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THE EFFECT OF LIGHT WORK ON MILK PRODUCTION OF MERINO EWES

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ABSTRACTS

The present experiment was undertaken in order to investigate the effect of light work on milk production of Merino ewes. Sixteen ewes were used in this experiment the animals were divided into two groups of eight animals, evenly matched for live weight and body size. One group was randomly assigned the Working treatment and the other was assigned the non-working treatment (control). The diet was a mixture of sorghum and Lucerne hay with a crude protein content of 13%. Mineral blocks and water were available at all times. The ewes were subjected to light work, for three hours a day for 21 days (Work days) after which they were rested for seven days (No-Work days). Milk yield of each ewe was measured at Days 1 – 28, twice a day at using the "*weigh-suckle-weigh*", in order to facilitate milk sampling for analysis, milking was carried out by hand. Milk composition were analysed for fat, lactose, N and total solids-non-fat (SNF). Results showed that milk yield peaked in the first week post partum, gradually decreased subsequently until 21 days post partum when it appeared to stabilise. In total amount of milk produced, working ewes yielded significantly ($P<0.01$) more milk than that of Control ewes throughout Work and No-Work periods. However, when milk yield is expressed per unit of respective ewes, mean values obtained for Working and Non-Working groups were not significantly ($P>0.05$) different. Result also showed milk composition produced by non-working and working animals was not significantly different. It might be concluded from the result of this experiment that light work would not adversely affect milk production and composition. Heavier work load would therefore be interesting to be investigated.

Key word : Working animal, Merino, milk production and composition

INTRODUCTION

It is generally accepted that the working animal requirements for energy-yielding substrates increase during work. Such increases can significantly conflict with the mammary gland requirement in the case of female animals who are lactating. The degree of conflict/competition between working muscles and lactating mammary glands for energy-yielding substrates, is likely to depend upon workload (*i.e.,* work intensity and duration) as well as more important factors affecting food intake and utilisation by the working animal.

Reported literature studies show that work has a variable effect on milk yield. Some authors reported a reduction (*e.g*., Jabbar 1983; Matthewman *et al.* 1989) while others reported no reduction in milk yield (*e.g*., Zerbini 1991; Gemeda *et al.* 1995). It is difficult to assess from the available information whether work *per se* affects milk yield or whether work, affects milk yield by means of its effect on food intake and utilisation. Pearson and Dijkman (1994) maintained that milking cows increased feed intake in response to *light* work, even when the feed was marginal quality hay. It would appear therefore that any adverse effects which work *per se* might have on milk yield might be offset by possible stimulatory effects on feed intake.

The present experiment was undertaken in order to investigate the effect of light work on milk production of Merino ewes.

MATERIALS AND METHODS

Experimental design

Sixteen ewes were used in this experiment in a Randomised Block design. Before mating, the animals were divided into two groups of eight animals, evenly matched for live weight and body size. One group was randomly assigned the *Working* treatment and the other, (*Control*) was assigned the non-working treatment

The animals and their diets

Animals

The Merino ewes obtained were approximately two years old and had lambed once before. This was the strategy used to minimise selection of infertile ewes. Approximately two weeks before lambing, ewes were kept in individual pens. At lambing, only ewes bearing single lambs were selected for inclusion in the study. These ewes were kept in metabolism cages during the measurement period.

Diet and feeding

The diet was a mixture of sorghum and lucerne hay with a crude protein content of 13%. The feed was offered at 120% *ad libitum* intake at 1600 h each day. Mineral blocksand water were available at all times. Lambs were kept in metabolism cages adjacent to their respective mothers and allowed to suckle twice a day at 0900 h and 1600 h. Lambs were given free access to water and mineral blocks.

Experimental procedure

Days for which activities/measurements were undertaken during the experimental period are presented in Table 1. The experimental period was from the 8th to the 35th day, *post partum*.

Table 1. Days in which activities/measurements were undertaken

Day	Activities / Measurements
1* - 28	Milk yield measurements
1 - 21	*Work* days on treadmill for *Working* ewes
14 – 21	Milk quality measurements
21 – 28	*No-Work* days (for the *Working* ewes)
1, 7, 14, 21, 28	Recordings of live weight

* Day 1 is the 8th day, *post partum*.

Workload and work periods

The ewes were subjected to *light* work for three hours a day for 21 days (*Work* days) after which they were rested for seven days (*No-Work* days).

Walking speed : 0.9 m/second
Walking duration : 3 hours
Load pulled : equivalent to 10% of live weight
Treadmill incline : 0^{o}

Fatigue by worked animals was assessed according to criteria published by Upadhyay and Madan (1985)

Milk yield and analyses

Milk yield of each ewe was measured (Days 1 – 28), twice a day at 0900 h and 1600 h, using the "*weigh-suckle-weigh*" method. Milking at 1600 h was carried out by hand on alternate days in order to facilitate milk sampling for analysis.

Live weight

Ewes were weighed weekly whereas the lamb weights were extracted from data on lamb weighings during milk yield estimations (See above).

Laboratory analysis

Milk samples were analysed for fat, lactose, N and total solids-non-fat (SNF). Fat concentration in milk was estimated using methods developed by Fleet and Linzell (1964) while lactose concentration in milk was measured using the titrimetric determination (MAFF 1973). Total solids were determined according to the gravimetric method described by MAFF (1973), and N concentration was measured using Kjeldahl digestion tube.

Statistical analysis

Data were collated then subjected to a one-way analysis of variance using SPSS for Windows release 11.0 (SPSS Inc., USA). In cases where ANOVA showed significant effects of treatments, mean values were compared using the Least Significance Difference (LSD) test (Daniel 1991).

RESULTS AND DISCUSSION

In total amount of milk produced, *Working* ewes yielded significantly more milk than that of *Control* ewes throughout *Work* and *No-Work* periods (Table 2). However, when milk yield is expressed per unit of respective ewes, mean values obtained for *Working* and *Control* groups were not significantly different (Table 2 and Figure 1).

Table 2. Means ± standard error of means (SEM) of milk yield by *Control* and *Working* ewes during *Work* period (Days 1 - 21) and *No-Work* period (Days 22 - 28)

	Control		*Working*		P
	Mean	± SEM	Mean	± SEM	
Milk Yield:					
During *Work* period:					
G	519	10	579	13	0.001
%LW	1.5	0.03	1.5	0.03	0.736
During *No-Work* period:					
G	498	14	577	20	0.001
%LW	1.5	0.04	1.5	0.05	0.948

In comparison with milk yields recorded for Merino ewes used in other studies, amounts of milk yielded by ewes in the current experiment were higher than those (216-303 mL/ewe/d) reported by Eady *et al.* (1991) but lower than those (938 - 1146 mL/ewe/d) reported by Jordan and Mayer (1989). Both research workers used similar tropical Merino breeds.

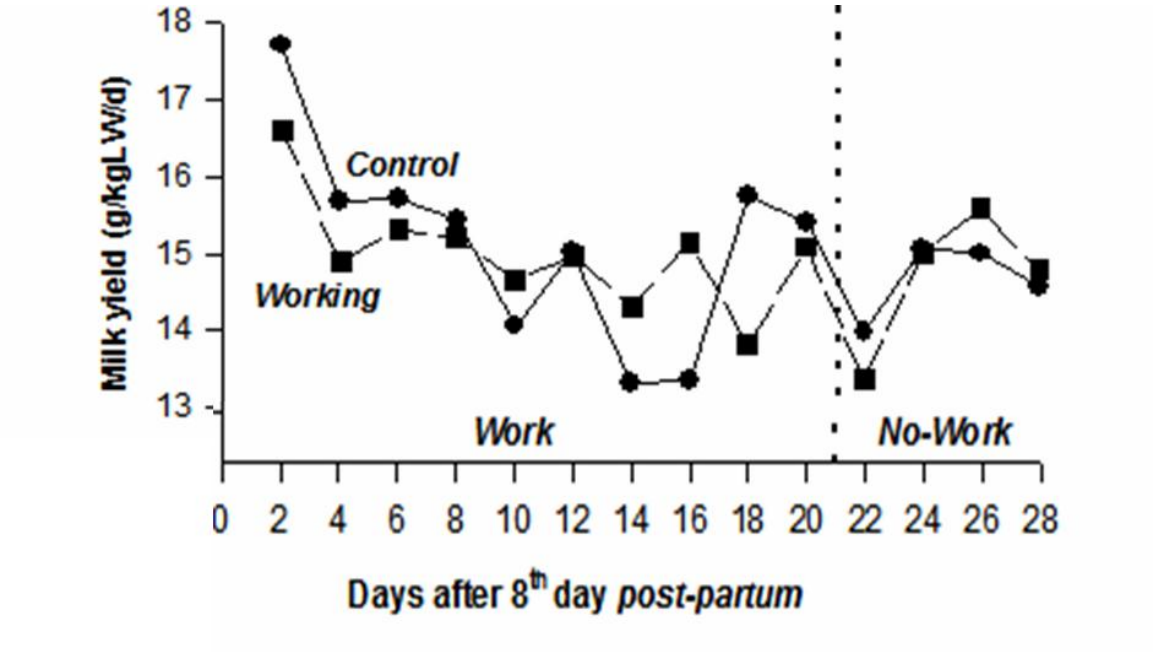

Figure 1. Means (■, ●) milk yield by *Control* and *Working* ewes recorded during *Work* and *No-Work* days.

Both *Working* and *Control* animals (Figure 1) seemed to reach their peaks of milk yield before Day 8, *post partum*. Expressed on the basis of live weight, milk yields of *Working* ewes were not significantly different. It would appear that *light* work does not adversely affect milk yield. Provision of a good quality diet, low milk yields and probable improvement of metabolic efficiency caused by work in the ewes used for the current experiment probably explain why work had no apparent impact on milk yield. Agyemang *et al.* (1991) observed that the effects of work on lactation of crossbred cows used for draught purposes was minimal when food supply was adequate.

Earlier studies have shown that the growth of lambs in the first 3–4 weeks after birth depends mainly on milk production from the dam, after which lambs begin to consume pasture (Doney and Peart 1976; Torres-Hernandez and Hohenboken 1979; Snowder and Glimp 1991; Afolayan *et al.* 2009). Also, there is a steady decline in milk production from the first few weeks of lactation to weaning (Moore 1966; Geenty 1979; Rhind *et al.* 1992).

While growth rates of Merino lambs observed by Jordan and Mayer (1989) varied from 139 - 178 g/lamb/day, those of lambs observed in the present experiment varied from 64 - 75 g/lamb/day only. The fact that *Working* ewes produced more milk in total per day is reflected in higher daily liveweight gain of these lambs compared to *Control* lambs (Figure 2).

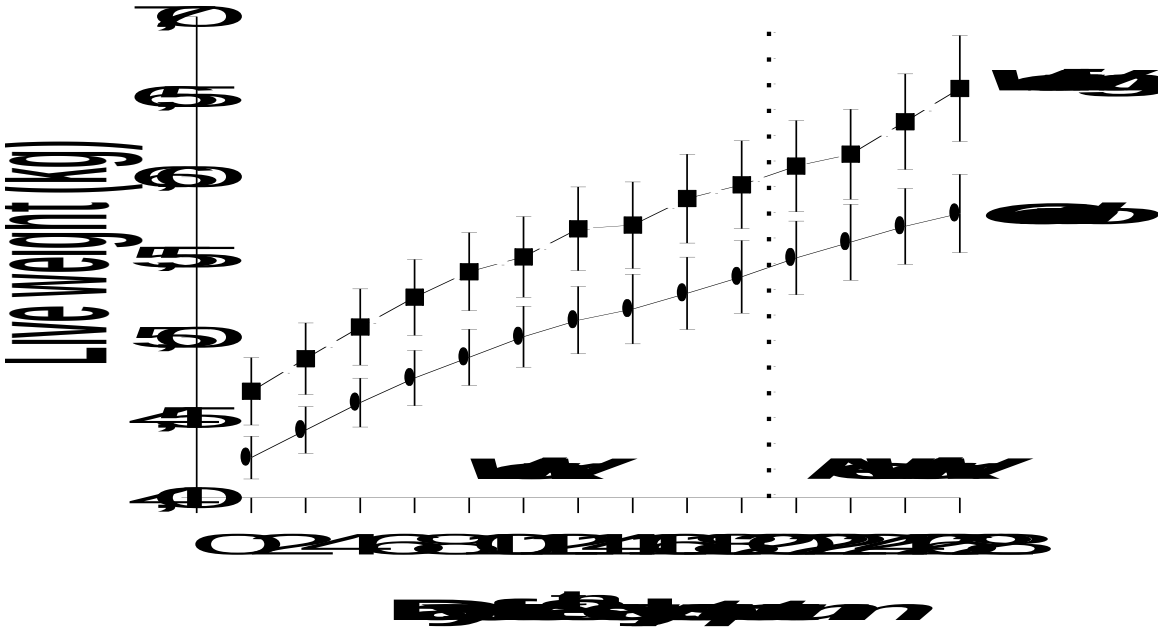

Figure 2. Means (■, ●) ± standard error of mean (vertical bars) of live weight of lambs suckling *Control* and *Working* ewes recorded during *Work* and *No-Work* days

Milk composition secreted by *Working* and *Control* ewes was not significantly different (Table 3).

Table 3. Means ± standard error of means (SEM) of milk composition of lactose, fat, protein, and solids-not-fat (SNF) of *Working* and *Control* ewes during *Work* days

	Control		*Working*		P
	Mean	± SEM	Mean	± SEM	
Composition (%):					
Lactose	4.9	0.15	4.8	0.16	0.744
Fat	10.0	0.47	10.9	0.62	0.296
Protein	4.8	0.18	4.9	0.16	0.796
Total SNF	16.2	0.33	16.2	0.41	0.970

Gemeda *et al.* (1995) also found that milk yield and milk quality of working cows were similar to those of non-working cows. These animals were subjected to a *light* workload regime.

CONCLUSIONS

It might be concluded from the result of this experiment that *light* work would not adversely affect milk yield and milk composition.

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