STUDIES ON
THE PEAK YIELD AND PERSISTENCY OF LACTATION IN CROSSBRED DAIRY COWS

By

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "STUDIES ON THE PEAK YIELD AND PERSISTENCY OF LACTATION IN CROSSBRED DAIRY COWS" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship, or other similar title, of any other University or Society.

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CERTIFICATE

Certified that this thesis, entitled "STUDIES ON THE PEAK YIELD AND PERSISTENCY OF LACTATION IN CROSSBRED DAIRY COWS" is a record of research work done independently by Smt. Girija, C.R. under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to her.

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CONTENTS

		Page
INTRODUCTION	:	1
REVIEW OF LITERATURE	:	4
MATERIALS AND METHODS	:	25
RESULTS	:	30
DISCUSSION	:	49
SUMMARY	:	56
REFERENCES	:	59

ABSTRACT

LIST OF TABLES

Table No.		Pages
1.	Milk production performance of crossbred cows	36
2.	Days to attain peak yield, peak yield and yield upto the attainment of peak yield in crossbred cattle.	37
3.	Persistency index in crossbreds.	38
4.	Mean persistency index according to season of calving in Jersey x Zebu crossbreds	39
5.	Mean persistency index according to season of calving in Brown Swiss x Zebu crossbreds	39
6.	Effect of season of calving on persistency in Jersey x Zebu crossbreds.	40
7.	Effect of season of calving on persistency in Brown Swiss x Zebu crossbreds.	40
8.	Mean persistency index according to farms in Jersey x Zebu crossbreds.	41
9.	Mean persistency index according to farms in Brown Swiss x Zebu crossbreds.	41
10.	Effect of farms on persistency in Jersey x Zebu crossbreds.	42
11.	Effect of farms on persistency in Brown Swiss x Zebu crossbreds.	42
12.	Mean persistency index of Jersey x Zebu crossbreds calved in different periods.	43
13.	Mean persistency index of Brown Swiss x Zebu crossbred cows calved in different periods	43

14. Effect of period of calving on persistency in Jersey x Zebu crossbreds 44

15. Effect of period of calving on persistency in Brown Swiss x Zebu crossbreds 44

16. Mean persistency index in Jersey x Zebu crossbreds according to age at first calving. 45

17. Mean persistency index of Brown Swiss x Zebu crossbred cows according to age at first calving. 45

18. Effect of age at first calving on persistency in Jersey x Zebu crossbreds. 46

19. Effect of age at first calving on persistency in Brown Swiss x Zebu crossbreds. 46

20. Correlation of peak yield with total lactation yield, lactation period and 305 day's yield. 47

21. Correlation of persistency with lactation period, peak yield and 305 day's yield. 47

INTRODUCTION

INTRODUCTION

Cattle occupy a unique position in the national economy of our country, predominantly dependent on agriculture. Amongst the various milch animals, the cow is the animal of choice, as the environmental conditions are generally favourable for its upkeep. Also cow milk is almost a perfect natural food. Further more, through judicious crossbreeding with exotic animals, it is possible to introduce into Indian cattle the genes for high production, earlier sexual maturity and regular breeding resulting in substantial increase in milk production of the country.

In Kerala, the cattle population has been 30.06 lakhs which consists of 16.51 lakhs of desi cattle and 13.55 lakhs of improved cattle (Livestock census,1977). The improved group consisted of 2.17 lakhs males and 11.38 lakhs females. The production of milk amounted to 7 lakh tonnes and the per capita availability of milk was 79 grams per day which was far lower than the requirement. In India the daily average consumption of milk per capita comes to 115 grams which is also less than even half of the minimum requirement (Singh and Moore, 1978).

The poor lactation yield of the Indian cow is the combined result of very low plane of nutrition, improper

management and indescriminate breeding. It was visualised that improvement in milk production could be brought about by careful selective breeding of good milch animals or grading up of the nondescript stock by using bulls of well defined breeds or crossbreeding of Indian cows with the exotic breeds viz. Jersey, Holstein-Friesian and Brown Swiss. But crossbreeding programme appears to be the quick method for the improvement of the production potential in our cattle. The introduction of the genetic potential upto an optimum level into the local cattle population from a high productive exotic dairy cattle breed is desirable.

In Kerala, Jersey x Zebu and Brown Swiss x Zebu crossbreds are most common. Information about the performance of these crossbreds is meagre.

Persistency, peak yield and lactation length are the three major factors determining the shape of the lactation curve. Persistency determines the degree to which milk yield in early lactation is maintained by a cow during the rest of her lactation and thus measuring the shape of the lactation curve (Ludwick and Petersen, 1943). Persistency and peak yield can be utilised as criteria for selection of dairy cows. Persistency denotes the capacity of a cow to continue to

produce without much decline in milk yield throughout the lactation. It is expressed as the rate of decline in milk from the maximum production after parturition, until milk secretion ceases (Dutt and Saksena, 1966). Studies on components of lactation curve are important in formulating effective breeding programmes for improving the character. Evaluation of the effects of different non genetic factors affecting persistency is essential for formulating management practices.

Considering the importance of the above parameters a study was undertaken to evaluate the peak yield and persistency of lactation and their relation with other production traits in Jersey x Zebu and Brown Swiss x Zebu crossbred cattle.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The literature available, relevant to peak yield and persistency of lactation is reviewed under the following heads.

1. Milk production performance.
2. Peak yield.
3. Persistency and factors affecting persistency.
4. Lactation curve.

Milk production performance

Crossbreeding of zebu cattle with exotic breeds has been adopted as a national policy for enhancing the genetic potential of the former for higher lactation yield (Sikka, 197 Superiority of crossbreds over Indian cattle in production have been reported by Sikka (1931), Littlewood (1933) and Mac Guckin (1937). Maule (1953) in his review on crossbreedin on dairy cattle pointed out that there has been 60 - 70 per ce increase in milk production in crossbred cows in comparison to Zebu cows. Stonaker et al. (1953), Naidu and Desai (1965), Bhatnagar et al. (1966), Amble and Jain (1967), Bhasin and Desai (1967) and Francis (1970) have reported on the performar of different crossbreds in India. Acharaya (1968) stated that crossbreds were better in production than pure breds. Bhatnag et al. (1970, 71) reported the performance of Brown Swiss x Sahiwal and Brown Swiss x Sindhi crossbreds at National Dairy

Research Institute, Karnal. Nair (1973) reported for the first time the performance of Jersey x Zebu crossbred cows in Kerala State. Nair (1973), reported on the first lactation yield of Brown Swiss halfbred cows maintained at the Indo-Swiss Project, Madupetty, where the conditions of management were superior to those in farmer's premises. Patel et al. (1975) made a study of the economics of the cattle breeding programme of the Indo-Swiss Project, Kerala. They have reported on the average daily yield of Brown Swiss cross cows in the plains, but without any mention of the level of exotic inheritance or order of lactation of those cows. Nair and Kelath (1977) observed 14.68 per cent heterosis for lactation yield in Brown Swiss x Zebu crossbred daughters belonging to F1 generation. The Brown Swiss x Zebu crossbreds were 89.25 per cent superior to their zebu dams in the first lactation yield which was 1611.40 ± 12.79 litres.

Peak yield

Haeker (1903) in a study of the best week in a cow's lactation period reported that the highest production per week varied in the same cow from lactation to lactation with 90 per cent of the cows reaching the peak production during the first 10 weeks after calving. But Gavin (1913) observed that only 84 per cent of the cows reached peak daily productio

by the 8th week after calving. The age of the cow and season of freshening were also seen affecting the time of attainment of peak production (Gavin 1913, Rakes et al., 1959, Pradhan 1970, Chauhan et al., 1974).

Delage et al. (1953) stated that the maximum production was reached on the 60th day of lactation in 96 per cent of the cows. Branton and Miller (1959) also observed the maximum daily and monthly milk yields in the second month of lactation in majority of the Holstein Friesian cows in Louisiana, regardless of the season and year of calving.

In Hariana cows, peak yield was seen significantly affected by the period of calving and lactation number (Gill et al., 1970). They also stated that non genetic factors had only very little effect on peak yield.

Pradhan (1970) stated that 51.18 per cent of Kankrej cows reached peak production by 7th week.

Dave and Patel (1971) reported an average period of 7 weeks from calving to attain the peak with a range of 3 - 26 weeks in Kankrej cattle.

Gill et al. (1971) reported high relationship between peak yield and milk yield, phenotypically and genotypically.

They concluded that selection for peak yield would also result in a high correlated response for total lactation yield, when compared to selection for persistency.

In Brown Swiss crossbred cows, the mean periods to attain peak yield were 36.2 ± 1.6 days in F1 and 46.8 ± 4.1 days in F2 (Chauhan et al., 1974).

In Tharparkar cows, Ram and Singh (1975) noticed that the period had significant effect on peak yield, though season had not exerted any influence.

Rajagopalan and Dave (1976) reported that Jersey cows reached maximum production by 6th week after calving and from that level the production was being maintained more or less upto 9 weeks, after which that declined almost in a straight line fashion.

Persistency and factors affecting persistency

Becker and Mc Gilliard (1928) while studying the inheritance of persistency in lactation observed that both sire and dam contributed to the persistency of milk production of their pregeny.

In the analysis of the lactation curve into maximum yield and persistency, Sanders (1930) noticed that the rate of decline in the average daily yield was the greatest before

January for cows which had calved before the previous August and were milked through the following May.

Season of calving had significant effect on persistency The cows calved in winter season were more persistent than those calved in other seasons.(Davydov, 1933; Johansson, 1937; Sikka, 1950; Mahadevan, 1951; Branton and Miller, 1959).

Dickson and Kopland (1934); Homes and Sykes (1960) and Griffiths (1965) could find significant influence of nutrition on persistency. On the contrary Mathew et al.(1960); Castle and Watson (1961); Leaver et al.(1968) and Broster (1970) have not observed any significant effect of nutrition on persistency.

In the study on persistency in a herd of Ayrshire cows, Ponte-corve (1940) found that the stimulus to produce milk is so strong in the first part of the lactation, that the environment, especially the plane of nutrition, could but slightly and only temporarily influence it. But the contrary was true as lactation advanced towards its end.

Ludwick and Petersen (1943) stated that the persistency values declined from the first to the fourth lactation and exhibited an erratic increase or decrease thereafter.

Jordao and Assis (1949) found that cows which calved in the cool dry season (May - August) had higher yields and

persistency indices than those calved in hot, rainy season (November - February) in the herd at the experimental institute of Animal Production, Pind_a_monhangaba. Persistency was found less in lactations with high (> 3500 kg) and low (500 - 1000 kg) yields than in lactations with intermediate yields while the highest persistency indices were found in lactation yields of 2000 - 2500 kg. They also found that the persistency was considerably less in the imported cows than in those born in the country.

Sikka (1950) by the 'paired lactation method' showed that persistency declined with age from the first lactation and that maximum yield rose to a peak at the 4th lactation after which there was a decline in the Ayreshire breed of cattle. The total yield attained peak at the 5th lactation and then declined. The shape of the lactation curve exerted a fair amount of influence on the total lactation yield.

The effect of month of calving on persistency of lactation varied significantly between herds. On the average the highest persistency was attained in winter calvers and that the lowest in summer calvers. The variation in persister with age showed that corrections for high persistency in first calvers were necessary when compared to cows in different lactations in Holsteins (Mahadevan, 1951). He also reported an average repeatability of persistency as 0.242 and heritabil

of 0.10 - 0.15. Hence improved feeding and management would bring about the greatest returns in the direction of improved persistency.

Ullah (1952) reported that the persistency of lactatio decreased as the number of completed lactations increased upto 6th lactations. There was significant correlation between persistency and total milk production.

Gestation period tended to increase persistency in the first four months and then it had a depressing effect on production in Dutch Friesian cows (Delage et al., 1953).

Graziosi and Aghina (1954) noticed the coefficient of persistency of lactation as the highest (0.9285) in the 3rd and 4th lactations and the lowest (0.9052) in the 1st, 6th and 7th lactations in Friesian cattle. But that were highest (0.9956) in the 1st, 2nd and 3rd lactation and lowest (0.9250) in the 6th and 7th lactations in Brown Alpine cattle.

Persistency was less in cows calved in March - June than in those calved in October - December, although their production during a 300 day lactation was less. The effect of month of calving on persistency was the greatest in the low land breeds and the lowest in the dual purpose breeds (Nagy and Gaspar, 1955).

Zimmerman (1955) could observe that persistency was the best in cows, in which milk production had been of average

quantity and fat content above the average.

Corely (1956) reported that the main factors effecting persistency were the methods of milking and season of calving in Holstein Friesian, Jersey and crossbred cattle. Machine-milked cows were approximately 5 per cent less persistent than hand-milked cows and cows in first lactations were about 8 per cent more persistent than those in second lactations. Cows calved in spring were less persistent than those cows calved in other seasons. He concluded that the major part of the variations in persistency were due to non-genetic factors.

After eliminating the effect of month of calving, Bouma (1957) got a heritability of persistency of 0.3 in Mieuse - Rhine Yssel breed of cattle based on 460 dam-daughter comparisons. Gruhn and Bartels (1958) stated that persistency of milk yield was under genetic control.

The maximum milk yield and persistency were independen factors which collectively influenced lactation yield in a positive way (R = 0.86). On an 'among lactations in breed' basis, lactation milk production and persistency were negative correlated (- 0.72) which expressed the observed effects of age at maturity in this relationship. In the analysis, additional effects due to persistency contributed 8.5 per cent to the total variation in 'among cows in lactation in breed'.

On an 'among lactation in breed' basis the effects due to persistency contributed 0.9 per cent of the total variation (Lennon and Mixner, 1958).

Asker et al. (1959) studied the environmental and hereditary factors affecting persistency of lactation in Friesian and native cows in Egypt. In Friesians the persistency was highest in their 4th and the native cows in their 1st lactations. Difference in persistency indices between cows at different lactations were not statistically significar Month of calving had a significant effect on persistency in Friesians. Persistency showed high positive correlation with lengths of calving intervals and lengths of lactations. Persistency had been the highest for Friesians and the lowest for native cows.

Branton and Miller (1959) studied the hereditary and environmental factors affecting persistency of milk yield in Holstein friesian cows in Louisiana. Season and year of calving had high significant effect on persistency of production. Cows calved in August - November had the highest persistency and those calved in December - February were intermediate and those calved in March - June were the least persistent. Rakes et al. (1959) observed that cows freshened in spring reached the highest peak milk production in all lactations.

Based on an analysis of data from 116 Brown Alpine cows, Maymone and Malossini (1960) observed that persistency of milk yield was greater for cows calving at 1.6 - 3.6 years of age than for those calved later. For those in which gestation period was initiated >180 days rather than within 70 days following pasturition, the effect being more marked in high yielding cows. Persistency was also greater for cows with a yield of $\leq$ 375.1 kg in the first month of lactation than for higher yielding cows. Persistency was influenced by better fat content but not by season of calving.

Saxena and Kumar (1960) studied the persistency of milk yield in Sahiwal cows and noticed that combining high persistency with high initial yield might lead to increased total milk production. Linear regression of persistency on total yield in each lactation gave highly significant results confirming the conclusion that the higher yielding cows were more persistent. Persistency declined on the average from the 1st - 2nd lactation. The decline was less marked for high yielding cows. No definite relationship could be observe between persistency and season of calving in that herd.

The persistencies of milk and butter fat production observed by Horn et al.(1961) in Jersey x Hungarian spotted and Jersey x Brown Alpine heifers were higher than those in

Hungarian spotted and Brown Alpine contemporaries. The average daily yields were 10.7 kg in Hungarian spotted x Jersey heifers and 9.9 kg in Hungarian spotted heifers.

The effects of herd, breed, sire and season on milking persistency were studied by Stallcup *et al.*(1961). Lactation yield had been the highest for Autumn calvers. Herd, breed and season had greater effects than sire on persistency of lactation.

Smith and Legates (1962) reported that the first calvers were more persistent with a mean persistency value of 1.844 ± 0.006 in Holstein herds. But the mean for later records was only 1.588 ± 0.005. Persistency decreased with age in later records. There were 0.8 and 0.4 per cent of the variations for 1st and later records. The sire component of variance in persistency was small and negative which indicated the sampling near zero.

Gianci and Montemuro (1963) stated that persistency varied significantly between months and the highest persistenc was obtained in cows freshened in March, April and July and that the lowest persistency in cows freshened in August and September.

Holstein and Jersey cows calved in autumn were found to be more persistent. But the cows calved in spring had the

highest lactation yield among Jerseys (Rakes et al.,1964)

In Swiss Brown cattle, Oecking (1965) observed, that the persistency of milk production was influenced by month of calving, pregnancy, lactation number and altitude but not by the age at first calving or yield over 300 recorded days. The h^2 of persistency of lactation was found to be 0.15.

Rose et al. (1965) studied the genetic relationship of persistency with production traits and reported that the genetic correlations between persistency values and yields were positive but quite variable and not statistically significant.

Singh et al.(1965) stated that, in Hariana cattle, summer calvers were more persistent than winter calvers. The persistency in first lactation was the highest. Persistency was found to be influencing milk production, though not to the same extent as peak yield and lactation period.

Cole (1966) reported that the total production gradually increased for the first 30 days of lactation and then declined slowly.

The average persistency index in percentage was found to be 86.3 $\pm$ 0.503 in Hariana cattle. No significant intra-herd correlation and regression coefficients between age at

first calving, calving interval, breeding efficiency and persistency index were obtained (Dutt and Saksena, 1966).

Crimella (1967) reported a persistency value of 1.237 ± 0.042 in Friesian cows of European origin and that of 1.296 ± 0.033 for those of American origin. The combined heritability of lactation persistency was 0.014.

Bolduan (1968) pointed out that selection for persistency within higher yielding herds may be more effective than hitherto, assumed owing to limitation of environmental variation.

Dohy (1968) could notice that the first lactation persistencies of Jersey crosses did not differ from those of pure bred Hungariarian Red pied cows in one farm but those were different on two other farms.

Wood (1968) reported that persistency of lactation varied considerably according to month of calving, parity and bull progeny groups. He also observed that persistency was negatively correlated with total yield.

Based on the studies on the first lactation yields of 521 Hariana cows Balaine et al. (1970), concluded that period of calving significantly affected persistency, peak

yield, lactation length and lactation yield. Persistency was also seen significantly affected by the season of calving. Phenotypic correlations of persistency were positive with lactation length and lactation yield. Peak yield and persistency were negatively associated both phenotypically and genetically. The heritability persistency was found to be 0.01.

Baric (1970) described a method of unbiased evaluation of lactation persistency in which the relative persistency of lactation

$$Pr = \frac{\text{Average milk yield in 2nd - 10th month of lactation}}{\text{Total milk yield in 2nd - 10th month of lactation}} \times 1$$

and the absolute persistency of lactation Pa = regression of milk yield per month on month of lactation.

Studies on the effect of non-genetic factors like year, season of calving, age of calving, lactation number and service period on persistency in Hariana cows revealed that the persistency was significantly affected by season and period of calving, lactation number and service period.(Gill et al., 197 They suggested that persistency could be improved by maintenanc of cows in better environmental conditions.

Pradhan (1970) reported highly significant seasonal

effect on persistency. Rainy season calvers were found to be most persistent, whereas winter season calvers the least persistent.

Wood (1970) concluded that, of the variation in persistency, 77.4 per cent was associated with parity and season of calving, 17.2 per cent with between cow difference and 5.4 per cent with herd.

Cicogna and Ciarrocchi (1971) put the primiparous Italian Friesian cows into groups of 52, 24, 17, 7 and 2 animals, respectively, according to whether they had 1, 2, 3, 4 or 5 inseminations for the next conception and they found persistencies of lactation of 1.32, 1.39, 1.39, 1.25 and 1.14 respectively.

The persistency values of lactation in Kankrej cattle were highest in summer and lowest in winter. Those were highly correlated with age at first calving (Dave and Patel, 1971).

El Amin and Osman (1971) stated that persistency index was not significantly influenced by the month of calving. Decline in milk yield with advances in lactation was not as rapid in Sudanese Zebu cattle as in the case of Hariana cattle.

In Sofia Brown breed, Gerov et al.(1971) assessed the persistency as good and very good.

Gill et al. (1971) found that though persistency was lowly heritable, the peak yield was highly heritable. They also observed that persistency had high and positive phenotypic correlation and low genetic correlation with milk yield.

Osman and Elamin (1971) reported from Northern Sudan the heritability estimate of 0.10 ± 0.09 for persistency index in Zebu cattle and they stated that the low heritability estimate indicated most of the variation in the trait as due to environmental effects. Hence they pointed out that persistency could be improved by better feeding and management.

Pradhan and Dave (1973) could observe that Kankrej cows reached their peak weekly production of 61.91 kg in the 7th week after freshening. The average rate of decline in a week was 1.67 per cent. They reported an average persistency of 97.90 ± 0.74 per cent and also reported that the parity had a highly significant effect on persistency. They could also observe that the season of freshening affected the persistency very significantly with rainy season calvers the most persistent and winter calvers the least.

The mean persistency indices of first lactation yield of Sahiwal, Red Sindhi and Brown Swiss crossbred cows in National Dairy Research Institute, Karnal were 3.05 ± 0.05, 3.96 ± 0.09 and 3.03 ± 0.06 respectively (Sharma and Bhatnagar,

1973). The persistency index did not differ significantly between the breeds. Age at first calving was found to have no effect on persistency of lactation. The persistency index was seen associated with lactation length and lactation yield. Though correlation between persistency and peak yield was significant in the case of Sahiwal cows, the same was non-significant in Red Sindhi and Brown Swiss crossbred cows. Therefore they concluded that the Sahiwal cows had higher peak yield and better persistency. In the case of Brown Swiss cross breds those calved in August, September and November had better persistency index.

The average persistency value for milk production in Jersey cows was observed as 98.81 $\pm$ 0.1847 per cent by Rajagopalan (1974). Season of freshening did not influence persistency appreciably in Jersey cows.

In Czech Pied cows lactation persistency index was significantly correlated with the number of inseminations per conception (0.54) and service period (0.72) (Brauner and Matouskova, 1975).

Gravert and Baptist (1976) reported that the persistenc expressed as regression was - 31 g/day. The phenotypic and genetic correlations between initial yields and regressions were - 0.65 and - 0.43, respectively. Estimates of heritability

were 0.26 and 0.18, respectively, for initial milk yield and regression.

In Simmental breed of cows, Antic (1977) found that the persistency index ranged from 55.73 to 100 per cent, with a mean of 80.92 per cent.

Choovatanapagon et al. (1977) reported that the year and season of calving, lactation number, breed of the cow and service period had highly significant effects on measures of persistency in Red Dane and Red Dane crossbred cows. The heritability of persistency was found to be 0.093 and 0.066, respectively, and the repeatability values were 0.165 and 0.204, respectively, in Red Dane and Red Dane crossbreds.

Based on the observation on the performance of Holstei Friesian cattle, Bhat et al. (1978) reported that in India, persistency of milk yield was not seen affected to any significant degree by change of genotype from a temperate to tropic environment. The average persistency value for milk productio was 4.23 on pooled basis.

Chawla and Mishra (1979) observed that the age at first calving and first lactation yield revealed poor correlation. Age at first calving explained significant variation in first lactation yield of Sahiwal and Brown Swiss x Sahiwal crossbreds. That indicated that there was no substantial incr

in first lactation yield with the increase in age and hence an attempt should be made to lower the age at first calving.

Koley et al. (1979) found the persistency index as 4.43 ± 0.08 with a coefficient of variation 31 per cent in Jersey-Hariana crossbred cows. The genetic correlation of persistency index with peak yield was almost zero. The phenotypic correlations of persistency index with total yield, 300 day yield, lactation period, service period and calving interval were positive and statistically significant. The correlations of total yield with peak yield and dry period were almost zero. Year and season of calving and herd, had no significant effect on persistency index.

Singh et al. (1979) reported that, in Hariana cattle, the intial milk yield was significantly affected by the month of calving. The initial milk yield increased with the increase in lactation order.

Lactation curve

Brody (1927) observed that milk yield declined at a constant rate of 5.5 per cent per month in a straight line decline. For those cows bred 3 - 4 months following calving there was a straight line decline upto 9 months from freshening and then there was a sharp decline when the cows were pregnant for 6 - 7 months. He also reported that the decline was about

17 per cent per month in poorly bred cattle.

Caukas (1939) reported that the shape of the lactation curve appeared to be inherited and there was significant difference in lactation curves among consecutive lactations of the same cow. But such within cow differences were not as great as between cow differences.

There were 2 periods in the lactation where in a decrease in production was noticed in 60 - 250 days and a more rapid decrease from 250 - 300 days (Delage et al., 1953).

Turner (1955) noticed that as the lactation advanced milk yield declined and it was probably due to the gradual decline in the secretary activity of the individual epithelial cells. He further stated that hormones from the adenohypophys was essential for the initiation and maintenance of lactation.

Stali-cup et al. (1961) divided the lactation curve into twelve segments and correlations between yields at different stages of lactations were calculated. The highest correlation was obtained between yield on the 20th day of lactation and yield at the peak (0.85 - 0.96). Correlations between different segments of the lactation curve, 60 days apart, ranged from 0.59 to 0.84.

Pradhan (1970) reported that in Kankej cows the period

from 1 to 7 weeks represented the rapidly rising segment of the curve followed by the decline. He also reported that the curve showed a high average persistency value of 98.235 per cen between 7th to 41st week. There was more or less a straight line decline in weekly milk yield from the 7th - 41st week. The average rate of decline was 1.67 per cent per week.

Wood (1970) reported that cows with the same parity of calving at the same time of the year showed similer curves modified only by total yield and abnormal seasonality of production.

Dave and Patel (1971) stated that the shape of the lactation curve is influenced by environmental factors, especially the age.

Ratheiser (1972) reported that the shape of the lactation curve and persistency in Simmental cows were not influenced by live weight.

Singh et al. (1979) reported that the shape of the lactation curve was significantly affected by the period of calving in Hariana cattle.

MATERIALS AND METHODS

MATERIALS AND METHODS

The data pertaining to the production and reproduction performance of 298 Jersey x Zebu crossbreds and 69 Brown Swiss x Zebu crossbreds maintained at the University Livestock Farm, Mannuthy, Livestock Research Station, Thiruvazhamkunnu and Livestock Farm, Agricultural College, Vellayani during the period from 1963-1979 were utilised in this study. Though the animals belonged to three different farms, for all practical purposes they were under identical conditions of management and feeding regime. Jersey crossbreds were born and brought up in the respective farms but occasionally there had been movement of animals from one farm to the other. Brown Swiss crossbreds were purchased from the field and maintained in the respective farms.

The traits taken into consideration in this study were

1. Lactation yield upto 305 days.
2. Total lactation yield.
3. Lactation period.
4. Peak yield.
5. Days to attain peak yield.
6. Lactation yield upto peak yield and
7. Persistency index.

From the daily records of individual animals the peak

yield and number of days to attain peak yield of each were taken. Initial yield upto the attainment of peak yield was also estimated.

Persistency index of milk yield was calculated as per the formula by Mahadevan (1951) where, persistency, $P = \frac{A - B}{B}$. 'A' and 'B' respectively, the milk yield upto the first 180 days and initial milk yield upto the 10th week of lactation. In the present study 'A' was taken as the total lactation yield upto 305 days or less and 'B' as the initial yield upto the attainment of peak production. Jersey x Zebu crossbreds attained peak yield by 45 days on an average and Brown Swiss x Zebu crossbreds attained peak by 50 days and hence 'B' in this study was the initial yield upto 45 days in the former genetic group and upto 50 days in the latter.

Means, standard errors and coefficient of variations of different traits were calculated by standard methods (Snedecor, 1967).

In order to study the influence of the season of calving on persistency index, the seasons were classified as follows:

Season	Temperature	Rainfall	Months
a. Cold and wet	Below 30°C	Above 500 mm	June, July, and August.
b. Warm and wet	Above 30°C	Below 500 mm	May, September October and November.
c. Warm and dry	Upto 32° C	Below 500 mm	December and January.
d. Hot and dry	Above 32° C	Below 500 mm	February, March and April.

This was the classification adopted by Somanathan (19

According to the season of freshening, the persistency indices were grouped.

To study the effect of year of calving, the persistency index data were grouped into four according to the period of calving viz. 1960-65, 1965-70, 1970-75 and 1975-80.

The effect of age at first calving on persistency index was calculated by grouping the age at first calving into eight periods, viz. upto 24 months, 24-36 months, 36-48 months 48-60 months, 60-72 months, 72-84 months, 84-96 months and above 96 months.

The effect of farm, year of calving, season of calving and age at first calving on persistency were ascertained by

analysis of variance (Snedecor, 1967). The linear model used in the analysis was:

$$Yij = a + ti + eij.$$

$$i = 1, 2.....v$$

$$j = 1, 2.....r$$

Where Yij = jth yield due to the ith treatment.

a = the general effect or general mean.

ti = effect of the ith treatment.

eij = error.

The analysis of variance table was as follows:

Source	df	S.S.	Mean S.S.	F
Treatments	(v-1)	$\leq_i \frac{yi^2}{vi} - CF$	T	T/E
Error	(N-V)	(N-v) x E	E	
Total	(N-1)	$\leq i \leq j\ yij^2 - CF$		

The correlation of peak yield with total lactation yield, lactation period and 305 days yield were calculated. So also the correlations of persistency with lactation period peak yield and 305 days yield were also ascertained by the method suggested by Snedecor (1967).

The lactation curves were fitted for those two genetic groups based on the average weekly yields from the time of freshening to the 44th week of lactation.

The average weekly rate of decline in milk production was estimated in percentage as follows:-

$$R = \frac{\left\{\left(\frac{Y_8 - Y_9}{Y_8} \times 100\right)\right\} + \left\{\left(\frac{Y_9 - Y_{10}}{Y_9} \times 100\right)\right\} \text{---} + \left\{\left(\frac{Y_{43} - Y_{44}}{Y_{43}}\right.\right.}{37}$$

Where

Y_8, Y_9 ---- Y_{44} = Average weekly yields of 8th, 9th.. 44th week of lactation.

37 = Number of weeks intervening between 8th and 44th weeks.

RESULTS

RESULTS

(a) Milk production performance

Presented in Table 1 are the means of lactation yield upto 305 days, total lactation yield and lactation period. It was seen that in Jersey x Zebu crossbreds, the lactation yield upto 305 days had been 1411.23 ± 32.38 kg with a coefficient of variation of 39.61 per cent. The corresponding average was 1453.92 ± 77.89 kg with a coefficient of variati of 44.50 per cent in Brown Swiss x Zebu crossbreds.

The total lactation yields in Jersey and Brown Swiss crossbreds were 1673.66 ± 49.97 kg and 1679.73 ± 101.78 kg respectively. The coefficient of variations were 51.54 per ce and 50.34 per cent, respectively.

The lactation period in Jersey crossbreds was 423.4 ± 29.58 days with a coefficient of variation of 120.61 per cent and that for Brown Swiss crossbreds was 349.7 ± 10.64 days with a coefficient of variation of 25.20 per cent.

(b) Days to attain peak yield and peak yield

The days to attain peak yield and peak yield in kg in Jersey x Zebu and Brown Swiss x Zebu crossbreds are presented in Table 2.

Jersey x Zebu crossbreds attained peak yield by 44.75 ± 1.23 days with a coefficient of variation of 47.84 per cent. The number of days to attain peak yield in Brown Swiss x Zebu crossbreds was 49.86 ± 3.06 days with a coefficie of variation of 51.50 per cent.

The mean peak yield in Jersey x Zebu crossbreds was 7.91 ± 0.15 kg with a coefficient of variation of 33.91 per ce The corresponding values were 7.70 ± 0.31 kg and 33.02 per cen in Brown Swiss x Zebu crossbreds.

It was seen that Jersey x Zebu crossbreds had an initial yield upto the attainment of peak of 246.25 ± 5.61 kg with a coefficient of variation of 39.36 per cent, where as in Brown Swiss x Zebu crossbreds the corresponding values were 279.76 ± 11.82 kg with a coefficient or variation of 35.22 per cent.

(c) Persistency Index

Table 3 presents the persistency index in Jersey x Zebu and Brown Swiss x Zebu crossbreds. The persistency index was 5.20 ± 0.30 in the former with a coefficient of variation of 99.89 per cent. In the latter the persistency index was 4.18 ± 0.15 with a coefficient of variation of 30.60 per cent.

(d) Effect of factors on persistency index

(i) Season of calving

The mean persistency index in Jersey x Zebu crossbred and Brown Swiss x Zebu crossbreds according to the season of calving are presented in Tables 4 and 5.

The analysis of variance of the effect of season of calving on persistency index (Table 6 and 7) revealed that the difference in the mean persistency according to the season of calving was found to be statistically non significant in both Jersey and Brown Swiss crossbreds.

(ii) Farm

Presented in Tables 8 and 9 are the means of the persistency index in Jersey x Zebu and Brown Swiss x Zebu crossbreds in the different farms.

From the analysis of variance (Table 10) it can be seen that the effect of farms on persistency index was not significant in the case of Jersey x Zebu crossbreds. But in the case of Brown Swiss x Zebu crossbreds, farms had significa effect on persistency index (Table 11). Pairwise comparison of the persistency index of Brown Swiss crossbreds maintained in the three farms have shown that the farm effect had been higher in the case of Brown Swiss crossbreds of the University

Livestock Farm, Mannuthy than those of the other two farms.

(iii) Year of calving

The mean persistency index of cows calved in different periods are presented in Tables 12 and 13. The analysis of variance presented in Table 14 and 15 revealed that the year of calving had no significant effect on persistency either for Jersey x Zebu crossbreds or for Brown Swiss x Zebu crossbreds.

(iv) Age at first calving

The mean age at first calving has been 40.2 ± 0.95 months in the case of Jersey x Zebu crossbreds and 43.2 ± 2.06 in the case of Brown Swiss x Zebu crossbreds. The coefficient of variations were 41.01 per cent and 39.61 per cent respectively.

Tables 16 and 17 present the persistency index according to the age at first calving. The analysis of variance presented in Table 18 and 19 revealed that the effect of age at first calving on persistency was not significant in both the genetic groups.

(e) Correlation of peak yield with other production traits

Presented in Table 20 are the correlations between peak yield and total lactation yield, lactation period and

305 days yield in Jersey x Zebu crossbreds and Brown Swiss x Zebu crossbreds. There were highly significant positive correlations between peak yield and total lactation yield in both the genetic groups. But the correlations between peak yield and lactation period though was significant ($P < 0.05$) in the case of Jersey crossbreds, the same was non significant in the case of Brown Swiss crossbreds. Highly significant positive correlations between peak yield and 305 days yield could be observed in Jersey crossbreds and Brownswiss crossbre

(f) Correlation of persistency with other production traits

Correlations of persistency with lactation period, peak yield and 305 days yield are presented in Table 21. The correlations of persistency with lactation period, peak yield and 305 days yield were not significant in the case of Jersey crossbreds but the same were highly significant in the case of Brown Swiss crossbreds.

(g) Lactation curve

The lactation curves for the first lactation in Jersey x Zebu crossbreds and Brown Swiss x Zebu crossbreds upto 44th week of lactation were plotted (Fig. 1). From the lactation curve it could be seen that following parturition, the lactation yield sharply increased upto the 3rd week and

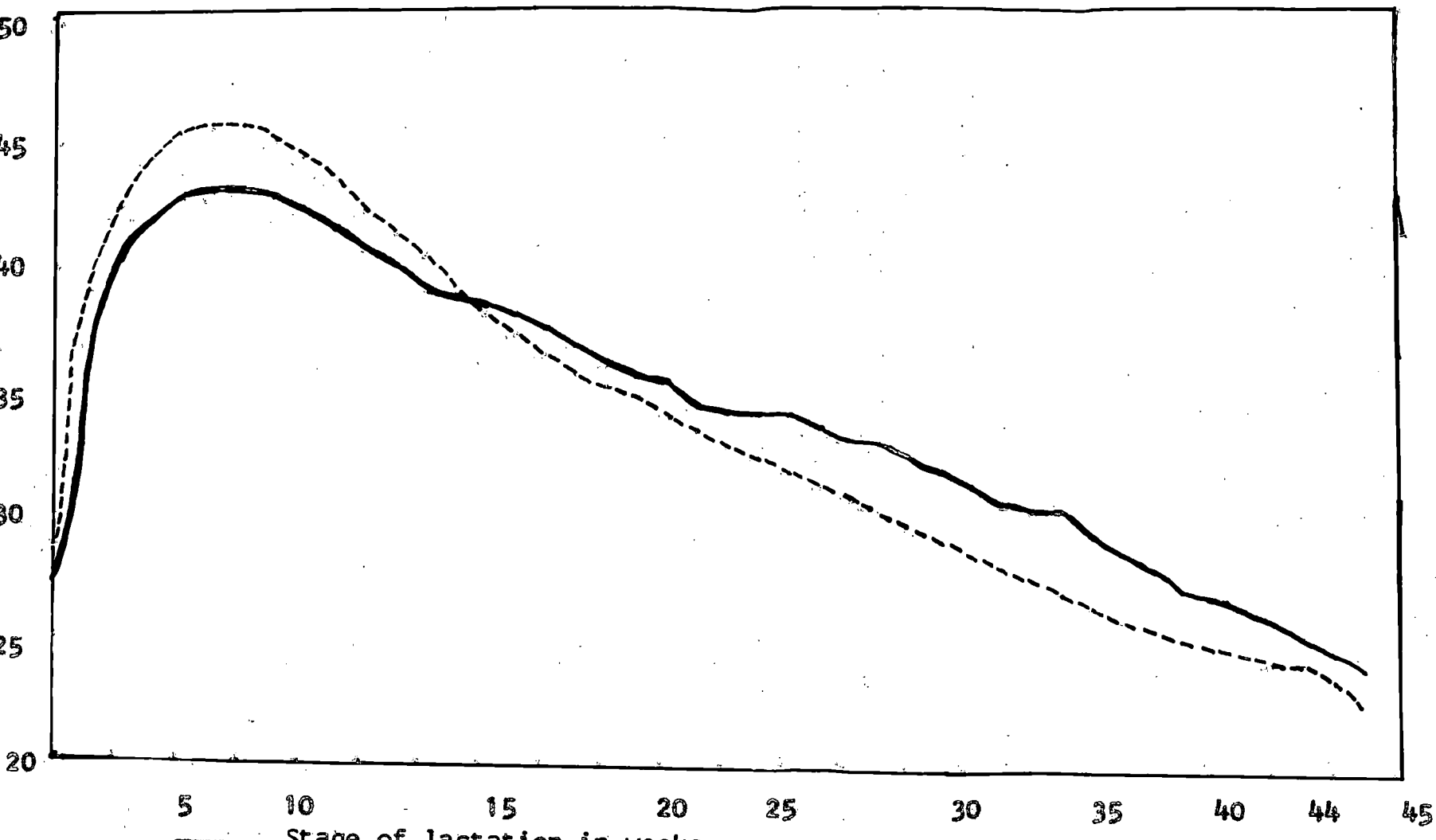

Fig.1. Lactation curves of Jersey x Zebu and Brown Swiss x Zebu crossbred cows.

rose to a maximum by 7th week. The level was more or less maintained upto the 9th week and after which the production declined in both the genetic groups.

Average peak weekly yield of Jersey x Zebu crossbreds was 45.9 kg and that of Brown Swiss x Zebu crossbreds was 43.3 kg. The study on the rate of decline in milk yield after attaining the peak production revealed that the weekly milk yield on an average gradually declined at a rate of 1.9 per cent per week in Jersey x Zebu crossbreds and 1.7 per cent per week in Brown Swiss x Zebu crossbreds cows.

Table - 1. Milk production performance of crossbed cows

Genetic group	No. of animals	Yield upto 305 days (in kg)			Total yield (in kg)			Lactation period (in days)		
		Average	S.E.	C.V.	Average	S.E.	C.V.	Average	S.E.	C.V.
Jersey x Zebu crossbreds	298	1411.23	32.38	39.61%	1673.66	49.97	51.54%	423.4	29.58	120.61%
Brown Swiss x Zebu crossbreds	69	1453.92	77.89	44.50%	1679.73	101.78	50.34%	349.7	10.64	25.20%

Table - 2. Days to attain peak yield, peak yield and yield upto the attainment of peak yield in crossbred cattle.

Genetic group	No. of animals	Days to attain peak yield			Peak yield (in kg)			Yield upto the attainment of peak yield (in kg)		
		Average	S.E.	C.V.	Average	S.E.	C.V.	Average	S.E.	C.V.
Jersey x Zebu crossbreds	298	44.75	1.23	47.84%	7.91	0.15	33.91%	246.25	5.61	39.36%
Brown Swiss x Zebu crossbreds	69	49.86	3.06	51.50%	7.70	0.31	33.02%	278.76	11.82	35.22%

Table - 3. Persistency index in crossbreds

Genetic group	No. of animals	Persistency index		
		Average	S.E.	C.V.
Jersey x Zebu crossbreds	298	5.20	0.30	99.89%
Brown Swiss x Zebu crossbreds	69	4.18	0.15	30.60%

Table - 4. Mean persistency index according to season of calving in Jersey x Zebu crossbreds

Seasons	No. of observations	Persistency mean index
Cold and wet	74	4.88
Warm and wet	82	5.22
Warm and dry	47	4.83
Hot and dry	94	5.60

Table - 5. Mean persistency index according to season of calving in Brown Swiss x Zebu crossbreds

Seasons	No. of observations	Mean persistency index
Cold and wet	26	4.20
Warm and wet	17	4.09
Warm and dry	8	4.44
Hot and dry	18	4.12

Table - 6. Effect of season of calving on persistency in Jersey x Zebu crossbreds.

Anova table

Source	df	S.S.	M.S.S.	F
Seasons	3	27.964	9.321	0.342 (NS)
Error	293	7983.413	27.247	
Total	296	8011.377		

NS = Non Significant.

Table - 7. Effect of season of calving on persistency in Brown Swiss x Zebu crossbreds.

Anova table

Source	df	S.S.	M.S.S.	F
Seasons	3	0.740	0.247	0.145 (NS)
Error	65	110.557	1.701	
Total	68	111.297		

NS = Non Significant.

Table - 8. Mean persistency index according to farms in Jersey x Zebu crossbreds.

Farms	No. of observations	Mean persistency index
U.L.F., Mannuthy	132	5.01
L.R.S., Thiruvazhamkunnu	119	5.19
L.F., Agricultural College, Vellayani	47	5.72

Table - 9. Mean persistency index according to farms in Brown Swiss x Zebu crossbreds

Farms	No. of observations	Mean persistence of index
U.L.F., Mannuthy	14	4.64
L.R.S., Thiruvazhamkunnu	51	4.16
L.F. Agricultural College, Vellayani	4	2.79

Table-10. Effect of farms on persistency in Jersey x Zebu crossbreds.

Analysis of variance table

Source	df	S.S.	M.S.S.	F
Farms	2	17.798	8.899	0.328 (NS)
Error	295	7993.582	27.097	
Total	297	8011.380		

NS = Non-Significant

Table - 11. (1) Effect of farms on persistency in Brown Swiss x Zebu crossbreds.

Anova Table

Source	df.	S.S.	M.S.S.	F
Farms	2	10.819	5.411	3.553*
Error	66	100.477	1.522	
Total	68	111.296		

*Significant P $\angle$ 0.05.

Table - 12. Mean persistency index of Jersey x Zebu crossbreds calved in different periods.

Period	No. of observations	Mean persisting index
1960-65	3	4.55
1965-66	102	4.51
1970-75	69	5.50
1975-80	121	5.62

Table - 13. Mean persistency index of Brown Swiss x Zebu crossbred cows calved in different periods.

Period	No. of observations	Mean persistency index
1960-65	-	-
1965-70	-	-
1970-75	24	3.89
1975-80	43	4.33

Table - 14. (2) Effect of period of calving on persistency in Jersey x Zebu crossbreds

Anova table

Source	df.	S.S.	M.S.S.	F
Periods	3	77.040	25.680	0.942 (NS)
Error	291	7931.280	27.255	
Total	294	8008.320		

NS = Non Significant

Table - 15. (2) Effect of period of calving on persistency in Brown Swiss x Zebu crossbreds

Anova table

Source	df.	S.S.	M.S.S.	F
Periods	1	3.067	3.067	1.847 (NS)
Error	65	107.936	1.661	
Total	66	111.003		

NS = Non Significant

Table - 16. Mean persistency index in Jersey x Zebu crossbreds according to age at first calving.

Age at first calving in months	No. of observations	Mean persisting index
Upto 24	3	4.26
24 - 36	99	4.90
36 - 48	103	5.49
48 - 60	48	4.22
60 - 72	17	4.41
72 - 84	7	5.23
84 - 96	3	5.99
Above 96	1	5.53

Table - 17. Mean persisting index of Brown Swiss x Zebu crossbred cows according to age at first calving

Age at first calving in months	No. of observations	Mean persistency index
Upto 24 months	1	5.78
24 - 36	14	4.59
36 - 48	24	4.12
48 - 60	14	4.09
60 - 72	9	3.88
72 - 84	2	3.91
84 - 96	-	-
Above 96	-	-

Table - 18. Effect of age at first calving on persistency in Jersey x Zebu crossbreds.

Anova table

Source	df	S.S.	M.S.S.	F.
Age at first calving	7	65.293	9.328	0.841 (NS)
Error	273	3027.892	11.091	
Total	280	3093.185		

NS = Non Significant

Table - 19. Effect of age at first calving on persistency in Brown Swiss x Zebu crossbreds

Anova table

Source	dt.	S.S.	M.S.S.	F.
Age at first cating	5	6.042	1.208	0.783 (NS)
Error	58	89.485	1.543	
Total	63	95.527		

NS = Non Significant

Table - 20. Correlation of peak yield with total lactation yield, lactation period and 305 day's yield

Trait	Correlation	
	Jersey crossbreds	Brown Swiss crossbreds
Total lactation yield	0.667**	0.810**
Lactation period	0.132*	0.155 (N.S.)
305 day's yield	0.868**	0.896**

** Significant $P < 0.01$

* Significant $P < 0.05$

N.S. Non Significant.

Table - 21. Correlation of persistency with lactation period, peak yield and 305 day's yield

Trait	Correlation	
	Jersey crossbreds	Brown Swiss Crossbreds
Lactation period	0.004 (N.S.)	0.431**
Peak yield	- 0.0004(N.S.)	0.331**
305 day's yield	0.064 (N.S.)	0.583**

** Significant $P < 0.01$

N.S. = Non Significant.

DISCUSSION

DISCUSSION

Poduction performance

The mean first lactation yield upto 305 days of 1411.23 ± 32.38kg observed in Jersey x Zebu crossbreds is higher than that reported by Nair (1973) in Jersey crossbreds under Kerala conditions. In Brown Swiss x Zebu crossbreds the mean first lactation yield was 1453.92 ± 77.89 kg. The first lactation yield of Brown Swiss crossbreds obtained in this study is lower than that reported by Nair (1973) in Brown Swiss crossbreds maintained at the Indo Swiss Project, Madupetty, where conditions of management might have been better. That was also lower than that was reported by Nair and Kelath (1977) in Brown Swiss crossbreds maintained in farmers homestuds. However, the exotic inheritance in crossbred cows had imparted better milk production potential. In the light of the reports by Sundaresan et al. (1954), Bhasin and Desai (1957) of Nair and Kelath (1977) that cows which produced more milk during the first lactation also produced more milk during their life time, it can be expected that Jersey and Brown Swiss crossbred cows, may also yield more milk during their life time. The total lactation yield in Jersey and Brown Swiss crossbreds were 1673.66 ± 49.97 kg and 1679.73 ± 101.78 kg respectively. The coefficients of variations were 51.54 per cent and 50.34 per cent respectively. Superior milk production performances of crossbred cattle over

Indian cattle were also reported by Sikka (1931), Little Wood (1933), MacGukin (1937) and Acharya (1968). There was no statistically significant difference between Jersey and Brown Swiss crossbreds in the mean first lactation yield. The coefficients of variation in lactation yield were higher in both the genetic groups indicating higher variability for the trait thereby affording selection for improvement.

The means of lactation periods in Jersey and Brown Swiss crossbreds were 423.4 ± 29.58 and 349.7 ± 10.64 days respectively, which indicates longer lactation periods in crossbreds. Considerable variability for that trait is evident from very high coefficient of variations in the respective genetic groups for the lactation periods.

Days to attain peak yield and peak yield

Jersey crossbreds attained peak production by 44.75 ± 1.23 days after freshening and the Brown Swiss crossbreds by 49.86 ± 3.06 days. So those crossbreds attained the peak production within a shorter period as against the observations of Haeker (1903), Gavin (1913) and Delage et al. (1953) in dairy cattle. However the time taken to attain peak, observed in the study, is longer than those reported by Chauhan et al. (1974) in Brown Swiss crossbreds and Rajagopalan (1974) in

pure Jersey cows. Considering the weeks to attain peak production the results are in agreement with the findings of Pradhan (1970) and Dave and Patel (1971) in Kankrej cattle and Koley et al. (1979) in Jersey x Hariyana crossbreds.

The mean peak daily yield in Jersey crossbreds was 7.91 ± 0.15 kg and that in Brown Swiss crossbreds was 7.7 ± 0.31 kg. There were no statistically significant differences between the genetic groups either for the days to attain peak yield or for the peak yield.

The means of total yield upto the attainment of peak yield were 246.25 ± 5.61 kg and 278.76 ± 11.82 kg respectively in Jersey and Brown Swiss crossbreds.

Persistency index

The persistency index in Jersey x Zebu crossbreds was 5.2 ± 0.3 with a CV of 99.89 per cent and that in Brown Swiss crossbreds was 4.18 ± 0.2 with a CV of 30.6 per cent. The persistency indices observed in the present study are higher than those recorded by Smith and Legates (1962) and Grimella (1967) in Holstein Friesian cattle; Balaine et al. (1970) in Hariana cattle; Sharma and Bhatnagar (1973) in Sahiwal, Red Sindhi and Brown Swiss x Sahiwal crossbred cows and Koley et al (1979) in Jersey x Hariana Crossbred cows. The early attainmen

of peak yield and its continuation through a major part of the lactation period can be attributed as the probable reason for the higher persistency indices in Jersey and Brown Swiss crossbreds. Statistically non significant difference in persistency index between the Jersey crossbreds and Brown Swiss crossbreds observed in this study is akin to the report of Sharma and Bhatnagar (1973) who found that persistency index did not differ significantly between genetic groups.

The 305 days lactation yield had not been significantly different. The apparent difference eventhough statistically non significant can be attributed to the difference in days to attain peak yield in both the genetic groups, which was also in turn statistically non significant.

Factors affecting persistency index

From the results it was seen that factors like farm, period, season and age at first calving have not exerted any statistically significant effect on persistency index except for the effect of farm in the case of Brown Swiss x Zebu crossbreds. Since the Brown Swiss crossbreds were purchased from different parts of Kerala and maintained in the farm the management and feeding prior to their procurement might have affected the persistency index. On the other hand the Jersey

crossbreds were born and broughtup in the respective farms itself. The crossbred animals in general, seem to have good adaptability and thereby not affected appreciably, by environmental difference. Non significant effect of season of calving on persistency index observed in this study is in agreement with the reports of Saxena and Kumar (1960) in Sahiwal cows, Sharma and Bhatnagar (1973) in Brown Swiss Sahiwal crossbred cows and Koley et al.(1979) in Jersey x Hariana crossbred cows. The present observations in Jersey crossbreds are in agreement with the report of Koley et al. (1979) who observed non significant effect of farm on persistency index in Jersey x Hariana crossbred cows but the result is not in agreement in the case of Brown Swiss crossbreds. Non significant effect of year of calving on persistency index in Jersey and Brown Swiss crossbreds obtained in this study concurs with the report of Koley et al. (1979) in Jersey x Hariana crossbred cows. It is also apparent from Tables 18 and 19 that the age at first calving did not exert any significant influence on persistency index. This finding is akain to the observations of Decking (1965) in Swiss Brown cattle, Dutt and Saksena (1966), Balaine et al.(1970) in Hariana cattle, Sharma and Bhatnagar (1973) in Brown Swiss x Sahiwal crossbreds and Koley et al.(1979) in Jersey Hariana crossbreds.

Correlation of peak yield with production traits

There were highly significant positive correlations between peak yield and total lactation yield in both the genetic groups. Similar was the observation of Gill et al. (1971) in Hariana cattle. Selection for peak yield is envisaged for obtaining correlated response for total lactation yield. The correlation between peak yield and lactation period was significant only in Jersey crossbreds. However the correlation was non significant in the case of Brown Swiss crossbreds. Highly significant positive correlation between peak yield and 305 day yield could be observed in Jersey crossbreds and Brown Swiss crossbreds.

Correlation of persistency with other production traits

There were no significant correlations for persistency index with lactation period, 305 days milk yield and peak yield in Jersey crossbreds. But in the case of Brown Swiss crossbreds the persistency index had significant positive correlations with lactation period, 305 days yield and peak yield. This observation on Brown Swiss crossbreds is similar to the reports of Ullah (1952) in dairy cattle, Saxena and Kumar (1960) in Sahiwal cattle, Gill et al. (1971) in Haryana and Koley et al. (1979) in Jersey-Hariana crossbred cows and at

least in this genetic group peak yield will give an indication of persistency.

The finding on Jersey crossbreds was contrary to the reports of the above mentioned workers.

Lactation curve

In both Jersey and Brown Swiss crossbreds the milk production sharply increased upto 3rd week and that rose to a maximum by about 7th week. The level was more or less maintained upto the 9th week and afterwards the production declined. Similar observations were made by Turner (1955) in dairy cattle and Pradhan (1970) in Kankrej cattle and Rajagopal (1974) in Jersey cows. The decline was found to be more rapid in the case of Jersey crossbreds than in Brown Swiss crossbreds The peak weekly production was 45.9 kg in Jersey x Zebu crossbreds and 43.3 kg in Brown Swiss x Zebu crossbreds. However the peak weekly productions obtained in the study were lower than those reported by Pradhan and Dave (1973) in Kankrej cows and Rajagopalan (1974) in Jersey cows.

The rates of decline in milk yield have been 1.9 per cent in Jersey crossbreds and 1.7 per cent in Brown Swiss crossbreds. This finding is in agreement with Brody (1945) who observed that milk yield declined at the rate of 5.5 per ce

per month, that was also in agreement with Pradhan (1970) in Kankrej cattle and Rajagopalan (1974) in Jersey cattle.

The Jersey and Brown Swiss crossbreds were found to have comparatively better milk production capacity than the local non-descript cattle of Kerala, which is reported to be 793 kg by Nair and Kelath (1977). The crossbreds have the ability to attain peak production within a short duration of seven weeks, after the onset of lactation. Correlation between peak yield and 305 day's yield is almost 0.9 and this can be advantageously utilised. Under field conditions when complete records are not available, the 7th week's production or a day's production in the 7th week is likely to give a good indication of lactation yield. Evenwhen the 305 day's milk yield is available peak production also can be considered for selecting the animal. Eventhough persistency did not appear to have any relation with milk yield, it could be seen that both types of crossbreds are quite persistent in production. The rates of decline in milk yield in the crossbreds were found to be without much decline which is comparable to the finding of Rajagopalan (1974) in Jersey cows in India. For a farmer a more persistent cow is preferable than a less persistent one, even if the total production is same. The present study on peak yield and persistency throws some more light on the suitability of the crossbred cows for Kerala conditions.

SUMMARY

SUMMARY

Data on the production and reproduction performance of 298 Jersey x Zebu crossbreds and 69 Brown Swiss x Zebu crossbreds maintained at the livestock farms of the Kerala Agricultural University during the period from 1963-1979 were utilised to study the peak yield and persistency in those cattle. Lactation yield upto 305 days, total lactation yield, lactation period, peak yield, days to attain peak yield, lactation yield upto peak yield, persistency index and the rate of decline in milk yield were the traits studied.

The means of lactation yield upto 305 days were 1411.23 ± 32.38 kg (CV 39.61 per cent) and 1453.92 ± 77.89 kg (CV 44.5 per cent) respectively in Jersey crossbreds and Brown Swiss crossbreds. The corresponding means of the total lactation yields were 1673.66 ± 49.97 kg (CV 51.54 per cent) and 1679.73 ± 101.78 kg (CV 50.34 per cent) respectively. When the Jersey crossbreds had lactation period of 423.4 ± 29.58 days (CV 120.61 per cent) the same in Brown Swiss crossbreds had been 349.7 ± 10.64 days (CV 25.20 per cent). The high coefficient of variations for the above traits indicate high genetic variability.

The days to attain peak yield were 44.75 ± 1.23 days (CV 47.84 per cent) and 49.86 ± 3.06 days (CV 51.50 per cent) in Jersey x Zebu crossbreds and Brown Swiss x Zebu crossbreds

respectively. The means of peak yield in Jersey x Zebu crossbreds and Brown Swiss x Zebu crossbreds have been 7.91 ± 0.15 kg (CV 33.91 per cent) and 7.70 ± 0.31 kg (CV 33.02 per cent) respectively. In Jersey x Zebu crossbreds and Brown Swiss x Zebu crossbreds the initial yields upto the attainment of peak were 246.25 ± 5.61 kg (CV 39.36 per cent) and 278.76 ± 11.82 kg (CV 35.22 per cent) respectively.

The persistency indices in Jersey x Zebu and Brown Swiss x Zebu crossbreds were 5.2 ± 0.30 (CV 99.89 per cent) and 4.18 ± 0.15 (CV 30.60 per cent) respectively.

In Jersey x Zebu crossbreds season of calving, farm, year of calving and age at first calving had no significant effect on persistency index. The same hold good in Brown Swiss x Zebu crossbreds also but for the significant effect of farm on persistency index.

In both the genetic groups there were highly significant positive correlation between peak yield and total lactation yield. But the correlation between peak yield and lactation period was significant only in Jersey crossbreds. Highly significant positive correlation between peak yield and 305 days yield were also observed in Jersey crossbreds and Brown Swiss crossbreds. Correlations between persistency

and lactation period, peak yield and 305 days yield were highly significant in the case of Brown Swiss crossbreds but the same were non significant in Jersey Crossbreds.

The lactation curves revealed that following parturition the lactation yield sharply increased upto the 3rd week and then rose to a maximum yield by 7th week. The level was maintained upto 9th week and after which the production declined. The average peak weekly yields were 45.9 kg and 43.3 kg respectively in Jersey crossbreds and Brown Swiss crossbreds. The rate of decline in milk yield after attainment of the peak were 1.9 per cent and 1.7 per cent respectively in Jersey x Zebu and Brown Swiss x Zebu crossbreds.

Thus it can be seen that Taurus x Zebu crossbreds in Kerala are persistent in production and the high correlation of peak yield with 305 days yield can be advantageously utilised in selection of cows.

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STUDIES ON
THE PEAK YIELD AND PERSISTENCY OF LACTATION IN CROSSBRED DAIRY COWS

By

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ABSTRACT OF A THESIS

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ABSTRACT

With the objective of studying the peak yield, persistency, their relation with other production traits and the shape of the lactation curves, the data on the production and reproduction records of 298 Jersey x Zebu and 69 Brown Swiss x Zebu crossbred cows maintained at Livestock farms of Kerala Agricultural University were utilised. Persistency was calculated as a ratio of the yield from the attainment of peak yield to the 305 days yield and the yield upto the peak yield.

The means of lactation yield upto 305 days were 1411.23 ± 32.38 kg and 1453.2 ± 77.89 kg respectively in Jersey and Brown Swiss crossbreds. The days to attain peak yield were 44.75 ± 1.23 days and 49.86 ± 3.06 days in Jersey and Brown Swiss crossbreds respectively. The respective means of peak yield in Jersey and Brown Swiss crossbreds were 7.91 ± 0.15 kg and 7.70 ± 0.31 kg. The persistency indices in Jersey x Zebu and Brown Swiss x Zebu crossbreds were 5.2 ± 0.30 and 4.18 ± 0.15 respectively. Season of calving, farm, year of calving and age at first calving had no significant effect on persistency index with the exeption of farm in the case of Brown Swiss crossbreds.

There were highly significant positive correlation between peak yield and total lactation yield and 305 days

yield. But the correlations between peak yield and lactation period was significant in Jersey crossbreds but not in Brown Swiss crossbreds. Correlation between persistency and lactation period, peak yield and 305 day's yield were highly significant in the case of Brown Swiss crossbreds but the same were non significant in Jersey crossbreds.

The lactation curves revealed that following parturiti the lactation yield sharply increased upto the 3rd week and then rose to a maximum by 7th week. The level was maintained upto 9th week and after which the production declined. The rates of decline were 1.9 per cent and 1.7 per cent respective in Jersey x Zebu and Brown Swiss x Zebu crossbreds.

Thus it can be concluded that the characteristic of good milk production potential, early attainment of peak yield, substantial persistency and the highly positive correlation of peak yield with 305 day's yield in the Jersey x Zebu and Brown Swiss x Zebu crossbreds make them quite suitable for adoption in Kerala.