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BEHAVIOR OF COWS USING MAGNETIC FEEDER

Clarence L. Moore
Dept. of Agriculture, Illinois State University, Normal, Illinois 61761

ABSTRACT

This study examines feeding behavior and milk production responses of dairy cows with and without guardrails at a magnetic feeder. Ten 24 h observation periods were made on 26 dairy cows using a magnetic feeder (Northco Serv-O-Matic). Guardrails protecting the cows at the feeder were installed for the last five observation periods. Guardrails for the magnet group (eleven cows) reduced cow visits to feeder by 65.8% and interferences by other cows by 73.0%. 87.6% of the interferences were caused by non-magnet cows. Average time per visit increased from 1.6 to 6.0 min with guardrails. Total time at feeder and total grain consumption in a 24 h period increased from 33.6 to 39.8 min/cow and from 12.0 to 15.4 kg/cow. Milk production increased from 25.5 to 25.9 kg/cow on magnetic cows while controls dropped .8 kg/cow/day. Guardrails for non-magnet group (15 cows) reduced cow visits to feeder by 65.5% and time spent at feeder by 24.6%. Production dropped 11.6% when magnets were removed from cows averaging 20.6 kg milk/day. The most activity at the feeder occurred approximately 1 h after milking (cows eat forage first) and the least activity was 1 h before milking. Milking began at 5 am and 4 pm.

INTRODUCTION

Getting enough grain into high producing dairy cows which are kept in a loose-housing or free stall facility and milked in a milking parlor has been a problem for dairymen. The magnetic grain feeder (Serv-O-Matic, Northco Co., La Verne, MN) is one system which will allow selected cows to receive extra grain. By hanging a special magnet on a cow's neck, the magnet hits a switch which activates the feed auger when the cow sticks her head in the feeder. One of the apparent problems with this type of feeder is the interference from other cows which could be reduced by the installation of guardrails (Hutjens 1976; Kubik 1976). In a Minnesota survey of 20 dairy farms using the magnetic feeder only 4 were using guardrails (Hutjens 1976). This study examines feeding behavior during a 24 h period and milk production responses of dairy cows with and without guardrails at a magnetic feeder.

METHODS

Twenty-six lactating Holstein cows from the Illinois State University dairy herd were used in this experiment. Eleven cows which ranged from 67 to 201 days in lactation when the experiment commenced had magnets. Fifteen cows which ranged from 90 to 539 days in lactation had no magnets. Ages of all cows ranged from two to nine years. Cows with magnets averaged 25.6 kg milk daily, and cows without magnets averaged 16.0 kg milk daily prior to the start of the experiment.

The experiment consisted of 10 trials. During the first five trials, no guardrails were provided to protect the cow from other cows while she was eating. Guardrails were installed for the remaining five trials. Each trial consisted of a 24 h observation with the following information recorded on each cow: 1) number of visits to feeder; 2) time spent per visit at feeder; 3) total min at feeder in 24 h; 4) kg feed consumed in 24 h; 5) number of interferences by cows with magnets; 6) number of interferences by cows without magnets; and 7) milk production weights.

Two adjustment periods were held in order for animals to adjust to the presence of observers. The first period was just prior to the experiment and involved a 12 h observation. The second adjustment was a 12 h observation period which occurred after the installation of guardrails and before the start of the last five trials. The feeder was equipped with a light which would go on each time it augered feed. Observers used a stop watch to record the length of time the light was on for each cow. The feeder augered .45 kg of pelleted feed (16% protein) per min. In addition, the cows were fed a blended ration of corn silage (6.0 kg dry basis) and haylage (7.7 kg dry basis) free choice, and 4 kg dry basis of high moisture corn daily. No grain was fed in the milking parlor during the experiment.

RESULTS

Average number of visits and time spent at the feeder by cows with magnets is shown in Table I. There was a more efficient use of the feeder when guardrails were installed to protect the cows while they were eating. Average number of visits to the feeder was 21.9 without guardrails and 7.5 with guardrails. Average time spent at the feeder increased when guardrails were installed (1.6 min without guardrails and 6.0 min with guardrails). Average range per visit varied considerably with each cow. The most dominant cows (1, 45, 72) had the greatest range.

The total min during a 24 h period that each cow spent at the feeder averaged 33.6 without guardrails and 39.8 with guardrails (Table I). Thus, the cow's total min at feeder increased 18.5% with guardrails. The kg of feed consumed also increased with guardrails (12.0 kg/cow without guardrails and 15.4 kg/cow with guardrails). As depicted in Table I, the kg of milk did not increase as much as the kg of feed consumed when there were guardrails. However, all cows had passed their peak production, so normally production would be expected to drop. If the cows had been in an earlier part of their lactation, then the extra feed may have been profitable. Milk production for the magnetic cows increased only 1.6% with guardrails. The non-magnetic cows dropped 5% in production during this same period of time. Guardrails were most helpful for the cows low in dominance rank (9, 70 and 86) in obtaining

more feed. There was a considerable amount of daily variation in the total min the feeder ran, and consequently, in the amount of feed consumed by most cows in a 24 h period. One cow (72) varied only 4.5 kg in daily feed consumed, whereas most of the cows varied between 8.0 and 14 kg. This variation in feed consumed is a disadvantage for this type of feeding system. The total min that the feeder ran in a 24 h period was always quite constant.

Table II shows the utilization of the feeder by cows without magnets. There was enough reinforcement from the small amount of grain which was left in the feeder by the previous cow to encourage them to keep interfering with those cows with magnets. One of the most dominant cows in the herd (13) did not have a magnet, but had more visits to the feeder (38.6) than any cow in the herd, including those with magnets. When guardrails were installed, the number of visits to the feeder decreased by 65.5% for the non-magnetic cows. The non-magnetic cows made several visits to the feeder when there were no guardrails (average 17.4) and only 6.0 visits with guardrails. The total min at feeder was reduced by 24.6% with guardrails.

Table III shows the interferences of cows with magnets in a 24 h period. Most of the interferences of cows carrying magnets were caused by cows without magnets. As the number of visits to feeder decreased, so did the number of interferences. With no guardrails, the average number of interferences from cows without magnets was 18.3, and only 2.0 from cows with magnets. Total interferences decreased 73.0% with guardrails. Non-magnetic cows caused 87.6% of the interferences.

Interferences of cows without magnets is shown in Table IV. Most of the interferences of cows without magnets were caused by cows with magnets. With no guardrails, the number of interferences from cows with magnets was 5.0, and 2.3 from cows without magnets. Total interferences were reduced 88.2% with guardrails.

Table V shows the effect on milk production when magnets were removed. Six cows which averaged 20.6 kg milk/day dropped 11.6% when magnets were removed. The percent decrease ranged from 4.3 to 23.5 kg milk/day. There was considerable variation with each cow in their response to the extra feed from the magnetic feeder.

The use of the feeder by magnetic and non-magnetic cows is shown in Fig. 1. The number of times the cow used the feeder was more constant and much less with guardrails. Milking was done at 5:00 am and 4:00 pm which accounts for the lower use of the feeder at this time because fewer cows were in the lot. When there were no guardrails, there were more cows at the feeder approximately 1 h before milking. With guardrails, the peak activity occurred at approximately 10:00 am. Generally, as a cow came out of the milking parlor, she would eat silage, drink water, and then go to the magnetic feeder.

DISCUSSION

The magnetic grain feeder is one way of providing extra feed to high producers. The feeder should have guardrails which will protect the cow while she is eating. There will be less problems with boss cows and all magnetic cows, especially the timid cows, will be able to consume more feed. Most interferences at the feeder (87.6%) are caused by non-magnetic cows and these disturbances are reduced by 76% with guardrails. Guardrails increased the use of the feeder by magnetic cows by 18.5% and reduced the use of the feeder by non-magnetic cows by 24.6%.

A problem with this type of feeding system is not knowing exactly how much feed each cow is consuming. This study showed most cows varied a great deal (8 to 14 kg) in their daily intake of pelleted feed at the magnetic feeder. Without knowing how much each cow is eating, it is difficult to know when the magnetic feeder is no longer supporting production.

The manufacturer of the magnetic grain feeder recommends one magnet cow/hour of feeder exposure. Eleven magnetic cows were used in this experiment for 24 hours of feeder use. Therefore, the magnetic cows had less competition for feed from other magnetic cows and consequently probably ate more feed than if we would have had 24 cows with magnets or limited the feeder use to 11 hours. However, we were interested in observing feeding behavior for a 24-hour period and found cows will use the magnetic feeder any time of day or night with least use just before milking.

ACKNOWLEDGMENTS

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LITERATURE CITED

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TABLE I. Utilization of Feeder by Cows with Magnets During a Twenty-Four Hour Period.[a]

Cow number	Avg. kg of milk	No. of visits to feeder	Avg. time per visit (min)	Avg. range per visit (min)	Total min at feeder	Total min feeder ran	kg of feed consumed
No guardrails							
1	28.6	27.8	2.4	<.2-32.0	66.9	46.0	20.8
9	18.4	11.2	.8	<.2- 7.5	9.3	8.1	3.7
41	20.8	29.6	1.3	<.2- 9.2	38.5	33.9	15.4
45	32.8	24.2	1.7	<.2-16.1	41.5	30.8	14.0
64	19.4	17.2	2.9	<.2-11.0	49.6	43.4	19.7
66	31.4	22.8	1.3	<.2-11.4	29.7	23.0	10.4
70	35.6	11.8	1.8	<.2- 8.5	21.6	15.3	7.0
71	18.2	25.4	1.5	<.2- 7.4	34.6	32.4	14.7
72	25.7	15.8	1.8	<.2-18.0	28.2	21.8	9.9
81	31.0	35.4	.9	<.2-11.2	30.5	24.3	11.0
86	18.2	21.6	.9	<.2-10.0	19.3	12.3	5.6
Mean	25.5	21.9	1.6		33.6	26.5	12.0
Guardrails							
1	29.8	7.8	9.1	.4-18.5	70.8	66.3	30.1
9	20.4	6.6	6.4	<.2-22.0	41.9	35.1	15.9
41	19.9	8.0	3.9	<.2- 8.3	31.1	28.1	12.8
45	30.9	6.4	5.9	<.2-13.1	37.4	31.4	14.3
64	19.0	7.0	4.9	<.2-16.0	34.5	32.0	14.5
66	33.2	5.8	8.3	.4-19.6	47.9	37.6	17.0
70	37.3	3.6	11.6	1.5-18.3	41.8	32.7	14.8
71	19.3	13.2	2.4	<.2-10.3	32.4	28.2	12.8
72	25.0	5.4	5.9	1.1-16.3	31.7	24.7	11.2
81	32.8	8.2	4.4	<.2-17.1	36.1	30.9	14.0
86	16.9	10.2	3.1	.5-14.3	31.4	26.9	12.2
Mean	25.9	7.5	6.0		39.8	34.0	15.4
% Reduction		65.8					
% Increase	1.6		275.0		18.5	28.3	28.3

[a]All figures are averages of five 24-hour observations made before and after installation of guardrails.

TABLE II. Use of Feeder by Cows without Magnets During a Twenty-Four Hour Period.[a]

Cow number	Avg. kg of milk	No. of visits to feeder	Avg. time per visit (min)	Avg. range per visit (min)	Total min at feeder
No guardrails					
15	18.2	38.6	1.0	<.2- 4.5	40.2
35	13.3	21.6	1.7	<.2- 4.1	36.3
46	18.3	23.6	1.9	.4- 5.1	45.0
50	18.2	26.6	1.6	<.2- 4.4	41.9
55	12.5	26.6	.7	<.2- 4.1	19.0
63	.0	10.8	3.3	<.2- 3.0	35.3
65	17.3	29.0	1.4	<.2- 3.4	39.1
73	14.3	17.4	1.2	<.2- 6.5	21.1
74	15.2	6.8	.8	<.2- 3.2	5.5
80	16.4	7.8	1.0	<.2- 6.1	8.0
82	21.2	9.2	1.0	<.2- 8.0	8.8
83	16.7	10.0	1.3	<.2- 6.1	13.0
85	19.9	7.2	1.0	<.2- 4.0	6.9
89	17.9	9.0	1.5	<.2-12.1	13.7
124	18.9	17.0	.5	<.2-10.0	9.1
Mean	15.9	17.4	1.3		22.8
Guardrails					
15	17.9	16.4	2.1	<.2- 8.3	31.8
35	10.6	.0	.0	.0- .0	.0
46	17.8	16.6	2.8	<.2- 4.3	45.9
50	11.6	5.6	2.6	<.2- 5.4	9.2
55	11.2	4.0	4.4	.6- 5.4	17.7
63	.0	3.1	2.3	<.2- 4.4	7.7
65	16.6	7.2	3.4	<.2- 7.2	24.1
73	13.5	6.4	4.2	1.1-14.3	27.1
74	15.7	1.8	4.3	<.2-10.5	7.8
80	15.7	1.2	.6	<.2- 1.0	.7
82	21.2	1.4	3.9	1.0- 5.0	5.5
83	18.7	10.6	3.0	<.2- 6.1	31.6
85	19.6	8.1	2.2	<.2- 7.1	18.9
89	16.5	6.0	2.6	<.2- 9.0	15.5
124	20.2	5.4	3.1	.5- 4.1	10.7
Mean	15.1	6.0	2.8		17.2
% Reduction	5.0	65.5			24.6
% Increase			115.4		

[a]All figures are averages of five 24-hour observations made before and after installation of guardrails.

TABLE III. Interferences of Cows with Magnets in a Twenty-Four Hour Period.[a]

Cow number	No. of visits to feeder	No. of interferences from cows with magnets	No. of interferences from cows without magnets	Total interferences
No guardrails				
1	27.8	4.5	36.0	40.5
9	11.2	2.0	5.5	7.5
41	29.6	.0	26.0	26.0
45	24.2	2.0	23.5	25.5
64	17.2	.5	4.5	5.0
66	22.8	3.5	20.0	23.5
70	11.8	1.5	11.5	13.0
71	25.4	1.0	4.0	5.0
72	15.8	.5	19.0	19.5
81	55.4	6.0	33.5	39.5
86	21.6	1.0	18.0	19.0
Mean	21.9	2.0	18.5	20.4
Guardrails				
1	7.8	1.0	6.5	7.5
9	6.6	5.5	3.5	9.0
41	8.0	.0	6.0	6.0
45	6.4	2.0	2.0	4.0
64	7.0	.0	5.0	5.0
66	5.8	1.0	1.0	2.0
70	5.6	.0	7.0	7.0
71	13.2	.0	5.0	5.0
72	5.4	.0	1.0	1.0
81	8.2	2.5	6.0	8.5
86	10.2	.5	5.0	5.5
Mean	7.5	1.1	4.4	5.5
% Reduction	65.8	45.0	76.0	73.0

[a]All figures are averages of five 24-hour observations made before and after installation of guardrails.

TABLE IV. Interferences of Cows without Magnets in a Twenty-Four Hour Period.[a]

Cow number	No. of visits to feeder	No. of interferences from cows with magnets	No. of interferences from cows without magnets	Total interferences
No guardrails				
13	38.6	4.5	.5	5.0
35	21.6	1.5	2.0	3.5
46	23.6	.5	.0	.5
50	26.6	3.0	7.0	10.0
55	26.6	.0	.5	.5
63	10.8	31.5	3.5	35.0
65	29.0	2.0	4.0	6.0
73	17.4	13.0	5.0	18.0
74	6.8	12.5	5.0	17.5
80	7.8	1.0	.0	1.0
82	9.2	.0	1.5	1.5
83	10.0	2.5	.5	3.0
85	7.2	.0	.5	.5
89	9.0	.0	1.5	1.5
124	17.0	2.5	3.0	5.5
Mean	17.4	5.0	2.3	6.8
Guardrails				
13	16.4	.0	.0	.0
35	0	.0	.0	.0
46	16.6	1.0	.5	1.5
50	3.6	1.0	.5	1.5
55	4.0	.0	.0	.0
63	3.4	1.5	.0	1.5
65	7.2	.0	.0	.0
73	6.4	.5	.5	1.0
74	1.8	.0	.0	.0
80	1.2	.5	.0	.5
82	1.4	.0	.5	.5
83	10.6	2.5	1.5	4.0
85	8.4	.5	.0	.5
89	6.0	1.0	.0	1.0
124	3.4	.5	.0	.5
Mean	6.0	.6	.2	.8
% Reduction	65.5	88.0	91.3	88.2

[a]All figures are averages of five 24-hour observations made before and after installation of guardrails.

TABLE V. Effect on Milk Production when Magnets were Removed.

Cow number	With magnets			Magnets removed			
	Avg. kg of milk	total min at feeder	kg of feed consumed	Avg. kg of milk	total min at feeder	kg of feed consumed	% decrease in milk
41	22.0	46.8	17.7	18.1	49.9	0	17.7
86	20.4	22.2	6.2	15.6	18.6	0	23.5
64	20.2	49.9	19.7	18.5	12.6	0	8.4
73	20.5	54.5	11.7	18.1	16.3	0	9.4
151	19.9	51.4	21.7	18.7	15.4	0	6.6
87	20.7	28.6	11.6	19.8	8.8	0	1.3
Mean	20.6	58.4	15.2	18.2	18.8	0	11.6

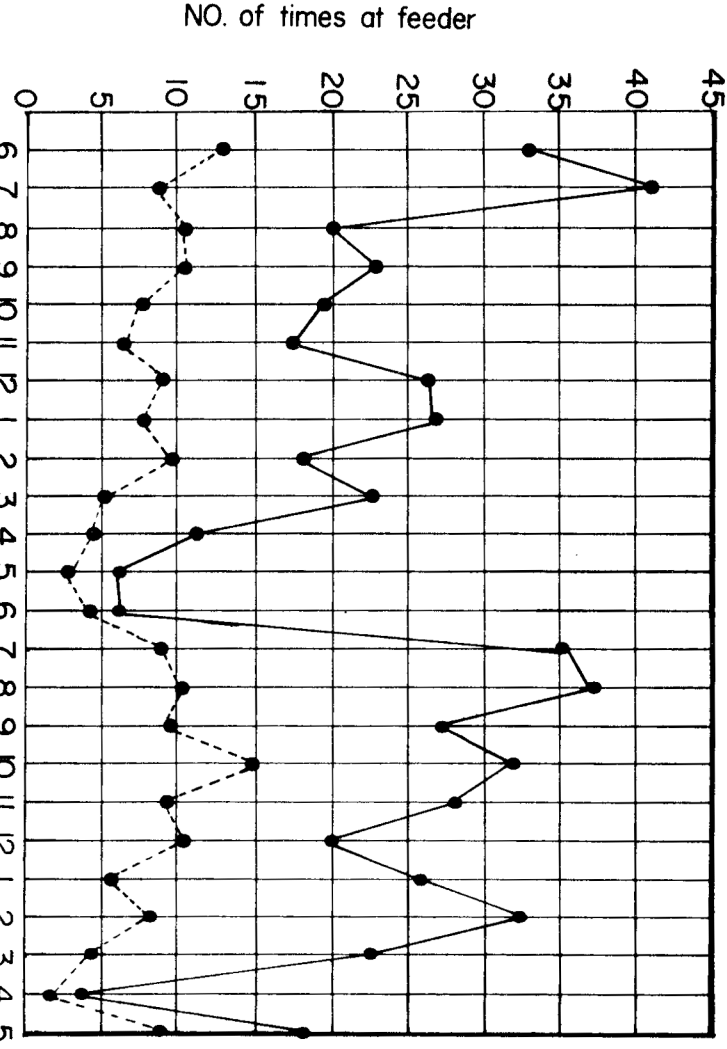

FIG. 1 Use of feeder by 26 cows in a 24 hour period.