Effect of body covers on the liveweight gain of heifer replacement calves and yearlings, and the liveweight gain and milksolids production of dairy cows

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ABSTRACT

Body covers are used on dairy stock in an attempt to increase production by reducing the amount of energy required for thermoregulation. Experiments were undertaken to determine the production response to covering calves, yearlings and cows at several sites representing different climatic conditions of the dairying districts of New Zealand.

Calves (n=435) were randomly allocated to covered or uncovered treatments on 5 farms in 1993 (n=249) using PVC covers and 4 farms in 1994 (n=186) using Jute covers. Calves were covered for approximately 6 weeks prior to weaning. The difference in total liveweight gain between the covered and uncovered calves within farms ranged from +2.6 kg (± 1.9 kg) to -0.8 (± 1.6 kg) for PVC covered calves and +1.7 kg (± 4.2 kg) to -0.7 kg (±1.7 kg) when Jute covers were fitted. Covers did not significantly affect the growth of calves on any of the farms in either year.

Replacement heifer yearlings (n=232) on three farms were allocated to jute covered and uncovered treatments in early winter 1994. The difference in liveweight gain between the covered and uncovered heifer groups ranged from + 5.7 kg (± 3.5 kg) to -7.4 kg (± 2.4 kg) after approximately 90 days. The use of covers significantly reduced (P(0.05) the liveweight gain on one of the farms where the animals were heavily infested with lice.

Dairy cows on four farms were allocated to four balanced treatment groups. Treatments were an uncovered control, or Jute covers being fitted for winter or spring, or both winter and spring. The difference in liveweight change between the covered cows and the uncovered herd mates ranged from +6 kg (±3.5 kg) to -7 kg (±4.9 kg) during the winter and 9 kg (±4.1 kg) to -4 kg (±5.2 kg) during the spring. Covered cows on one farm lost significantly less (P<0.05) weight during the spring, however these cows also had lower (P<0.05) milksolids production during the same period. Covers were not beneficial for any group of stock, on any of the farms involved.

Keywords: dairy cattle, body covers, milksolids, liveweight, body condition score.

INTRODUCTION

In recent years an increasing number of farmers have fitted body covers to stock in an attempt to achieve better liveweight gains of replacement heifers, and improved calving condition of pregnant cows. Either of these factors could result in improved productive and reproductive performance of the herd. The rationale behind these claims is a reduction in the maintenance requirement of the animal, and an increased partitioning of energy to liveweight gain and milk synthesis.

Animals must increase their heat production, for thermoregulatory purposes, when they are exposed to temperatures below their lower critical temperature (Tcl), which would reduce their productive efficiency. The body insulation of cattle is reduced by exposure to wet and windy conditions, which will cause an increase in the value of Tcl. Cattle on a low level of feeding also have higher values for Tcl, because of their slower rate of heat production (Webster, 1976). In general, Tcl for cattle range between -10°C for well-fed dry cattle up to +10°C to +20°C for cattle on restricted feed, or young calves, exposed to wet and windy conditions (Webster 1976; Holmes and Maclean 1975; Holmes *et al.,* 1978). Therefore it is likely that cattle are exposed to conditions below their Tcl on occasions during winter and spring in New Zealand.

Several studies have shown that body covers can decrease the chilling effects of wind and rain on livestock. Jute coats effectively reduced heat loss from sheep exposed to wind and rain, but had no effect in dry conditions (Webster and Park.,1967). The death rate of recently shorn sheep was reduced from 55% to 5% by fitting plastic body covers (Panaretto *et al.,* 1968), and oxygen consumption of calves exposed to simulated wind and rain was reduced by coats (Holmes *et al.,* 1993).

The aim of this trial was to determine if the use of body covers would increase animal production on New Zealand dairy farms.

MATERIALS AND METHODS

Calves

Spring born heifer calves (240 Jersey and 195 Friesian) were randomly allocated to covered (+) treatment or uncovered (-) control groups on each of 5 farms in Waikato and Taranaki in 1993, and 4 farms in 1994. Calves in the respective treatment groups were fitted with Polyethylene (PVC) covers in 1993 (n=249), and Jute covers in 1994 (n=186). Calves were covered for approximately 6 weeks prior to weaning, otherwise they were managed as normal for that farm. All calves were weighed at the start and conclusion of the trial period. All calves were fed 5 to 6 litres of milk and had access to concentrates.

Yearlings

Replacement yearling heifers (92 Jersey and 140 Friesian) on each of three farms in the Waikato and Wanganui area were allocated to Jute covered (+) or uncovered (-) treatment groups balanced for liveweight immediately prior to the start of the trial. Covers were fitted on the animals in the treatment groups in late May early June, and removed in mid September 1994. The yearlings were covered for an average of 90 days. All yearlings were weighed at the start and at the conclusion of the trial period and were drenched with Ivermectin at the start of the trial.

Cows

Dairy cows (n=784) on four farms one in each of the Waikato, Bay of Plenty, Taranaki and Southland were allocated to 4 treatment groups balanced for age, breed, Payment Breeding Index, and calving date. Two of the herds consisted predominantly of Jerseys and the other two consisted of Friesian and Friesian cross cows. Treatments were an uncovered control; jute covers fitted from late May until immediately prior to calving; from immediately prior to calving until late September; and from late May until late September. On average the covers were fitted for 66 and 65 days respectively over the winter and spring periods. The cows were weighed and their body condition scored (BCS) at the start and end of each period. Milk production was measured monthly and a sample was analysed for the concentration of milkfat and milk protein, which was used to calculate the average daily milksolids (MS) production during the first 3 months of lactation. All cows were drenched with Ivermectin at the start of the trial to reduce the incidence of lung worms and lice.

Statistical Analysis

The results were analysed using a general lineal model in SAS. Least squares means and SED are presented.

RESULTS

Climatic conditions

The climatic data for the respective locations is contained in Table 1. The average air temperature for the winter period ranged from 5.3°C for Invercargill (Southland) to 9.1(C for Hamilton (Waikato), and for spring it ranged from 8.0°C in Invercargill (Southland) to 10.0°C at Whakatane (Bay of Plenty).

Calves

Fitting PVC covers did not increase the liveweight gain of calves (Table 2). The difference in total live–weight gain between the covered and uncovered groups of calves ranged from -0.8kg to +2.6kg/calf. The use of Jute covers in 1994 produced similar results. The difference in total liveweight gain between the covered and uncovered groups ranged from -0.7kg to +1.7kg. Covering calves did not significantly affect liveweight gain on any of the trial farms.

TABLE 2: Calves: Mean liveweight gain of uncovered (-) and covered (+) calves in 1993 (Polyethylene covers) and 1994 (Jute covers).

1993 PVC	Breed	Cover	L.Wt . gain Kg	Difference Kg	SED
Farm 1	Jersey	-	60.8		
		+	60.0	- 0.8	1.6
Farm 2	Friesian	-	30.9		
		+	33.5	+ 2.6	1.5
Farm 3	Friesian	-	54.1		
		+	55.0	+ 0.9	2.2
Farm 4	Jersey	-	29.0		
		+	31.6	+ 2.6	1.9
Farm 4	Friesian	-	31.9		
		+	33.4	+ 1.5	1.8
Farm 5	Friesian	-	48.2		
		+	48.9	+ 0.7	2.8
Farm 5	Jersey	-	36.3		
		+	38.7	+ 2.4	1.7
Average	Jersey	-	43.4		
		+	43.6	+ 0.2	1.2
Average	Friesian	-	40.5		
		+	42.2	+ 1.7	1.1
1994 Jute					
Farm 1	Friesian	-	48.8		
		+	48.1	- 0.7	1.7
Farm 2	Friesian	-	36.0		
		+	37.1	+ 0.9	1.8
Farm 3	Jersey	-	37.5		
		+	37.5	0	1.3
Farm 4	Jersey	-	30.9		
		+	32.6	+ 1.7	4.2
Average	Jersey	-	34.3		
		+	34.9	+ 0.6	1.9
Average	Friesian	-	42.2		
		+	42.2	+ 0.2	1.4

TABLE 1: Climatic conditions measured during the trial period (Cows)

Locality	Winter Av. Air Temp.°C	Spring Av. Air Temp.°C	Winter Rainfall mm	Spring Rainfall mm	Winter % days rain	Spring % days rain	Winter Av. Wind speed km/hr	Spring Av. Wind speed km/hr
Hamilton	9.1	9.8	297	299	26	26	11.5	11.3
Whakatane	8.9	10.0	347	369	47	59	6.6	5.9
Stratford	7.5	8.8	663	467	33	39	9.8	7.1
Invercargill	5.3	8.0	382	194	29	36	16.4	21.3

Yearlings

Fitting covers had no beneficial effect. The range in liveweight gain was from -7.4kg to +5.7kg (Table 3). On farm 2 the covered Friesian yearlings gained significantly less weight ($P<0.05$). This group of yearlings were heavily infested with lice, (particularly the covered yearlings), which may have had an effect on performance.

TABLE 3. Yearlings: Mean liveweight gain of uncovered (-) and covered (+) yearlings during the experimental period.

	Breed	Cover	L.Wt gain Kg.	Difference Kg.	SED
Farm 1	Friesian	-	60.7		
		+	61.4	+ 0.7	3.1
Farm 2	Friesian	-	43.6		
		+	26.2	- 7.4	2.4
Farm 2	Jersey	-	30.6		
		+	32.2	+ 1.6	2.7
Farm 3	Friesian	-	82.7		
		+	88.4	+ 5.7	3.5
Farm 3	Jersey	-	49.0		
		+	47.6	- 1.4	2.7
Average	Jersey	-	39.7		
		+	40.9	+ 0.3	1.9
Average	Friesian	-	62.1		
		+	62.2	+ 0.1	1.9

Cows

Liveweight

Covering cows in winter had no effect on liveweight change. The difference between the covered and uncovered cows in winter was from -7kg to +6kg (Table 4). The Taranaki herd lost liveweight precalving whereas the other herds gained weight.

All the cows lost liveweight after calving (Table 5), with the Taranaki and Southland herds losing the smallest amount. Over this period the covered cows in the Taranaki herd lost significantly less liveweight ($P<0.05$) than their uncovered herd mates.

Body Condition Score

Fitting cows with covers resulted in significantly higher body condition scores being estimated at the end of the winter, and spring periods (Tables 4 & 5). Covered cows gained an extra 0.20 of a BCS during the winter period and lost 0.14 less than the uncovered cows during the spring period ($P<0.05$). However, the estimated changes in BCS were not consistent with the measured changes in liveweight. Between herds there was a variation between liveweight change and BCS change. For example, in the winter period the Waikato covered cows put on an extra 0.17 BCS but 7kg less weight than the uncovered cows, whereas in Southland the covered cows put on an extra 0.14 BCS but only 2kg extra weight. It is generally accepted that 1 BCS is equal to 25 kg in liveweight

TABLE 4. Cows: Mean liveweight change (kg/cow) and Condition Score change (BCS units) of uncovered (-) and covered (+) cows during the winter experimental period.

Locality	Covered	Lwt (kg) Change	Difference	SED	BCS Change	Difference BCS.	SED
Waikato	-	+ 27			+ 0.34		
	+	+ 20	- 7	4.9	+ 0.51	+ 0.17	0.07
Bay of Plenty	-	+ 19			- 0.11		
	+	+ 14	- 5	3.5	- 0.19	- 0.08	0.06
Taranaki	-	- 31			- 0.64		
	+	- 25	+ 6	3.5	- 0.42	+ 0.18	0.08
Southland	-	+ 25			+ 0.39		
	+	+ 27	+ 2	2.3	+ 0.53	+ 0.14	0.06
Average	-	+ 12				+ 0.21	
	+	+ 11	- 1	1.9	+ 0.41	+ 0.20	0.04

TABLE 5. Cows: Mean liveweight change (kg/cow) and Condition Score change (BCS units) of uncovered (-) and covered (+) cows during the spring experimental period.

Locality	Covered	Lwt (kg) Change	Difference Kg.	SED	BCS Change	Difference BCS	SED
Waikato	-	- 68		- 0.69			
	+	- 72	- 4	5.2	- 0.52	+ 0.17	0.07
Bay of Plenty	-	- 68		- 0.59			
	+	- 72	- 4	5.4	- 0.34	+ 0.15	0.08
Taranaki	-	- 29			- 0.26		
	+	- 20	+ 9	4.1	+ 0.18	+ 0.44	0.10
Southland	-	-11			- 0.26		
	+	- 9	+ 2	3.6	- 0.24	+ 0.02	0.07
Average	-	- 38			- 0.51		
	+	- 40	- 2	2.2	- 0.37	+ 0.14	0.04

(Macdonald and Macmillan 1993). The liveweight change between the uncovered and covered cows for the winter and spring period was similar, yet the difference in BCS change was 0.20 and 0.14 respectively.

Milk production:

The use of covers gave no increase in milksolids production in the first three months of lactation. In the Taranaki herd, the winter covered cows produced 0.04kg MS/day less and the spring covered cows 0.10kg MS/day less ($P<0.05$) than the uncovered cows (Table 6). For both the winter and spring periods the average daily production (for the first 3 months of lactation) was 1.83 and 1.81 kg MS/day for the uncovered and covered cows respectively.

Reproduction:

The use of body covers did not affect reproductive performance. The days from calving to the mean date of first insemination cows was 74 and 73 days respectively for the winter covered cows, and 73 and 74 days respectively for the cows covered during the spring.

DISCUSSION

The use of covers did not significantly affect the growth rate of the calves on any of the farms in either year when PVC and Jute covers were used. The results for the yearlings were very similar to that of the calves. Felted wool covers had no beneficial effect on calf growth rate, and in one group their growth rate was significantly reduced (Macdonald and Holmes, 1995), suggesting that the use of covers in some situations may cause heat stress. These results are contrary to the findings of Holmes et al., (1993) who showed that fitting covers significantly reduced the oxygen consumption of calves exposed to simulated rain and wind. Although this suggested that covers are of benefit during bouts of rain and wind, the proportion of time calves are exposed to these conditions is probably relatively small. In wet and windy conditions calves tend to seek shelter, either provided, or by huddling together.

Fitting jute covers to cows resulted in increased liveweight gain on two of the four farms, however this was not reflected in MS production, and on the Taranaki farm the spring covered cows produced significantly less MS. Holmes et al., (1993), also demonstrated that fitting poyethylene covers to lactating dairy cows in winter had no effect on milk production.

The fact that the covers made no difference to the liveweight change yet there was a perceived body condition score advantage, could explain why farmers and others have concluded covers have a beneficial effect. The fact that the covered cows looked better (in terms of body condition score) is a possible reason for these perceived benefits.

In these trials it was not possible to measure if the covered cattle had a lowered maintenance requirement, however these results suggest that this is unlikely. The effect of covers on cows daily intakes is probably small in the winter period in New Zealand as they are generally restricted to maintenance feed intakes during the winter period.

Lice was a problem on several of the farms, particularly on the covered cattle. Body covers provide an ideal environment for lice to thrive. It is normally accepted that Ivermectin is effective for 45 days. The covers were on the yearlings for 90 days and the cows for 65 days, therefore use of covers may be associated with extra costs for lice control.

TABLE 6: Cows: Mean daily milksolids production (kg MS/cow/day) in the first 3 months of lactation, of the uncovered (-) and covered (+) cows during the winter and spring experimental periods.

Locality	Covered	Winter covered	SED	Spring covered	SED
Waikato	-	1.98		1.96	
	+	1.96	0.03	1.98	0.03
Bay of Plenty	-	1.58		1.58	
	+	1.57	0.04	1.57	0.04
Taranaki	-	1.78		1.81	
	+	1.74	0.04	1.71	0.04
Southland	-	1.98		1.99	
	+	2.00	0.03	1.99	0.03
AVERAGE		1.83		1.83	
		1.82	0.02	1.81	0.02

CONCLUSION

The results of this study suggest that under normal climatic conditions, typical of the dairying regions of New Zealand, the fitting of body covers to dairy cattle will not increase their productivity.

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