milking herd of 55 Saanen does had access to pasture grown under dryland conditions (average rainfall 643 mm) and a pelleted ration. The average allowance of pelleted feed of 1.72 kg DM/day \((17.4\ MJ\ ME/day,\ 270\ g\ CP/day)\) was fed in troughs to the entire herd in 2 equal portions, after each milking. Pasture was a mixture of ryegrass \((Lolium\ perenne)\), subterranean clover \((Trifolium\ subterraneum)\), cocksfoot \((Dactylis\ glomerata)\), phalaris \((Phalaris\ aquatica)\) and barley grass \((Hordeum\ Zeporinum)\). The stocking rate was about 2 does per hectare and the topography undulating to hilly. Does did not have access to shedding, but belts of trees adjacent to paddocks provided some shelter away from feed troughs.

Prior to commencement of the study 3 woven polythene coat designs were assessed for fit, durability and retention. A new design produced in 3 sizes (Fig. 1) was subsequently developed and successfully trialled.

Samples of jugular blood were obtained from all does before the investigation and their CAEV status diagnosed by an ELISA test, as described by Schroeder et al. (1985). Goats were allocated to 1 of 4 treatment groups (CAEV-free or -infected, with or without coats) according to positive or negative serology for CAEV and stage of lactation. Each goat was weighed prior to commencement of the study in late May, the herd average being 57.8 \pm 1.5\ kg (mean \pm\ s.e.), Goats were then weighed in mid June, late July and at the conclusion of the investigation at the end of August. Yields of milk and percentages of milk fat and milk protein were determined before, once during (late July), and at the completion of the study. Initial yields of milk, milk fat and milk protein per doe were 1,187 \pm 55\ ml/day, 43.4 \pm 1.9\ g/day and 43.7 \pm 1.9\ g/day respectively. Climatic details for the district over the duration of the study were obtained from the Bureau of Meteorology, including historical surface wind analysis records. The
Fig. 1. Woven polyethylene coat worn by goats in the study. The coats were tied across the chest through eyelets using thin nylon cord, but were open under the belly and udder and over the hind end. Two hind leg holes (275 by 25 mm) kept the coats in place, and all cut edges were hemmed. The dimensions (mm) of the 3 coat sizes are:

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<th></th>
<th>Small</th>
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<tr>
<td>Dorsal length</td>
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<td>Ventral length</td>
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<tr>
<td>Anterior drop</td>
<td>380</td>
<td>430</td>
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<tr>
<td>Posterior drop</td>
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CAEV status of each goat was again determined at the end of the study. Serological samples were also assessed at this time for the presence of Johne’s disease (*Mycobacterium paratuberculosis*) (Eamens 1989).

Animals whose CAEV status changed according to serology, or were found to be suffering from Johne’s disease, were excluded from analyses. The exclusions (11 does), plus ‘drying-off’ of 7 does, 2 lost coats and failure to obtain some measurements or milk samples resulted in analyses of data for between 29 and 37 does. Analyses of covariance which accounted for age and stage of lactation of does were performed on the data.

**RESULTS**

Average minimum temperatures in June, July and August were 1.9, 2.6 and 2.6°C (range -3°C to 8°C), average maximum temperatures 11.5, 11.4 and 11.3°C (range 6°C to 19°C) and total rainfall 34, 85 and 99 mm which fell on 12, 14 and 22 wet days, respectively.

Initial average liveweights for CAEV-infected and virus-free does were 61.1 ± 3.4 kg (n = 15) and 55.7 ± 1.9 kg (n = 19) respectively. Significant differences were found between coated and non-coated does (P < 0.01) and between CAEV-infected and virus-free does (P < 0.05) for the rate of change in liveweight between the initial and final weighings (Fig. 2). An interaction between coat and CAEV status for the rate of change in liveweight (Fig. 2) was statistically significant during early winter (P < 0.05).

The decline in yield of milk for does in the different treatment groups is shown in Fig. 2. Effects of coats and CAEV on yields of milk, milk protein and milk fat and percentages of milk protein and milk fat were not significant (P > 0.05). The average daily rates of decline in yield of milk over the duration of the investigation for CAEV-infected and virus-free does were -4.0 ± 0.8 mL/day (n = 12) and -1.4 ± 0.8 mL/day (n = 18) (P < 0.10), for milk protein -138.3 ± 28.6 mg/day and -52.1 ± 24.0 mg/day (P < 0.10) and for milk fat -142.1 ± 37.7 mg/day and -67.2 ± 28.5 mg/day (P < 0.10) respectively. Average rate of decline among coated does (n = 15) for yields of milk, milk protein and milk fat were -2.3 ± 0.8 mL/day, -90.3 ± 25.8 mg/day and -116.1 ± 29.6 mg/day respectively, and for non-coated does (n = 15) -2.1 ± 0.6 mL/day, -73.7 ± 20.9 mg/day and -74.3 ± 24.8 mg/day. There was a tendency (P < 0.10) for coated does to have higher percentages of milk fat (3.95 ± 0.13% v. 3.30 ± 0.25% respectively) and milk protein (3.78 ± 0.08% v. 3.47 ± 0.10%) than non-coated does at the late-July sampling.
Fig. 2. Mean values (±S.E.) for (a) rate of change in liveweight (g/day), and (b) rate of decline in yield of milk (mL/day) during winter, of coated and non-coated Saanen does infected with or free from caprine arthritis and encephalitis virus (CAEV). Bars with hatching represent CAEV-infected does and filled bars virus-free does. Number of goats in each treatment group are shown in parentheses.

DISCUSSION

There was a clear difference in the liveweight response when coated and non-coated does were compared. However, effects of coats on lactational performance were not significant and considerable variation in the data was evident. Although the lower limit of the thermoneutral zone for temperate goats is apparently between 0 and 10°C, they are adversely affected by cold within this temperature range if protection from rain and wind is lacking (Constantinou 1987). During the present study, rain fell on 48 days. On average in the Yass district, calm conditions have prevailed for only 52% of morning and afternoon daily wind speed recordings during winter. This suggests there were periods when cold stress may have occurred, particularly as Saanen goats are less tolerant of cold than some temperate goat breeds because of their short hair coat (Bianca and Kunz 1978). When exposed to acute cold stress, coated sheep suffered less depletion of muscle and liver glycogen (Ellis et al. 1985), and lower heat loss in wet and dry conditions (Panaretto et al. 1968) compared to non-coated sheep. Although the goats in the current investigation may not have suffered conditions as severe as in these studies, exposure to cold, wet and wind may have contributed to differences in liveweight change due to lower energy expenditure among coated does.

Effect of coats on liveweights of sheep have not been unequivocally demonstrated in the field, although it has been suggested that, if the nutrient supply is limited and severe cold prevails, benefits will occur (Cahill and Marchant 1982). In the present study nutrient supply did not appear to be limiting, but group feeding practices may have resulted in disparate intake of pellets and hence pasture, and therefore may have contributed to high levels of variation in results. During more extreme climatic conditions, non-coated does may have sought shelter more frequently with a concomitant decline in ingestive behaviour.

The results also suggest that climatic conditions had a greater effect on liveweight change in CAEV-infected does than in virus-free does. Effects of cold on arthritic joints of infected does and hence reduced foraging ability may have contributed, while effects of the virus may manifest themselves as an overall reduction in intake of nutrients during exposure to cold, and/or impaired energy metabolism. However, the interaction between CAEV and coat status for liveweight change demonstrated that coats may limit effects of the virus during winter.

In conclusion, it is apparent that coats may provide benefits in cold environments to producers of goat milk, and may limit effects of CAEV among virus-infected goats exposed to cold.

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REFERENCES


