POST-PARTUM REPRODUCTIVE PERFORMANCES OF CROSSBRED COWS

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "POST-PARTUM REPRODUCTIVE PERFORMANCES OF CROSSBRED 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.

Mannuthy,
31-7-1981.

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CERTIFICATE

Certified that this thesis, entitled "POST-PARTUM REPRODUCTIVE PERFORMANCES OF CROSSBRED COWS" is a record of research work done independently by Sri.K.V.Bhaskaran, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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CONTENTS

DEDICATED TO

THE MEMORY OF MY LOVING MOTHER,

CHERIYAMMA.

INTRODUCTION

INTRODUCTION

Dairying is one of the most effective instruments for solving the widespread problem of poverty, unemployment, underemployment and malnutrition in rural areas. The National Commission on Agriculture, with this view in mind, recommended harnessing and developing the facilities available with the small and marginal farmers and agricultural labourers to augment milk production in the country. But dairying cannot progress unless milk production becomes an economic proposition. The low producing indigenous cattle are therefore being replaced by high producing crossbred cows by implementing major crossbreeding programmes in the country.

In Kerala too, crossbreeding programmes with exotic bulls are being implemented on a large scale. Kerala has a cattle population of over 30 lakhs of which more than 50 per cent are crossbreds. It goes without saying that the full economic advantages of these crossbreds cannot be fully realised unless they have high reproductive efficiency. In view of these facts, there has been an increased interest in recent past to study the reproductive physiology and pathology of crossbred cows and a rapidly expanding field of research has grown up, with newer knowledge being added each year. Though significant advances have been made in the field of reproduction in purebred cattle, there are many physiological parameters of crossbreds on which informations are yet to be gathered. With the amazing growth of crossbreeding programme, it has become absolutely essential to study the physiopathology of reproduction of crossbred cattle of different levels of exotic inheritance under the varying agro-climatic conditions existing in the country. Major efforts have not yet been made to study the various factors affecting the reproductive potential of crossbred cows.

One of the important aspects of reproduction in dairy cow is its post-partum reproductive performances. Systematic studies on the performances of crossbred cows after parturition appear to be scanty (Choudhury et al., 1974; Jana and Mishra, 1978; Rao et al., 1981). A long inter-calving period is a major cause of poor reproductive efficiency in our bovine population. This can be considerably reduced by breeding cows during early post-partum period. But there are reports to indicate that services per conception increase if cows are inseminated prior to day 60 post-partum (Morrow et al., 1969; Britt, 1975; Sharma et al., 1979). However, there is paucity of information on the effect of early post-partum breeding on the reproductive efficiency in crossbred cows.

The present study was, therefore, taken up with the object of studying the post-partum reproductive performances of crossbred cows under the agro-climatic conditions existing in the state and the factors affecting them and also to evaluate the possible hazards or benefits of early post-partum breeding in crossbred cows.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Extensive studies have been carried out on the post-partum reproductive performances like genital involution, onset of ovarian activity and fertility on purebred dairy cows in different parts of the world (Marion et al. 1968; Morrow et al., 1969; Roberts, 1971). But perusal of literature reveals paucity of information on these aspects in crossbred cows both in India and abroad (Jana and Mishra, 1978).

Casida and Wisnicky (1950) reported that involution of uterus was complete in 29.4 days in dairy cows and that parity of the cow influenced the duration of involution period. In Holstein Friesian cows, Buch et al. (1955) recorded 47 and 50 days for involution of uterus in normal and abnormal calvers respectively. They also observed that parity of the cow influenced the duration. This was later confirmed by Morwood (1963). Menge et al. (1962) reported 42.3 days for involution in the same breed. Morrow et al. (1966) observed that the process of involution of uterus was slow during first 4 to 9 days and quick from 10 to 14 days after parturition. Involution was complete in 25 days in normal and 30 days in abnormal calvers. It was also revealed that the rate of involution decreased as the number of lactations increased. Marion et al. (1968) reported

39 days as the average interval from calving to involution. Primipara took 34 days in contrast to pluripara which took 40.6 days. Gier and Marion (1968) found that the length of the gravid uterus was reduced to half of its gravid size in 15 days and complete involution occurred by 50 days after calving. Morrow et al. (1969) observed that the gravid horn remained slightly thickened and never involuted to the pregravid stage. Francis and Raja (1971) reported that involution was complete from 32 to 44 days with a mean of 36.27 ± 0.69 days in Sindhi cows. Calving sequence and sex of calf had no influence in the rate of uterine involution. Roberts (1971) recorded less time (26-52 days) in dairy than beef cattle (38-56 days) for involution and observed a longer involution period in pluripara than primipara. Choudhury et al. (1974) reported that in first calvers of Holstein Friesian X Harjana crosses, the process of uterine involution was complete at 50.00 ± 1.67 days with a range of 28 to 77 days. It was also reported by them that birth weight of calf significantly influenced the involution of uterus. Sharma and Bhatnagar (1975) reported that first calvers took more time for uterine involution because of more distension of uterus in first pregnancy than in subsequent pregnancies. Jana and Mishra (1978) recorded an interval of 34.89 ± 4.00 and 23.91 ± 0.30 days from calving to the

involution of gravid and nongravid uterine horns respectively in crossbred cows with normal calvings. The involution period was less in primiparous cows (32.61 ± 0.49 days) than pluriparous cows (36.94 ± 0.52 days). Nair (1979) reported 28.70 ± 0.60 and 37.15 ± 1.09 days for involution in normal and abnormal calvers of crossbred cows respectively. The duration was less in primiparous than pluriparous cows. Breed, milk yield and sex and weight of calf had no influence on the process of involution. The process of involution was rapid in young Siberian Black Pied cows than older ones with an average of 28.88 ± 1.9 days(Avdeenko, 1979). Barcikowski et al.(1980) reported an average of 26 days for involution in Polish Black and Lowland cows.

Pathological conditions affecting uterine involution and post-partum oestrus were studied by many workers (Menge et al., 1962; Morrow et al., 1966; Johanns et al., 1967; Graden et al., 1968). Rasbech (1950) reported that 25 to 30 per cent of cows showed massive bacterial growth in the uterine lochia causing delay in uterine involution. Menge et al. (1962) found that pathology of uterus like pyometra and mucometra caused retention of corpus luteum thereby affecting the ovarian activity. Abnormal parturition causing damage to the uterus resulted in delaying involution for several days (Roy and Luktuke, 1962). Morrow et al. (1966) noticed that dystocia, retained placenta and milk fever delayed involution of uterus. Johanns et al. (1967) reported that about 85 per cent of bovine uteri contained bacterial flora in the early post-partum period and these bacterial flora or their toxins may affect fertility. On the contrary, Graden et al. (1968) opined that bacteria in bovine genital tract had little or no effect on fertility. Morrow et al. (1969) found a seven to ten days delay in uterine involution in cases of mild infection of uterus.

Many workers have conducted studies on the post-partum cow with respect to factors like cessation of uterine lochia, onset of post-partum oestrus etc. Nezhdanov and Kuznetsov (1978) observed that in normal calvers the lochial discharge lasted for 16.4 days. Nair (1979) observed that cessation of lochia occurred at 18.15 ± 0.59 and 29.35 ± 1.07 days in normal and abnormal crossbred cows respectively. The duration for primipara, bipara and for those calved more than twice were 18.43 ± 0.93, 19.00 ± 0.92 and 17.54 ± 2.84 days respectively. Breed, milk yield and sex and weight of calf had no influence on the time taken for cessation of lochial discharge.

Involution of vulva which occurred concomittently with the involution of uterus was completed between 24 and 40 days in Sindhi cows (Francis and Raja, 1971). Jana and Mishra (1978) reported that vulval involution was complete at 19.51 ± 0.39 days in primipara and 21.6 ± 0.45 days in pluripara in crossbred cows. Nair (1979) recorded 23.31 ± 0.51 days for vulval involution in normal and 30.00 ± 0.94 days in abnormal crossbred cows. In low, medium and high yielders the duration was 25.10 ± 1.28, 22.02 ± 0.75 and 23.01 ± 0.77 days respectively.

Usoanga (1973) reported that the corpus luteum verum started regressing between day two and four post-partum and by day 18, only eight per cent of cows had a palpable corpus luteum. In Siberian Black Pied cows the corpus luteum regressed at 21.13 ± 2.13 days after calving (Avdeenko, 1979). Nair (1979) recorded 12.40 ± 0.39 days for normal and 20.75 ± 0.71 days for abnormal calvers for regression in crossbred cows. In low, medium and high yielders he noticed 12.02 ± 1.08, 12.00 ± 0.64 and 13.05 ± 0.65 days respectively for regression of corpus luteum. Breed, parity and sex of calf did not influence the time taken for regression of corpus luteum. Rao et al. (1981) reported that 75 per cent of F_1 crossbred cows had no palpable corpus luteum after 14 days and by day 32 post-partum regression was complete in all the cows.

Perusal of literature revealed wide variation in the interval from parturition to the first observed oestrum. Casida and Wisnicky (1950) noticed the first ovulation 35 days after parturition. In Hereford cows, Warnick (1955) observed an interval of 61.4 days while Trimberger (1956) noticed 50.2 days in Brown Swiss breed for the onset of first observed heat with the first ovulation occurring at 44 days after calving. Fallon (1958) reported a mean post-partum oestrous interval of 40 ± 23 days in Jersey cows in contrast to 45 days observed by Fosgate _et al._ (1962). While Higaki _et al._ (1959) reported a mean interval of 33.6 days for the development of first follicle from parturition, Morrow _et al._ (1966) observed first ovulation as early as 10 to 15 days after calving in normal cows. Abnormal calvers had ovulation only at 30.8 days after calving. Johanns _et al._ (1967) noticed first ovulation and corpus luteum formation within 30 days of calving. Morrow _et al._ (1969) recorded high incidence of silent or unobservable oestrum accompanied by ovulation in early post-partum period. Francis and Raja (1971) observed an average post-partum oestrous interval of 103 days in Sindhi cows. Uscanga (1973) reported that follicles mature to size at 21 days after calving in dairy and beef breeds. In Holstein X Haryana crosses, Choudhury _et al._ (1974) recorded 39 to 54 days for the onset of heat in 78 per cent of cows, the intensity of heat being weak in majority of cases. Kadu and Kaikini (1976) noticed 57 days in Sahiwal cows whereas Yadava *et al.* (1976) observed 55 ± 12 and 41 ± 17 days in Holstein Friesian and Jersey cows respectively. Jana and Mishra (1978) working on *Bos Indicus*, *Bos Taurus* and their crosses reported an overall average interval from calving to the first detectable heat at 49.26 ± 1.97 days irrespective of breed and parity. Jaiswal *et al.* (1979) observed 51.64, 48.64, 50.64 and 49.14 days in Haryana crosses with Holstein Friesian, Brown Swiss, Jersey and Danish red cows respectively whereas Pandey *et al.* (1979) reported 54.09 ± 4.8, 48.2 ± 3.1 and 50.9 ± 3.2 days in the first three crossbreds respectively mentioned above. Purbey and Sane (1979) recorded 159.2 ± 8.1 days for the occurrence of first detectable heat after calving in Dangi cows. Nair (1979) recorded 52.40 ± 3.86 days in Jersey crossbred cows with normal parturition in contrast to 60.48 ± 7.75 days in abnormal calvers for the onset of post-partum heat. Breed of the cow, level of milk production and sex and weight of calf had no effect on the onset of post-partum heat. Yadava *et al.* (1976) also concurred with the above but stated that cows that had male calves took more time than female calves. Rao *et al.* (1981) recorded an interval of 17.43 ± 0.85 days in F_1 crossbreds for the first post-partum oestrus, with an incidence of 64.6 per cent silent heat and 55.4 per cent follicular atresia.

Effects of changes in body weight after calving on the onset of post-partum oestrus and conception rate in dairy cows have been widely studied (King, 1968; Topps, 1977; Bond and Weinland, 1978; Patil and Deshpande, 1979 and 1981). However, similar observations in crossbred cows appear to be very scanty. King (1968) observed in Ayrshire cows that an increase in body weight during post-partum period resulted in higher conception to first service than those which showed a decrease in weight. It was also revealed that on conception, gain in body weight reduced the milk yield and loss increased the yield. But when conception did not take place the milk production was not affected irrespective of whether there was a gain or loss in body weight after calving. Baker (1969) reported that the plane of nutrition of the post-partum cow influenced the onset of oestrum. Hamond (1970) also reported that the plane of nutrition influenced the ovarian response to gonadotrophin. He also reported that every cow should reach an optimum level of weight, neither gaining more nor less, for successful conception. Steenkamp et al. (1975) reported that in Africander cows, heavy cows conceived irrespective of gain or loss in weight while small cows could conceive only when they showed a gain in weight during post-partum period. Ward and Tiffin (1975) observed higher conception rate in Mashona cows weighing more, than weighing less. On the contrary, Richardson *et al.* (1976) observed no relationship between calving percentage and the percentage change of body weight from post-partum to midway through the mating season. This was considered as an indication that the animal's ability to conceive was a function of body weight per se and not the rate of gain during this period. Youdan and King (1977) reported that Holstein Friesian, Ayrshire, Jersey and Guernsey cows had a higher percentage of successful services when they showed a gain in weight. The mechanism by which loss of body weight adversely affects fertility is not fully known. Cyclic ovarian activity ceased when cows lost about 20 to 30 per cent of their mature weight (Topps, 1977). Bond and Weinland (1978) reported that raising feed intake level prior to parturition had no effect on the post-partum oestrous interval and conception rate. On the contrary, significant improvement in the reproductive performances was observed when feed levels were increased after calving. Patil and Deshpande (1979, 1981) observed in Gir cows that reduction in body weight after calving caused low fertility and animals which gained in body weight after parturition exhibited early oestrum. McClure (1965, 1970), Baker (1969) and Otel *et al.* (1979) have also reported similarly.

Numerous studies have revealed the optimum post-partum interval required for maximum breeding efficiency in dairy and beef cattle. Hofstad (1941) reported a steady increase in fertility and reduction in breeding problems as the service period increased upto 90 days. VanDemark and Salisbury (1950) recorded high conception rate at 60 to 80 days after calving. Shannon *et al.* (1952) opined that cows should not be rebred before 50 days after calving. According to Trimberger (1954) the conception rate of cows was lower in those bred earlier than 50 days. However, he noticed a better conception rate in cows which were bred during the second heat prior to 60 days after calving. Cows bred prior to 50 to 60 days after calving suffered from a high incidence of metritis, abortion and dystocia (Hofstad, 1941; VanDemark and Salisbury, 1950). Morrow *et al.* (1969) observed a conception rate of 40 per cent when bred 45 to 60 days and 58 per cent at 61 to 90 days post-partum. Normal calvers required 1.77 services per conception and abnormal calvers 2.01. Normal cows inseminated during 45 to 60 days post-partum required 2.2 services per conception as against 1.8 services for 61 to 90 days post-partum. Olds and Cooper (1970) observed conception rate of 71.3 per cent and 75.5 per cent in cows bred before and after 35 days of parturition respectively. Machmai et al. (1972) in Israeli Friesian cows reported a conception rate of 71.7 ± 35.4 per cent when bred between 40 and 60 days post-partum in contrast to 85.3 ± 28.8 per cent after 60 days post-partum. These cows required 1.70 ± 1.1 and 1.78 ± 1.1 services per conception respectively. The daily milk yield of those cows which conceived earlier was higher than that conceived later. According to Whitemore et al.(1974) early post-partum breeding resulted in significantly fewer cases of cystic ovaries compared to late breeding in Holstein Friesian cows. Britt (1975) observed that early breeding improved the reproductive and productive efficiency of the cows, although number of inseminations required for conception was more. Britt et al. (1978) have also concurred with the above finding. Kalas (1978) found that the conception rate to first insemination was 34.2, 47.6, 55.6 and 54.9 per cent when bred at less than 31, 31 to 60, 61 to 90 and above 90 days respectively after calving. Bach and Stemmler (1978) noticed in dairy cows a conception rate of 52.2 per cent when inseminated at less than 29 days post-partum, 72.7 per cent at 40 to 49 days and 76 per cent at 60 to 80 days. Sharma et al.(1979)

working on reproductive efficiency of Haryana cows reported a conception rate to first service of 28.8, 40.5 and 35.6 per cent when bred at less than 45, 46 to 75 and above 75 days respectively. The number of services per conception was 3.5, 2.8 and 2.4 respectively. Ilyakhov et al. (1979) revealed that conception rate to first insemination was highest in cows bred between 51 and 90 days post-partum than later. Stodola et al. (1979) observed in Pied cows the lowest conception rate (15.6 per cent) to first insemination when bred at less than 35 days and highest (75 per cent) when inseminated at 101 to 105 days after calving. Parra and Rodriguez(1979) recorded a conception rate to first insemination of 55, 62.50 and 57.14 per cent when inseminated at the first (40 days after calving), Second (67 days) and third (104 days) post-partum heat respectively. Purbey and Sane (1979) observed in Dangi cows that most of the first post-partum heat was ovulatory and a conception rate of 76.4 per cent was recorded when bred at this time.

MATERIALS AND METHODS

MATERIALS AND METHODS

The materials for the present investigation consisted of crossbred cows (Jersey X Sindhi, Jersey X Local and Brown Swiss X Local) belonging to the University Livestock Farm, Mannuthy, maintained under identical conditions of feeding and management. In order to study the various post-partum reproductive performances, fifty two freshly calved crossbred cows were selected at random and the following observations were made.

I. Involution of uterus

The course of involution of uterus was studied by semiweekly examination of uterus per rectum, commencing from day 7 post-partum. Involution of uterus was considered complete when the uterus regained its nearly normal pregravid location, size and tone. In addition, the following are also considered along with uterine involution.

a) Cessation of uterine lochia

All the cows were observed for the interval from calving to the stoppage of lochial discharge. The flow was considered ceased when no further discharge occurred even after gentle rectal massage.

b) Involution of vulva

Involution of vulva was studied by recording the measurement between the upper and lower commissures of vulval lips on the day of calving and subsequently at semiweekly intervals. The gradual disappearance of vulval folds was also taken into consideration to decide the progress of involution. Vulval involution was considered complete when there was no further reduction in the vulval dimension and no additional appearance of folds on vulval lips.

II. Regression of pregnancy corpus luteum

Regression of pregnancy corpus luteum was assessed by daily rectal examination starting from day 7 post-partum until the corpus luteum was no more palpable.

III. First observed oestrus

The onset of first observed oestrus after calving was detected by visual observation of animals both in the morning and evening and confirmed by rectal examination. Ovulation was confirmed by palpation of corpus luteum at about 8 to 10 days after heat.

Cows which had dystocia, abortion, retained placenta and post-partum genital tract infection were grouped as abnormal calvers and all other cows were grouped as normal calvers. The cows, on the basis of average daily milk production upto 90 days post-partum, were grouped into low (below 5 kg) medium (5 to 7 kg) and high (above 7 kg) yielders. The effect of parity of cows on the reproductive performances was also studied by grouping them into first calvers (primipara) and two or more calvers (pluripara). The data were also classified according to the sex and weight of calf and their effect on the various parameters studied.

Effect of changes in body weight after calving on post-partum oestrous interval and fertility

To study the effect of changes in body weight after calving on the onset of post-partum heat and conception rate twenty four normal crossbred cows were randomly selected. The weight of these animals were recorded at fortnightly intervals commencing from the day of calving till 90 days post-partum. In order to minimise the error, the weighing process was done between 9 A.M. and 10 A.M. each fortnight. Finally the animals were grouped as those gaining body weight (Group A) and those losing body weight (Group B) after parturition. These animals were observed for the onset of heat and those exhibited heat were inseminated. Pregnancy was confirmed later by rectal examination. The service period, percentage of conception and number of inseminations for conception in each group were also observed and recorded.

Early post-partum breeding

To study the effect of early post-partum breeding on the future reproductive performances, thirty eight normal crossbred cows in oestrum were grouped into three. Group I was inseminated between 30 and 45 days, group II between 46 and 60 days and group III after 60 days post-partum. The conception rate, complications if any and milk yield of those cows were recorded.

The data were subjected to statistical analysis as per Snedecor and Cochran (1967).

RESULTS

RESULTS

The results obtained after a detailed investigation on the various parameters of post-partum cows belonging to Jersey and Brown Swiss crossbreds are presented in tables 1 to 13.

Involution of uterus

In normal and abnormal calvers the interval from calving to the involution of uterus was 35.02 ± 0.78 days and 40.73 ± 1.22 days respectively (Table 1); the difference between the two groups being statistically significant ($P < 0.01$). Jersey X Sindhi, Jersey X Local and Brown Swiss X Local cows took 36.55 ± 1.09, 33.55 ± 1.48 and 33.60 ± 1.55 days respectively for the involution of uterus (Table 2). However, statistical analysis revealed no significant difference among the breeds with respect to the involution of uterus (Table 3). Primipara took 32.29 ± 0.92 days in contrast to pluripara which took a longer interval of 36.44 ± 0.99 days for involution (Table 4); the difference being statistically significant ($P < 0.01$). Involution was complete at 33.25 ± 1.79, 35.44 ± 1.68 and 35.46 ± 1.03 days in low, medium and high yielding cows respectively (Table 5). Analysis of data revealed no significant difference in involution of uterus among cows having different levels of milk production (Table 6). Cows with male calves took 35.73 ± 1.10 days while those with females took 34.21 ± 1.10 days (Table 7); the difference being not statistically significant. Cows with calves weighing less than 25 kg took 34.54 ± 0.81 days and those with calves weighing 25 kg and more required 35.87 ± 1.63 days for involution (Table 8). This difference, however, was also not statistically significant.

Cessation of uterine lochia

The flow of lochial discharge ceased at 16.39 ± 0.37 days in normal calvers and 26.64 ± 1.28 days in abnormal ones (Table 1). Statistical analysis revealed significant variation between the two groups ($P < 0.01$). Jersey X Sindhi, Jersey X Local and Brown Swiss X Local cows took 16.65 ± 0.54, 16.36 ± 0.73 and 15.90 ± 0.76 days respectively for the stoppage of lochial discharge (Table 2). However, this difference was not statistically significant (Table 3). An interval of 16.79 ± 0.26 days was observed in primipara and 16.18 ± 0.55 days in pluripara for cessation of lochia (Table 4). This difference was also not significant. In low, medium and high yielding cows the values were 15.63 ± 0.85, 16.44 ± 0.80 and 16.63 ± 0.49 respectively (Table 5). The data, on analysis, revealed that milk yield had no significant influence on cessation of lochial discharge (Table 6). In cows with male calves and those with female calves the corresponding values were 16.73 ± 0.67 days and 16.00 ± 0.22 days respectively (Table 7); the difference being not significant statistically. Cows with calves weighing less than 25 kg showed an interval of 16.62 ± 0.57 days and those with 25 kg and above 16.00 ± 0.24 days for the cessation of lochia (Table 8). Analysis revealed that weight of calf had no influence on the flow of uterine lochia.

Involution of vulva

Perusal of table 1 showed that normal calvers took a shorter interval (21.76 ± 0.45 days) than abnormal calvers (27.27 ± 0.62 days) for involution of vulva. This difference was statistically significant ($P < 0.01$). Jersey X Sindhi, Jersey X Local and Brown Swiss X Local cows required 21.50 ± 0.63, 20.91 ± 0.84 and 23.20 ± 0.89 days respectively for the involution (Table 2). However, the difference was not statistically significant (Table 3). The values for primipara and pluripara were 20.07 ± 1.09 and 22.63 ± 0.26 days respectively (Tabel 4). On analysis, parity status of cows was found to influence vulval involution ($P < 0.01$). It may be observed from table 5 that low, medium and high yielding cows took 20.63 ± 0.99, 22.44 ± 0.93 and 22.04 ± 0.57 days respectively for involution of vulva. However, statistical analysis did not reveal any significant difference among the three groups (Table 6). Cows with male calves took 22.00 ± 0.61 and those with females 21.47 ± 0.66 days for involution (Table 7). Similarly, cows with calves weighing less than 25 kg required 21.31 ± 0.45 days and those with calves weighing 25 kg and above took 22.53 ± 0.93 days for involution (Table 8). Analysis of data revealed no significant influence of sex and weight of calf on the period of involution of vulva.

Regression of pregnancy corpus luteum

The data presented in table 1 revealed that abnormal calvers required significantly longer period of time than normal calvers for regression of pregnancy corpus luteum. Regression was complete in 13.09 ± 0.36 days in normal calvers in contrast to 17.91 ± 1.24 days in abnormal ones. On statistical analysis the difference was reckoned to the significant (P ∠0.01). Pregnancy corpus luteum was not palpable beyond 13.10 ± 0.49, 12.18 ± 0.67 and 14.10 ± 0.70 days in Jersey X Sindhi, Jersey X Local and Brown Swiss X Local cows respectively Table 2). However, breed of the cow did not significantly influence the process of regression of pregnancy corpus luteum (Table 3). In primiparous and pluriparous cows, regression occurred at 13.86 ± 0.65 and 12.70 ± 0.41 days respectively (Table 4); the difference being not significant. In low, medium and high yielding cows the values were 12.63 ± 0.80, 12.33 ± 0.76 and 13.54 ± 0.46 days respectively (Table 5); the difference being not significant (Table 6). Cows with female calves took 12.79 ± 0.35 days and those with male calves 13.45 ± 0.58 days for regression (Table 7). However, this difference was also not statistically significant. Cows with calves weighing less than 25 kg and those with 25 kg and above, showed no palpable corpus luteum beyond 12.97 ± 0.30 and 14.00 ± 0.79 days respectively (Table 8). The data, on analysis, revealed that weight of calf had no influence on regression of pregnancy corpus luteum.

First observed oestrus

It could be seen that normal calvers came to first observed heat after calving by 48.93 ± 1.43 days whereas abnormal calvers took a longer interval of 68.20 ± 6.89 days (Table 1). This difference was statistically significant (P ∠0.01). Jersey X Sindhi cows had their first heat at 49.85 ± 2.09 days whereas Jersey X Local and Brown Swiss X Local cows required 47.82 ± 2.82 and 48.30 ± 2.96 days respectively (Table2). However, it was revealed that breed of cow had no significant influence on the onset of first post-partum heat (Table 3). Primipara came to heat at 55.93 ± 1.17 days and pluripara at 45.29 ± 1.71 days afterparturition (Table 4); the difference being statistically significant (P ∠ 0.01). Low, medium and high yielding cows exhibited their first heat after calving by 48.00 ± 3.26, 52.22 ± 3.07 and 48.21 ± 1.88 days respectively (Table 5). Analysis of data revealed no influence of milk yield on the onset of post-partum heat (Table 6). Cows with male calves and those with females took 48.68 ± 1.86 and 49.21 ± 2.27 days respectively for the onset of first post-partum heat (Table 7). However, sex of calf had no influence on the post-partum oestrous interval. The weight of calf also did not significantly influence the onset of post-partum oestrus. Cows with calves weighing below 25 kg and those with calves of

25 kg and above exhibited oestrum at 48.85 ± 1.96 days and 49.07 ± 2.01 days respectively (Table 8).

Effect of changes in body weight after calving on post-partum oestrous interval and fertility

The fortnightly body weights of cows in group A and B are presented in Table 9 and 10 respectively. It could be seen from table 9 (group A) that the mean body weight at parturition was 294.83 ± 11.19 kg and at fortnightly intervals upto twelve weeks, the values were 298.50 ± 11.16, 298.96 ± 10.72, 299.75 ± 10.69, 299.83 ± 11.37, 306.67 ± 11.04 and 307.42 ± 11.01 kg respectively. It may also be seen that these animals came to oestrus at an average intervals of 48.58 ± 3.35 days (range of 31-60 days) at a body weight of 301.08 ± 10.94 kg. Perusal of table 10 (Group B) revealed that the mean weight on the day of calving was 317.92 ± 14.96 kg and at fortnightly intervals upto 12 weeks were 304.75 ± 14.56, 297.75 ± 13.53, 296.08 ± 14.98, 295.67 ± 13.90, 291.02 ± 12.50 and 289.75 ± 12.73 kg respectively. The animals in this group exhibited the first oestrum after calving at an interval of 74.00 ± 7.86 days (34-124 days) at a body weight of 295.87 ± 15.19 kg. Analysis of data revealed that the difference in the post-partum oestrous interval between group A and B was significant ($P \angle 0.01$). The service period of cows in group A and B was reckoned to be 77.89 and 90.38 days respectively (Table 11). However, the difference was not statistically significant. The percentage of conception with single service and three or less services were 33.33 and 75.00 respectively for group A and 25 and 66.66 respectively for group B. The number of services per conception was 1.75 in both the groups. Statistical analysis revealed that the percentage of conception with single or three or less services and number of services per conception were not significantly altered by changes in body weight after calving.

Early post-partum breeding

Effects of early post-partum breeding on the reproductive traits of crossbred cows are furnished in table 12. The service period of cows bred between 30 and 45 days (mean 36.78 days), 46 and 60 days (mean 54.41 days) and above 60 days (76.25 days) was 59, 69.41 and 92.20 days respectively with an overall mean of 67.45 days. The percentage of conception with single service and with three or less services in cows bred between 30 and 45 days, 46 and 60 days and above 60 days were 50, 71.42;

75, 100; and 58.33, 75 respectively. The percentage of nonbreeders and abortions were 28.57 and 7.14 respectively in 30 to 45 days group and 16.66 and 8.33 for cows bred after 60 days. There was no incidence of nonbreeders and abortions in cows bred between 46 and 60 days. The lactation yield (305 days yield) of the cows conceived in the first group was 1674.39 kg, in the second group 1701.16 kg and in the third group 1614.63 kg. Analysis of data revealed no significant difference in any of the above parameters among the three groups (Table 13).

TABLES

Table 1. Post-partum changes in normal and abnormal calvers (days).

Type	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus
Normal calving	35.02 ± 0.78 (41)	16.39 ± 0.37 (41)	21.76 ± 0.45 (41)	13.09 ± 0.36 (41)	48.93 ± 1.43 (41)
Abnormal calving	40.73 ± 1.22 (11)	26.64 ± 1.28 (11)	27.27 ± 0.62 (11)	17.91 ± 1.24 (11)	68.20 ± 6.89 (10)

Figures in parenthesis denote number of observations.

Table 2. Influence of breed on post-partum changes (days).

Breed of cow	No. of cows	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus.
Jersey X Sindhi	20	36.55 ± 1.09	16.65 ± 0.54	21.50 ± 0.63	13.10 ± 0.49	49.85 ± 2.09
Jersey X Local	11	33.55 ± 1.48	16.36 ± 0.73	20.91 ± 0.84	12.18 ± 0.67	47.82 ± 2.82
Brown Swiss X Local	10	33.60 ± 1.55	15.90 ± 0.76	23.20 ± 0.89	14.10 ± 0.70	48.30 ± 2.96
Overall	41	35.03 ± 0.78	16.39 ± 0.37	21.76 ± 0.45	13.10 ± 0.36	48.93 ± 1.43

Table 3. Analysis of variance

Influence of breed on post-partum changes.

Character	Mss	df	Moss	df	F
Involution of uterus	45.449	2	23.949	38	1.898
Cessation of uterine lochia	1.880	2	5.842	38	0.322
Involution of vulva	15.026	2	7.829	38	1.919
Regression of pregnancy corpus luteum	9.637	2	4.956	38	1.944
First observed oestrus	17.247	2	87.323	38	0.198

Table 4. Influence of parity on post-partum changes (days).

Parity	No. of cows	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus
Primipara	14	32.29 ± 0.92	16.79 ± 0.26	20.07 ± 1.09	13.86 ± 0.65	55.93 ± 1.17
Pluripara	27	36.44 ± 0.99	16.18 ± 0.55	22.63 ± 0.26	12.70 ± 0.41	45.29 ± 1.71
Overall	41	35.02 ± 0.62	16.39 ± 0.37	21.76 ± 0.44	13.10 ± 0.35	48.93 ± 1.43

Table 5. Influence of milk yield on post-partum changes (days).

Level of milk production	No. of cows	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus
Low (below 5 kg)	8	33.25 ± 1.79	15.63 ± 0.85	20.63 ± 0.99	12.63 ± 0.80	48.00 ± 3.26
Medium (5 to 7 kg)	9	35.44 ± 1.68	16.44 ± 0.80	22.44 ± 0.93	12.33 ± 0.76	52.22 ± 3.07
High (above 7 kg)	24	35.46 ± 1.03	16.63 ± 0.49	22.04 ± 0.57	13.54 ± 0.46	48.21 ± 1.88
Overall	41	35.02 ± 0.78	16.39 ± 0.37	21.70 ± 0.44	13.10 ± 0.36	48.93 ± 1.43

Table 6. Analysis of variance

Influence of milk yield on post-partum changes.

Character	Mss	df	Mess	df	F
Involution of uterus	15.648	2	25.518	38	0.613
Cessation of uterine lochia	3.017	2	5.782	38	0.522
Involution of vulva	8.033	2	7.817	38	1.028
Regression of pregnancy corpus luteum	5.888	2	5.154	38	1.143
First observed oestrus	58.194	2	84.777	38	0.686

Table 7. Influence of sex of calf on post-partum changes (days).

Sex of calf	No. of cows	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus
Male	22	35.73 ± 1.10	16.73 ± 0.67	22.00 ± 0.61	13.45 ± 0.58	48.68 ± 1.86
Female	19	34.21 ± 1.10	16.00 ± 0.22	21.47 ± 0.66	12.71 ± 0.35	49.21 ± 2.27
Overall	41	35.02 ± 0.78	16.39 ± 0.37	21.70 ± 0.44	13.10 ± 0.36	48.93 ± 1.43

Table 8. Influence of weight of calf on post-partum changes (days).

Weight of calf	No. of cows	Involution of uterus	Cessation of uterine lochia	Involution of vulva	Regression of pregnancy corpus luteum	First observed oestrus
Below 25 kg	26	34.54 ± 0.81	16.62 ± 0.57	21.31 ± 0.45	12.57 ± 0.30	48.85 ± 1.96
25 kg and above	15	35.87 ± 1.63	16.00 ± 0.24	22.53 ± 0.93	14.00 ± 0.79	49.07 ± 2.01
Overall	41	35.02 ± 0.78	16.39 ± 0.37	21.76 ± 0.44	13.09 ± 0.36	48.93 ± 1.43

Table 9. Body weight (kg) of animals gaining weight (Group A) during post-partum period.

Sl No.	At parturition	2nd week	4th week	6th week	8th week	10th week	12th week	First observed post-partum oestrus	
								Weight	Days
1.	343	351	334	350	343	344	348	350	41
2.	345	352	348	338	362	360	361	346	45
3.	320	297	312	318	324	326	327	321	50
4.	269	275	282	275	260	284	285	271	63
5.	272	268	278	288	285	285	280	281	31
6.	283	288	266	279	282	295	293	286	60
7.	303	317	322	316	311	333	335	320	39
8.	257	277	273	272	268	292	288	273	35
9.	286	285	300	291	291	292	294	291	60
10.	282	289	291	291	283	284	285	283	60
11.	352	355	358	358	354	357	358	358	39
12.	226	228	229	231	235	228	235	233	60
Mean	294.83±	298.50±	298.96±	299.75±	299.83±	306.67±	307.42±	301.08±	48.58±
SE	11.19	11.16	10.72	10.69	11.37	11.04	11.01	10.94	3.35

Table 10. Body weight (kg) of animals losing weight (Group B) during post-partum period.

Sl No.	At parturition	2nd week	4th week	6th week	8th week	10th week	12th week	First observed post-partum oestrus	
								Weight	Days
1.	332	339	315	303	305	310	296	304	51
2.	313	302	296	300	300	289	290	298	34
3.	322	303	292	294	290	282	290	..	105
4.	271	269	266	257	260	252	255	255	87
5.	308	277	282	280	285	290	290	290	79
6.	304	290	280	283	290	289	290	281	36
7.	277	270	256	259	254	255	260	..	124
8.	438	421	409	420	412	383	385	384	86
9.	355	323	320	328	315	316	315	315	68
10.	361	354	347	346	342	338	337	..	95
11	301	288	283	268	275	274	259	274	62
12	233	222	227	215	220	215	210	221	61
Mean	317.92±	304.75±	297.75±	296.08±	295.67±	291.02±	289.75±	295.87±	74.00±
SE	14.96	14.56	13.53	14.98	13.90	12.50	12.73	15.19	7.86

Table 11. Post-partum service period and conception.

Group	Service period (days)	Percentage of conception with single service	Percentage of conception with three or less services	Number of services per conception
Animals gaining weight	77.89 (9)	33.33 (12)	75.00 (12)	1.75 (9)
Animals losing weight	90.38 (8)	25.00 (12)	66.66 (12)	1.75 (9)

Inference:- On statistical analysis change in body weight was found to have no significant influence on service period, percentage of conception and number of services per conception.

Figures in parenthesis denote number of observations.

Table 12. Effect of early post-partum breeding on certain productive and reproductive traits.

Inseminat-ion period	No. of cows	Interval from cal-ving to first service (days)	Service period (days)	Percent-age of concept-ion with single service	Percent-age of concept-ion with 3 or less services	Percent-age of non-breed-ers	Percent-age of abort-ions	Lactat-ion yield (kg)
30-45 days	14	36.78	59.00	50.00	71.42	28.57	7.14	1674.39
46-60 days	12	54.41	69.41	75.00	100.00	nil	nil	1701.16
Above 60 days	12	76.25	92.20	58.33	75.00	16.66	8.33	1614.63
Overall	38	50.8	67.45	56.10	75.61	14.63	4.88	1663.39

Table 13. Analyasis of variance

Effect of early post-partum breeding.

Character	Mss	df	Mess	df	F
Service period	5797.95	2	1282.36	29	2.26
Lactation yield	28713.82	2	189476.94	19	0.08

DISCUSSION

DISCUSSION

Reduction in the service period to a great extent depends on the onset of heat early during post-partum and fertility status during this period. With this view in mind, post-partum reproductive performances like genital involution, post-partum oestrum, cyclic ovarian activity, effect of changes in body weight on post-partum oestrous interval and fertility and effect of early breeding were studied and discussed.

From the data presented in table 1, it could be seen that normal and abnormal calvers required 35.02 ± 0.78 and 40.73 ± 1.22 days respectively for involution of uterus; the difference being statistically significant. The present observation that normal calvers required 35.02 ± 0.78 days is in agreement with the findings of Jana and Mishra (1978) who recorded 34.89 ± 4.00 days for uterine involution in crossbred cows with normal calvings. Francis and Raja (1971) and Roberts (1971) also made similar observations. On the other hand, Buch et al. (1955) and Menge et al. (1962) observed longer intervals of 47 and 42.3 days respectively in normal Holstein Friesian cows. The present observation that abnormal calvers took a significantly longer period is in concurrence with the findings of Buch et al. (1955), Morrow _et al._ (1966), Nezhdanov and Kuznetsov (1978), Jana and Mishra (1978) and Nair (1979). Gier and Marion (1968) attributed the delay in abnormal calvers to the decrease in uterine motility immediately after parturition, thus preventing normal regression of uterus brought about by frequent muscular contractions of myometrium during the first 24 hours after calving. Morrow _et al._ (1969) opined that uteri of abnormal calvers were larger during the early post-partum period, especially in those with retained foetal membranes and metritis, resulting in a delay of 3 to 5 days for involution. Primipara took 32.29 ± 0.92 days in contrast to pluripara which required 36.44 ± 0.99 days for uterine involution (Table 4); the difference being statistically significant. The present finding is in full agreement with that of Jana and Mishra (1978) who recorded 32.61 ± 0.49 and 36.94 ± 0.52 days in crossbred primiparous and pluriparous cows respectively. The present observation that pluripara required a significantly longer period is in keeping with the findings of Casida and Wisnicky (1950), Buch _et al._ (1955), Morrow _et al._ (1966), Marion _et al._ (1968), Roberts (1971) and Avdeenko (1979) in purebred cows and Jana and Mishra (1978) and Nair (1979) in crossbred cows. On the contrary, Francis and Raja (1971) reported that calving sequence had no influence on uterine involution. The present study also disclosed that breed of the cow, milk yield and and sex and weight of calf had no influence on uterine involution. These observations are in general agreement with those of Bhalla et al. (1966, 1967), Morrow et al. (1969), Jana and Mishra (1978) and Nair (1979) and not in accordance with Choudhury et al. (1974) who observed a significant influence of birth weight of calf on the duration of involution.

Perusal of table 1 revealed that normal calvers took 16.39 ± 0.37 days and abnormal calvers 26.64 ± 1.28 days for cessation of uterine lochia; the difference being statistically significant. The duration for the cessation of lochial flow currently observed in normal calvers is in general agreement with those of Morrow et al. (1969) and Nezhdanov and Kuznetsov (1978) and for abnormal calvers with that of Nair (1979). Rasbech (1950) found that 25 to 30 per cent of the cows developed an infection that resulted in massive bacterial growth in the uterine lochia after calving. Tennant et al. (1967) attributed the cause for the flow of uterine lochia for a longer period to uterine pathology due to infection during post-partum period. Roberts (1971) reported that abnormalities of calving tended to increase the chances of uterine infection during puerperal period. The prolonged lochia noticed in abnormal calvers during the present study could be attributed to infection of uterus. It was also revealed that breed of the cow, parity, milk yield and sex and weight of calf had no influence on the duration of flow of lochia. This is in contrast to Roberts (1971) and Nair (1979) who observed significant influence of parity on lochial flow.

From table 1, it was evident that normal calvers took a shorter interval (21.76 ± 0.45 days) than abnormal calvers (27.27 ± 0.62 days) for involution of vulva. Analysis of data revealed that this difference was statistically significant. The values obtained for normal cows are in agreement with the observations of Jana and Mishra (1978) for vulval involution in normal crossbred cows. Nair (1979) also observed a significantly longer interval in abnormal calvers for vulval involution. The present observation is also in concurrence with this finding. Roberts (1971) opined that inflammation of uterus would affect vagina and vulva also leading to delayed involution of vulva. It could be seen from table 4 that primiparous cows took 20.07 ± 1.09 days and pluriparous cows a significantly longer period of 22.63 ± 0.26 days for involution of vulva. This is in agreement with the findings of Jana and Mishra (1978) in crossbred cows. The present observation further revealed that breed of the cow, milk yield and sex and weight of calf had no influence on vulval involution. Bhalla *et al.* (1967) also observed no influence of breed on vulval involution. In Sindhi cows, Francis and Raja (1971) noticed that calving sequence and sex and weight of calf did not significantly alter the duration of vulval involution.

In normal and abnormal calvers, the corpus luteum of pregnancy regressed at 13.09 ± 0.36 and 17.91 ± 1.24 days respectively after calving (Table 1); the difference being statistically significant. The present finding is in agreement with that of Morrow *et al.* (1969) who noticed that the pregnancy corpus luteum was not palpable beyond 14 days post-partum in normal calvers. In crossbred cows, Nair (1979) and Rao *et al.* (1981) recorded 12.40 ± 0.39 and 14 days respectively for regression of pregnancy corpus luteum. The present observation is therefore in general agreement with the above. On the contrary, Uscanga (1973) and Avdeenko (1979) observed a longer interval (18 days) for regression in normal calvers. The present investigation also revealed that the corpora lutea tended to persist for a longer duration in abnormal calvers. Menge *et al.* (1962) and Morrow *et al.* (1969)

opined that when the uterus was infected, the life of corpus luteum was prolonged. The longer duration now observed in abnormal calvers could therefore be attributed to pathology of uterus. The present study, however, did not reveal any influence of breed of the cow, parity, milk production and sex and weight of calf on regression of pregnancy corpus luteum. Perusal of literature does not throw much light on the above factors in crossbred cows.

Data presented in table 1 revealed that normal calvers came to first observed oestrus at 48.93 ± 1.43 days after calving as against 68.20 ± 6.89 days in abnormal calvers. This difference was statistically significant. The present finding is in concurrence with that of Jana and Mishra (1978) who recorded 49.26 ± 1.97 days in normal crossbred cows for the onset of first oestrum. Similar findings were also observed by Jaiswal et al. (1979) and Pandey et al. (1979) in Jersey and Brown Swiss crossbreds. Nair (1979) also noticed significantly longer interval in abnormal crossbred cows for the onset of first post-partum oestrus. Morrow et al. (1969) attributed the variation in the onset of first post-partum oestrus to the effect of disease at or near calving. It was also revealed that primipara took significantly more days

(55.95 ± 1.17 days) than pluripara (45.29 ± 1.71 days) for the onset of first oestrum. This is essentially in keeping with the findings of Jana and Mishra (1978) who recorded 54.28 ± 3.03 days and 44.50 ± 2.4 days in primiparous and pluriparous crossbred cows respectively. Wiltbank and Cook (1958), Raja and Patel (1972), Uscanga (1973) and Nair (1979) also recorded significantly more time in primiparous cows. On the contrary, casida and wisnicky (1950), Norwood (1963) and Marion et al. (1968) noticed a longer post-partum oestrous interval in pluriparous cows. However, Buch et al. (1955), Foote et al. (1960), Kadu and Kaikini (1976) and Yadava et al. (1976) could not find any influence of parity on the post-partum oestrous interval. The present study also disclosed that, breed of the cow did not significantly influence the onset of first observed oestrum after calving, which is in keeping with the findings of Nair (1979). It could be seen from table 5 that level of milk production had no influence on the interval from calving to the onset of first heat. Nair (1979) also reported similarly. In contrast, olds and seath (1953), Carman (1955) and Roberts (1971) recorded a statistically significant relationship between milk production and post-partum oestrous interval. The present study also revealed that sex and weight of calf had no influence on the onset of first post-partum heat. This is in conformity with the observation of Nair (1979). However, Yadava et al. (1976) observed that cows with male calves took more time than with females for the first observed oestrum after parturition.

Perusal of table 9 and 10 revealed that the cows gaining weight (Group A) and losing weight (Group B) exhibited the first oestrum after calving at an interval of 48.58 ± 3.35 and 74.00 ± 7.86 days respectively. The difference between the two groups was statistically significant. The mean body weight of animals in group A steadily increased from 294.83 ± 11.19 kg on the day of calving to 307.42 ± 11.01 kg by 12 weeks after calving. The increase in body weight of these cows was 12.59 kg at 12th week after calving. The mean body weight of animals in group B on the day of calving was 317.92 ± 14.96 kg which steadily decreased to 289.75 ± 12.73 kg by 12 weeks, the reduction being 28.17 kg. The present observation is essentially in keeping with the findings of McClure (1965, 1970), King (1968), Baker (1969) and Patil and Deshpande (1979, 1981) who observed that animals which gained in body weight after parturition exhibited early oestrum. The delay in the expression of oestrum in cows losing body weight observed in the present study might be due to the delay in the attainment of requisite threshold of female hormones as postulated by McClure (1970). Topps (1977) also concurred with the above and opined that cows losing body weight during post-partum had low hypothalamic activities resulting in delayed ovarian function. The data presented in table 11 showed that the mean interval from calving to conception was lower (77.89 days) in animals which gained body weight than those which lost weight (90.38 days). However, this difference was not statistically significant. The percentage of conception with single service was more in group A (33.33 per cent) than in group B (25.00 per cent). The present finding is in accordance with that of McClure (1961) and King (1968) who observed that an increase in body weight during post-partum resulted in higher conception to first service than those which showed a decrease in weight. Lamond (1970) also suggested that for each cow there is an optimum body weight for successful conception. As body weight declined below this target, the ability of the animal to reproduce decreased. Boyd (1972) also demonstrated a nonsignificant increase in the fertility rate in cows which gained weight after calving. Youdan and King (1977) reported that Holstein Friesian, Ayrshire, Jersey and Guernsey cows had higher percentage of successful services when they showed a gain in body weight. It could therefore be concluded from the present investigation that gain in body weight after calving tended to indicate onset of early post-partum oestrum and better fertility.

Perusal of data presented in table 12 revealed that the service period of cows bred between 30 and 45, 46 and 60 and above 60 days post-partum was 59.00, 69.41 and 92.20 days respectively. Though statistical analysis (Table 13) revealed no significant difference, it was observed that service period could be considerably reduced by reducing the post-partum breeding interval from 60 to 30 days. The percentage of conception with single service and with three or less services was 50.00, 71.42; 75.00, 100.00 and 58.33, 75.00 respectively for the above three groups. Analysis of data, however, revealed that the difference among the three groups was not significant. Olds and Cooper (1970) also did not observe significant difference in cows bred early or late during post-partum. The present observation that higher first service conception could be achieved during 46 to 60 days post-partum is in agreement with that of Singh et al. (1979).

However, Trimberger (1954), Morrow et al. (1969) and Machnai et al. (1972) observed better conception rate when bred after 60 days post-partum. The percentage of nonbreeders and abortions was 28.57 and 7.14 respectively when inseminated at 30 to 45 days and 16.66 and 8.33 when bred after 60 days (Table 12). There was no incidence of nonbreeders and abortions in cows bred between 46 and 60 days after parturition. The difference was not statistically significant among the three groups which is in general agreement with Olds and Cooper (1970) and Machnai et al. (1972). On the contrary, Hofstad (1941) and VanDemark and Salisbury (1950) recorded a high incidence of metritis, abortion and breeding problems when cows were bred prior to 50 to 60 days after calving.

The results of the present investigation indicate that the advantages of early breeding was not outweighed by inferior performance of cows in respect of most of the reproductive traits studied. But, in order to recommend early breeding, it is also necessary to ensure that the milk production of cows are not deterrently affected. The data presented in table 12 revealed no significant difference in milk yield among cows bred either early or late post-partum. From the foregoing paragraphs, it could be inferred that breeding of cows earlier to 60 days post-partum has the advantage of reducing the service period and calving interval, without adversely affecting milk production. However, further studies on larger number of crossbred cows would throw more light on the various findings presently observed.

SUMMARY

SUMMARY

The aim of the present investigation was to assess the various post-partum reproductive performances of crossbred cows and to study the factors influencing them. The reproductive efficiency of cows bred at various post-partum intervals (30 to 45, 46 to 60 and above 60 days) was also investigated.

The materials used for the study comprised of crossbred cows (Jersey X Sindhi, Jersey X Local and Brown Swiss X Local) belonging to the University Livestock Farm, Mannuthy and maintained under identical conditions of feeding and management. Fifty two freshly calved and randomly selected crossbred cows, formed the material for the study of genital involution, cyclic ovarian activity and post-partum oestrus. These animals were grouped into normal and abnormal calvers based on the normalcy of calving. The time taken for the involution of uterus, cessation of uterine lochia, involution of vulva, regression of pregnancy corpus luteum, onset of first observed oestrus were studied and the influence of normalcy of calving, breed, parity, milk yield and sex and weight of calf on the above parameters were recorded and analysed. To study the effect of changes

of body weight after calving on the post-partum oestrous interval and fertility, twenty four normal crossbred cows were randomly selected. Fortnightly weights of these animals were recorded, commencing from the day of calving till 90 days post-partum. They were later grouped as those gaining body weight (Group A) and those losing weight (Group B). Animals exhibiting heat were inseminated and pregnancy confirmed later. To study the effect of early post-partum breeding on the future reproductive performances, thirty eight normal crossbred cows showing oestrum were grouped into three. Group I was inseminated between 30 and 45 days, group II between 46 and 60 days and group III after 60 days post-partum and fertility assessed.

In normal and abnormal calvers, the interval from calving to the involution of uterus was 35.02 ± 0.78 and 40.73 ± 1.22 days respectively; the difference being statistically significant. Primiparous cows took significantly shorter interval (32.29 ± 0.92 days) than pluriparous ones (36.44 ± 0.99 days). Analysis of data showed no influence of breed, milk yield and sex and weight of calf on the involution of uterus.

The flow of uterine lochia ceased at 16.39 ± 0.37

days in normal calvers in contrast to 26.64 ± 1.28 days in abnormal ones. The data, on analysis, was statistically significant. However, the duration for the stoppage of lochia in cows grouped according to breed, parity, milk yield and sex and weight of calf was not found to very significantly.

Vulval involution was significantly delayed in abnormal calvers (27.27 ± 0.62 days) than in normal ones (21.76 ± 0.45 days). Parity of the cow was also found to influence the vulval involution, the values being 20.07 ± 1.09 days for primipara and 22.63 ± 0.26 days for pluripara. On the other hand, factors like breed, milk yield and sex and weight of calf had no influence on the involution of vulva.

The time required for the regression of pregnancy corpus luteum in normal and abnormal calvers were 13.09 ± 0.36 and 17.91 ± 1.24 days respectively; the difference being statistically significant. Breed, parity, milk yield and sex and weight of calf did not significantly influence the regression of corpus luteum.

Normal calvers took a significantly shorter interval of 48.93 ± 1.43 days than abnormal ones which required 68.20 ± 6.89 days for the onset of first obsered oestrum, this being significantly influenced by parity of the cow. But, variations due to breed, milk yield and sex and weight of calf had no influence on the onset of first oestrum.

The mean interval from calving to the onset of first observed oestrum in cows gaining weight (Group A) was 48.58 ± 3.35 days (range 31 to 60 days) and those losing weight (Group B), 74.00 ± 7.86 days (range 34 to 124 days). The difference between the two groups was statistically significant. The service period, percentage of conception with single service and with three or less services and the number of inseminations per conception were 77.89 days, 33.33, 75.00 and 1.75 respectively in animals gaining weight and 90.38 days, 25.00, 66.66 and 1.75 respectively in the other group.

The service period in the three groups observed for the effect of early breeding were 59.00, 69.41 and 92.20 days respectively; the difference being not significant. The percentage of conception with single and with three or less services were 50.00, 71.42; 75.00, 100.00 and 58.33, 75.00 respectively in the above three groups. The percentage of nonbreeders and abortions were 28.57 and 7.14 in group I and 16.66 and 8.33 in group III. There was no incidence of nonbreeders and abortions in group II. The lactation yield (305 days) was 1674.39, 1701.16 and 1614.63 kg for the cows conceived in group I, II and III respectively.

To sum up, it could be stated that abnormal parturition adversely affected genital involution, cyclic ovarian activity and onset of first post-partum heat. It was further revealed that gain in body weight after parturition was a pointer indicating the possibility of early post-partum heat and better fertility. The investigation further revealed that breeding of cows between 30 and 60 days post-partum yielded high fertility without adversely affecting milk yield, thus reducing service period and calving interval.

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POST-PARTUM REPRODUCTIVE PERFORMANCES OF CROSSBRED COWS

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ABSTRACT OF A THESIS

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The observations made and inferences drawn are summarised below:

Abnormal calving significantly delayed the involution of uterus, cessation of uterine lochia, involution of vulva, regression of pregnancy corpus luteum and onset of first observed oestrus. The rate of uterine and vulval involution were significantly higher in primipara than pluripara. In contrast, primiparous cows took a significantly longer interval for the onset of first observed heat. However, breed of the cow, milk yield and sex and weight of calf did not influence any of the parameters studied. Animals gained in body weight after calving exhibited early oestrum and better fertility. Further, breeding of cows, between 30 and 60 days after calving yielded high fertility without adversely affecting milk yield, thus reducing the service period and calving interval.