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SOME FACTORS AFFECTING PERSISTENCY OF LACTATION IN SAHIWAL COWS

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Data on 716 lactations of 201 Sahiwal cows kept at the Dairy Farm of University of Agriculture, Lyallpur were analysed to find the shape of lactation curve and the various factors affecting persistency. The peak production was attained during the 2nd month of lactation, and the decline upto the 8th month was more or less linear. The decline from 8th to 10th month was sharp. Milk produced in each month expressed as the percentage of the total yield was 13.3%, 14.4%, 13.2%, 11.9%, 10.9%, 9.8%, 8.7%, 7.5%, 6.0% and 4.3% from 1st to 10th month of lactation. Average milk yield in this herd was 2347.8 kg.

The persistency varied between seasons and between lactations of different number (1—5). The highest persistency index of 0.8924 was among the cows calving in spring season and the lowest index (0.8769) was in the winter calvers. The overall persistency index in this herd was 0.8859. Persistency was higher (0.9014) in the 1st than in other lactations. It was also higher in 2nd and 3rd lactations as compared to 4th and 5th lactations. Lactation yield were however, greater among the cows in 5th lactation. Data showed a definite relationship between level of production and persistency. The high yielding cows were more persistent. The persistency index for cows yielding 2700 kg or more milk was 0.9069, whereas it was 0.7808 among the cows producing less than 1350 kg of milk in a lactation.

INTRODUCTION

The amount of milk produced by a cow in a lactation depends largely upon the initial yield and the persistency with which such yields are maintained. Sufficient evidence is available to justify the statement that in general, cows having high degree of persistency are the most economical producers. Like other dairy traits, persistency is also influenced by numerous genetic and environmental factors. Persistency index was found to vary significantly due to season of calving and lactation number (Cianci and Montemurro, 1963; Singh *et al.* 1965; Gavrielatos, 1969). Singh *et al.* (1965) reported it to be higher in summer than in winter calvers and also in first than in other lactations.

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However, Saxena and Kumar (1960) observed no definite relationship between persistency and season of calving in Sahiwal cows. They further noticed that high yielders were more persistent. Contrarily, Kartha (1934) reported that higher the level of production, the greater was the decline in yield. Attempt has been made in the present investigation, to study the shape of lactation curve in Sahiwal cows, and also various factors affecting persistency of lactation yield.

MATERIALS AND METHODS

Data on 716 lactations of 201 Sahiwal cows kept at the University of Agriculture, Lyallpur from 1917 to 1965 were used in this tudy. Lactations affected by diseases or less than 200 days duration were excluded from analyses. Milk yields during first 305 days (10 months) were considered to study the shape of lactation curve. Numerical expression for the shape of lactation curve was obtained by the formula:

$$\text{Persistency Index} = \frac{\frac{X_2 n}{X_1} + \frac{X_3\,(n-1)}{X_2} + \frac{X_4\,(n-2)}{X_3} + \ldots\ldots + \frac{X_n\; n-(n-2)}{X_{n-1}}}{n(n-1) - (n-1)\,\frac{(n-2)}{2}}$$

Where

X (with the aid of subscript) designated the production of any particular period after attaining the peak yield, and

n was the number of divisions into which the lactation was divided after attaining peak yield.

Persistency indices of cows calving in different seasons were calculated to assess the variability associated with this factor. Monthly averages for milk yield of cows calving in different seasons were also depicted on graph to see the trend. In this analysis the year was divided into spring (March–May), summer (June–August), autumn (September–November) and winter (December–February) seasons.

Influence of age expressed as lactation number (1 to 5) on persistency was also studied. Lactations were also grouped according to the level of production. Five production levels, i.e. below 1350 kg, 1350—1800 kg, 1800—2250 kg, 2250—2700 kg and 2700 kg and above were used. The course of lactation, in this study, was divided into 10 divisions of one month each.

RESULTS AND DISCUSSION

The analyses of the lactation data revealed that milk yield in this herd during the first 305 days averaged 2347.8 kg. Monthly averages from Ist to

10th month when plotted showed that the peak production (337.9 kg) was attained during the 2nd month of lactation and decline upto the 8th month was more or less linear (Figure 1). The decline from 8th to 10th month was rapid. Milk produced in each month expressed as percentage of the total yield was 13.3%, 14.4%, 13.2%, 11.9%, 10.9%, 9.8%, 8.7%, 7.5%, 6.0% and 4.3% from 1st to 10th month of lactation.

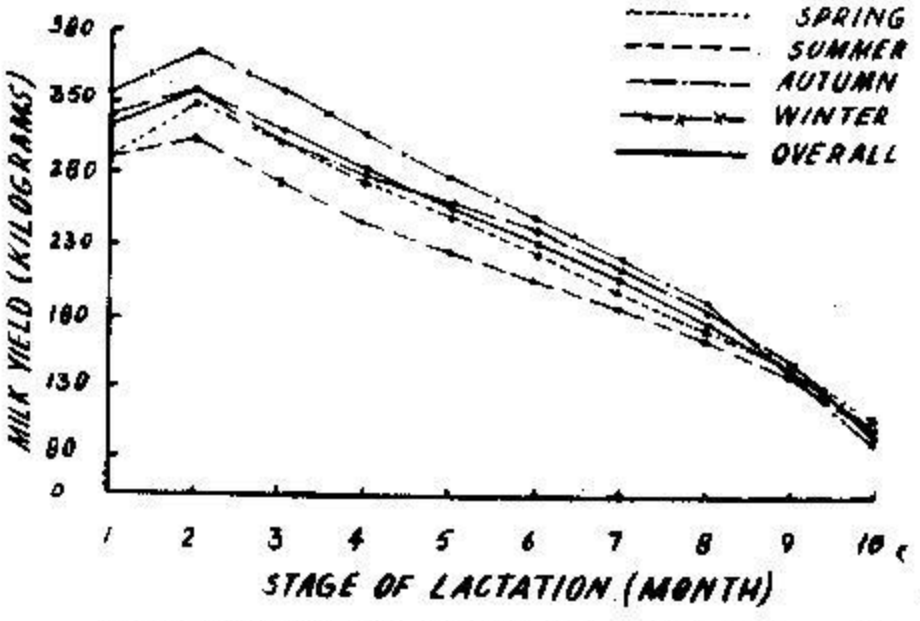

FIG. 1. LACTATION CURVE OF COWS CALVING IN DIFFERENT SEASONS.

1. Seasonal influences on persistency and yield Maximum number of calvings (38.4%) and the highest average milk yield of 2512.9 kg was noticed among the cows calving in winter season (Table 1). Summer calvers had the

Table 1. *Persistency indices for milk yield of cows calving in different seasons*

Season	No. of calvings	Av. lactation milk yield (kg)	Persistency index
Spring	174	2306.5	0.8924
Summer	166	2134.2	0.8915
Autumn	139	2377.3	0.8883
Winter	237	2512.9	0.8769
Overall	716	2347.8	0.8859

lowest production (2134.2 kg), but minimum calvings occured in autumn season. Lactation curves for the cows calving in different seasons is shown in Figure 1. Spring calvers had lactation curve with desirable slope, but the cows calving in winter season had constant decline upto 8th month, after which the monthly yield fell sharply thereby indicating low persistency. Summer and autumn calvers had poor shaped slopes after 5th month of parturition. The cows calving in spring season had the highest persistency index of 0.8924 (Table 1). Next in the order were cows calving in summer months (0.8915). The winter calvers ranked the lowest for persistency index (0.8769). The overall persistency index in this herd was 0.8859.

These results agreed to some extent with those reported by Singh *et al.* (1965) and Gavrielatos (1969). The persistency index as reported by these workers, varied significantly with calving season and was the lowest in winter than in other seasons. However, Mahadevan (1951) reported that among Ayrshire cows, the highest persistency was attained by the cows calving in winter and the lowest by the summer calvers. On the contrary, Rakes *et al.* (1963) found autumn calving Holstein Friesian and Jersey cows more persistent than those calving in other seasons. No definite relationship was observed between persistency and season of calving among Brown Alpine and Sahiwal cows (Maymone and Malossini, 1960; Saxena and Kumar, 1960). These differences might be due to the varying management and climatic conditions under which their herds were maintained.

The observed variation in persistency indices of the cows calving in different seasons could be due to seasonal influences. The type of feed, temperature, humidity and management vary greatly with the season. A low persistency among the winter calvers was mainly due to sharp declines after 8th month of lactation (August—October) which might be due to the scarcity of the green fodders in autumn season during which this part of the lactation of winter calvers happened to occur. The other plausible explanation for it would be the last stages of pregnancy among the winter calvers. The cows calving in winter usually come in heat during the forthcoming spring season and hence become pregnant which reduces milk secretion after 6th month of gestation. High persistency among spring calvers might be due to late post-partum conception and hence longer calving intervals.

II. Lactation curve in relation to lactation number. Milk yield increased from the Ist to the 3rd lactation but dropped slightly in the 4th lactation (Table 2).

Surprisingly there was an increase in the 5th lactation. Although, the cows in the Ist lactation had sharp decline during the 10th month, but had constant decrease in monthly yield from 2nd to 9th month of lactation (Figure 2). The

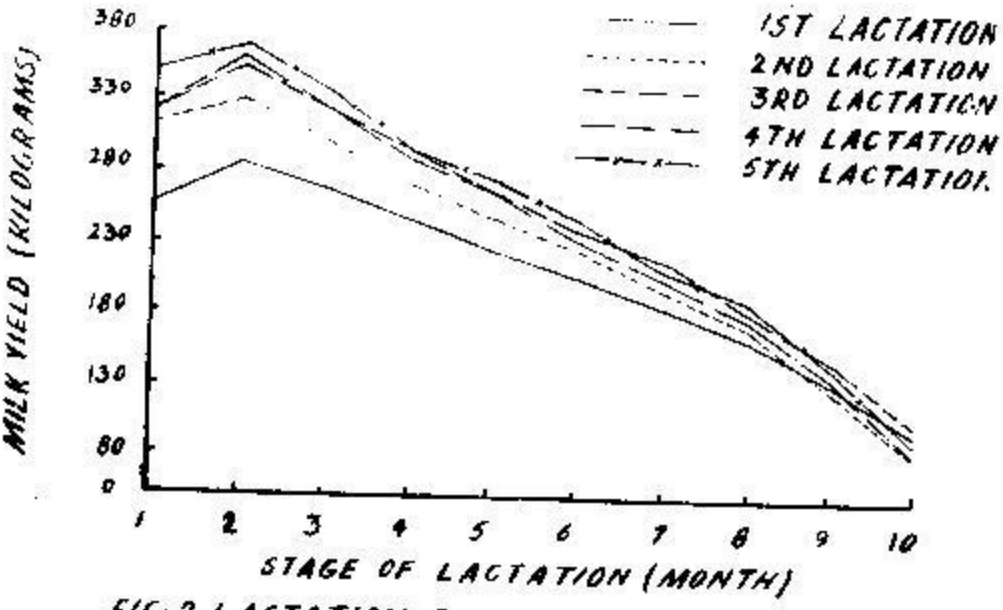

FIG. 2 LACTATION CURVE OF COWS IN DIFFERENT LACTATIONS

cows in the 2nd lactation had a slight increase from the initial to the peak yield but reduction from 8th month onward was very high. The lactation curves for 3rd and 5th lactation were linear in shape but highly zigzag. Milk yield in the 4th lactation fell sharply after the peak production as well as after 8th month of lactation.

Table 2. *Persistency indices for milk yield of cows in relation to lactation number*

Lactation number	Frequency	Av. milk yield (kg)	Persistency index
1.	201	2077.5	0.9014
2.	148	2277.9	0.8801
3.	106	2459.4	0.8879
4.	85	2419.5	0.8741
5.	65	2500.7	0.8785

Persistency index was the highest in the Ist lactation but no specific trend was observed in the later lactations (Table 2). However, it was the lowest (0.8741) in the 4th lactation. Second and 3rd lactations had 0.8801 and 0.8879 as the persistency indices.

Numerous other workers had also reported the highest persistency in the Ist lactation. Mahadevan (1951) observed variation in persistency due to age and showed its necessity to correct high persistency in Ist calvers when comparing with other lactations. Saxena and Kumar (1960) also reported that persistency declined on an average from the Ist to the 2nd lactation. Amongst the Dutch Friesian and Brown Swiss cows, the persistency was the highest in Ist lactation and it remained relatively constant thereafter (Cianci, 1963; Gavrielatos, 1969). High persistency in the first lactation as compared to other lactations, might be due to the fact, that the heifers are in better condition and carry greater body reserves at this stage than any other stage in the future life. Heifers are also usually more generously cared for, and the development of mammary glands and the amount of the secretory tissues in their udders are also maximum in the earlier stages.

III. Persistency as affected by the level of production. The lactation curves of cows at different levels of production are shown in Figure 3. The cows producing below 1350 kg of milk had a slight increase from initial yield to the peak production. However, it was maximum among the cows yielding

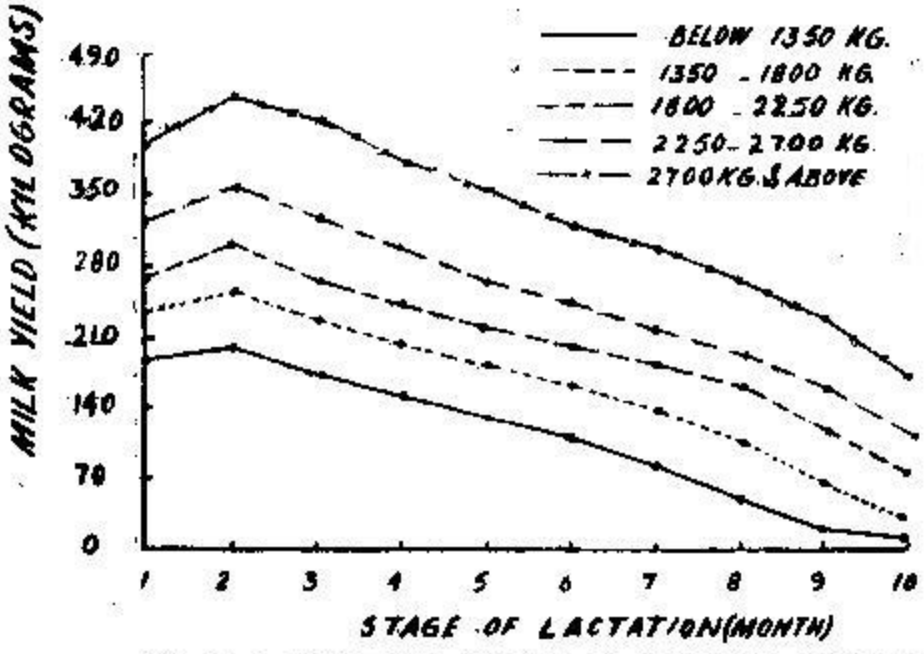

FIG. 3. LACTATION CURVE OF COWS AT DIFFERENT LEVEL OF PRODUCTION.

above 2700 kg of milk in a lactation. The drops were more sharp after 8th month of lactation among the cows yielding below 1350 kg and also 1350—1800 kg of milk. Comparatively constant declines were noticed among the cows producing 1800—2250 kg and 2250—2700 kg of milk in a lactation. A smooth reduction in milk yield after the peak production was obvious among the cows yielding above 2700 kg of milk.

Persistency indices among the cows increased with the production level (Table 3). It was 0.7808 among the cows producing below 1350 kg of milk and 0.9069 for those yielding above 2700 kg of milk in a lactation.

Table 3. *Persistency indices for milk yield of cows as influenced by level of production.*

Production level (kg)	Frequency	Av. milk yield (kg)	Persistency index
Below 1350	72	1124.5	0.7808
1350—1800	134	1599.8	0.8391
1800—2250	155	2041.6	0.8746
2250—2700	125	2507.9	0.8883
2700 and above	230	3298.1	0.9069

The present finding was in confirmity with that reported by Saxena and Kumar (1960) who found that high yielding cows were more persistent. The low persistency values among the poor producers might be due to their shorter production period. The persistency of lactation tended to increase with increased length of lactation (Cianci, 1963). Among the Sahiwal cows, Ahmad (1972) had reported a positive correlation of 0.62 ± 0.01 between lactation length and lactation milk yield. The high yields were usually associated with longer lactation duration. However, the results in this study differed from that reported by Maymone and Malossini (1960). They observed a higher persistency among Brown Alpine cows yielding 375 kg or less in their Ist month than those yielding more (86.7% vs. 80.0%). High persistency among these initially low milk producing cows, perhaps be due to their poor feeding and management practices. This might have kept the production so much below the cow's inherent ability that her level of production remained more stable than it would have been under better management.

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