
THE EFFECT OF FREQUENCY OF MILKING ON DAILY MILK PRODUCTION IN INDIAN DAIRY BREEDS

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THE SENSITIVITY of the switch-back or double-reversal design for research on dairy cattle is widely recognized. Basically, this design permits the comparison of two treatments, although change-over designs of the Latin-square or round-robin type may be used for the comparison of more than two treatments. The main advantage of these designs is that they permit the completely random allotment of the animals to the treatment sequences, because the design and the method of analysis automatically remove from experimental error the between-cow variation in production level and most of the variation in persistency. Thus, grouping or pairing of animals for similarity prior to allotment or for balancing cow differences across treatments becomes completely unnecessary. This is a very great advantage particularly in small herds of dairy cattle where pairing of cows is almost an impossibility.

DESIGN

For minimum experimental error with the switch-back design, it is important that the cows should have passed the lactation peak at the commencement of the experiment and no cows should have passed five months of gestation at the close of the experiment. Four Red Sindhi and eight Sahiwal cows at the Dry Zone Research Station, Maha Illuppallama, that satisfied these requirements, were allotted at random to two lots, A and B, of six cows each. Three of the cows were in their first lactation, three in the second, and the remaining six were in their third or later lactations. Supplementary concentrate feeding according to level of production was given to all cows included in the experiment.

Lots A and B were placed on the following treatment sequences :

<i>Experiment period</i>	<i>Treatment sequences</i>					
	<i>Lot A</i>			<i>Lot B</i>		
1st to 27th day	2	×	milking	3	×	milking
28th to 54th day	3	×	milking	2	×	milking
55th to 81st day	2	×	milking	3	×	milking

Where milking was carried out twice daily, the hours of milking were 4 a.m. and 4 p.m. ; for 3 × milking the hours were 4 a.m., 12 noon and 8 p.m.

To eliminate any possible carry-over or residual effects, the performance of cows during only the last twenty days of each experimental period was used for the statistical analysis described below. It may be noted here that other designs and methods of analysis exist which permit the estimation of residual effects without deleting the performances from the earlier portions of the periods. In the present experiment, however, the residual effects, if any, were of no particular interest and were therefore not studied.

RESULTS

The data from the experiment are shown in Table 1.

TABLE 1—Milk Yield Data in Pints in the Switch-back Experiment to determine the Effects of 2 × and 3 × milking

<i>Lot</i>	<i>Cow No.</i>	<i>PERIOD</i>					
		<i>1st to 7th day</i>	<i>8th to 27th day</i>	<i>28th to 34th day</i>	<i>35th to 54th day</i>	<i>55th to 61st day</i>	<i>62nd to 81st day</i>
A		(2 ×)	(2 ×)	(3 ×)	(3 ×)	(2 ×)	(2 ×)
	AD 97	73	218	78	222	71	193
	AD 70*	60	168	59	175	60	188
	AD 145	63	176	66	184	55	153
	AD 122	75	221	75	206	64	179
	AD 38	79	229	83	224	68	175
	AD 156	59	168	65	181	52	148
B		(3 ×)	(3 ×)	(2 ×)	(2 ×)	(3 ×)	(3 ×)
	N 223	56	158	51	130	53	141
	AD 57	88	252	76	204	81	204
	AD 104	66	218	71	182	68	192
	E 69	76	242	83	223	76	196
	AD 126	67	200	72	188	70	174
	AD 96	80	250	81	231	89	231

* The milk yield of cow No. AD 70 was adversely affected from the 43rd to the 45th day of the experiment by the illness and subsequent death of her suckling calf. Her yield during these three days was therefore corrected on the basis of her yield on the day prior to the calf's illness.

Using only the data for the periods 8 to 27 days, 35 to 54 days and 62 to 81 days for the analysis, the error variance was found to be 514.73, while the sum of squares for the comparison of 2 × and 3 × milking was 8008.33.

Hence, $F = 8008.33/514.73 = 15.56$ which is a highly significant value for degrees of freedom 1 and 10.

The magnitude of the increase in yield from 2 × milking to 3 × milking may be readily computed from Table 1. It will be seen that the average daily yield per cow was 6.6 per cent higher when she was milked thrice daily as compared with 2 × milking.

DISCUSSION

Parr and Sen (1947) claimed that in Tharparker cows at Karnal, an increase in average daily yield of 47 per cent was obtained by four times milking and special handling. Unfortunately, in their experiment, the effects of 4 × milking and handling on the one hand, and of age on the other, had been confounded, and the methods used by these authors to separate out the two groups of effects were not quite satisfactory.

With European cows, increases in yield of the order of 20 to 25 per cent have been obtained from 3 × as compared with 2 × milking. Lush and Shrode (1950) suggests multiplying 3 × records by 0.80 when they are first lactations and by 0.833 when they are later ones for correcting them to the basis of twice-a-day milking. Their data also hinted the possibility that the difference between 2 × and 3 × milking is even larger than 4 : 5 at extremely young ages.

By comparison, the average difference in yield of 6.6 per cent between 2 × and 3 × milking obtained in the present experiment is of very small magnitude indeed. The level of milk production in Red Sindhi and Sahiwal cows, which was of the order of 9.8 pints per cow per day in this instance, is so much lower than in European animals that perhaps the effect of the extra milking in relieving pressure in the udder is negligible. The additional expenditure that would be incurred in switching over from 2 × to 3 × milking of these cows would not be adequately balanced by the increase in production to warrant the adoption of 3 × milking as routine farm practice.

SUMMARY

A statistically significant increase in milk yield was obtained in Red Sindhi and Sahiwal cows by increasing the frequency of milking from two to three times per day. The numerical magnitude of this increase

was found to be of the order of 6.6 per cent. From an economic point of view, this increase does not appear to warrant the adoption of 3 × milking as routine farm practice in herds of Indian dairy cattle.

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