STUDIES ON POST-PARTUM OESTRUM IN CROSS BRED COWS

BY

S. P. SURESAN NAIR

THESIS

Submitted in partial fulfilment of the requirement for the degree

MASTER OF VETERINARY SCIENCE

Faculty of Veterinary and Animal Sciences
Kerala Agricultural University

Department of Animal Reproduction

COLLEGE OF VETERINARY AND ANIMAL SCIENCES
Mannuthy - Trichur.

1979

DECLARATION

I hereby declare that this thesis entitled "STUDIES ON POST-PARTUM OESTRUM IN CROSS BRED 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,

28-7-1979.

28/7/79

S.P. Suresan Nair

CERTIFICATE

Certified that this thesis, entitled "STUDIES ON POST-PARTUM OESTRUM IN CROSS BRED COWS" is a record of research work done independently by Sri.S.P.Suresan Nair, 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.

Mannuthy,

28-7-1979.

Dr.C.P. Neelakanta Iyer,
Professor,
Department of Animal Reproduction.

ACKNOWLEDGEMENT

I wish to record my sincere gratitude to Dr. C.P. Neelakanta Iyer, Professor, Department of Animal Reproduction, and Major Advisor under whose guidance this work has been carried out.

I am thankful to Dr. T.R. Bharathan Namboothiripad, Professor (Project Co-ordinator, Cattle and Buffaloes), Dr. M. Subrahmanyam, Professor, Department of Dairy Science and Dr. M.S. Nair, Associate Professor, Department of Animal Reproduction, members of the Advisory Committee for their valuable suggestions, help and guidance.

I am greatly indebted to Dr. E.Madhavan, Assistant Professor, Department of Animal Reproduction for the valuable help rendered in the conduct of the work and preparation of thesis.

I am grateful to Dr. P.G. Nair, Dean, Faculty of Veterinary and Animal Sciences for the facilities provided for the study.

Grateful acknowledgement is made to Dr. P.U.Surendran, Professor, and Sri. R.Balakrishnan Assan, Assistant Professor, Department of Statistics for the help rendered in the statistical analysis of the data.

I am also thankful to Dr. A Jalaludeen, Assistant Professor, Communication Centre, Dr. Sebastian Joseph, Dr. K.N. Aravinda Ghosh and Dr. P.P. Balakrishanan, colleagues for the help rendered to me.

I am also thankful to the Director of Animal Husbandry, Kerala, for the leave granted to me for the post graduation studies.

I am grateful to the Kerala Agricultural University for the Fellowship awarded to me for my research programme.

My thanks are also due to Sri. V.T.Kurian, Typist, Kerala Agricultural University for typing the manuscript.

S.P. Suresan Nair.

CONTENTS

DEDICATED

TO

THE MEMORY OF MY LOVING BROTHER,

REGHU.

INTRODUCTION

INTRODUCTION

A predominantly agricultural country with the vast majority of its population living in villages has to necessarily depend upon auxillary industries with a rural bias to raise the standard of living of its people. Among such rural auxiliary occupations livestock industry plays the most vital role. A healthy and productive livestock industry thus forms the backbone of Indian rural economy. One of the most urgent and important problems that confronts the livestock industry in this country is the poor reproductive performance of our cattle.

The average annual milk production of the Indian cow is considerably low when compared with cows of the advanced countries. The per capita availability of milk in India is estimated to be about 110 gm per day as against 284 gm recommended by the Nutritional Advisory Committee (Patel,1976). The reason for this deplorable position has been identified and efforts are afoot to improve the production potential of the indigenous cattle by better breeding and management practices. Cattle improvement programme lays emphasis on upgrading the local cows with high yielding exotic breeds with the ultimate object of evolving a dairy type of animal suitable for the agro-climatic conditions of the state. For this purpose, massive cross breeding programme launched by the Government is being implemented by several agencies.

Poor reproductive performance of the cross bred cows as a limiting factor for the full exploitation of its production potential has attracted attention of research workers in the recent past. It is an accepted fact that a dairy cow must conceive and deliver a full term calf each twelve months during her life span in order to fulfil her potential milking and reproductive ability. Better reproductive efficiency of a female sustains regularity in breeding. A good dairy cow must have a long lactational period, shorter dry period, better breeding efficiency, low age at first calving and better milk production.

Delay in resumption of cyclic sexual activity after calving has long been recognised as a cause for prolonged intercalving period. For earlier and effective post-partum breeding adequate information on oestrum, ovulation and related phenomena after calving is a prerequisite. Studies on the reproductive phenomena of the post-partum cow have been done extensively in the exotic breeds of cattle (Morrow et al., 1966, Marion et al., 1968; Roberts, 1971; Olds and Cooper, 1970). Similar studies have also been carried out in the Indian cattle (Francis and Raja, 1971; Jana and Mishra, 1978; Pandey et al., 1979). However, perusal of literature reveals paucity of information on the post-partum ovarian activity of cross bred cows (Jana and Mishra, 1978). Considering the importance of the cross bred cow in the livestock industry of the state, it is felt that detailed studies on the various aspects of post-partum breeding of cross bred cows are warranted. With this object in view, a detailed investigation was taken up on the onset of post-partum oestrum and the factors that influence it in cross bred cows.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Extensive studies have been carried out by many workers in different parts of the world on post-partum oestrus interval in cows (Menge *et al*., 1962; Morrow *et al*., 1966; Marion *et al*., 1968; Jana and Mishra, 1978). The onset of post-partum oestrum and subsequent conception are directly related. Many factors have been found to influence post-partum breeding of bovines and the studies carried out on various aspects of this problem have yielded varying results. However, perusal of literature reveals paucity of information in this regard in cross bred cattle in India and abroad.

Chapman and Casida (1937) reported average interval from calving to first oestrus as 69±38 days in Holstein-Friesian cows. Clapp (1937) observed average post-partum oestrus interval of 69, 46 and 72 days respectively in three groups of Holstein cows. Casida and Wisnicky (1950) have also concurred with the above findings. In Jersey cows, Fallon (1958) recorded a mean post-partum oestrus interval of 40±23 days. Fosgate *et al*. (1962) also observed in the same breed a mean post-partum oestrus interval of 45 days with first ovulation at 35 ± 19 days. In Hereford cows, Warnick (1955) reported post-partum oestrus interval of 63 ± 29 days while Trimberger and Fineher (1956) observed 50 days as post-partum oestrus interval in Brown Swiss breed. First ovulation in this breed was observed at 44 days post-partum.

Francis and Raja (1971) observed post-partum oestrum from 56 to 127 days with an average of 103 days in Sindhi cows. Jana and Mishra (1978) studied post-partum interval in Bos indicus (Red Sindhi, Sahiwal and Tharparkar), Bos taurus (Brown Swiss, Holstein, Jersey) and their crosses. They observed that Bos indicus showed post-partum oestrus at 49.28 ± 2.41 days and Bos taurus at 46.86 ± 7.26 days. Karan Swiss cows exhibited first post-partum oestrum at 55.35 ± 3.96 days while Holstein x Sahiwal cows showed at 44.89 ± 6.64 days and Bos taurus x Tharparkar cows at 43.41 ± 2.91 days. In cross breds of Friesian, Brown Swiss and Jersey, Pandey et al.(1979) observed first post-partum oestrum at 54.0 ± 4.8, 48.2 ± 3.1 and 50.9 ± 3.2 days respectively. In Dangi breed of cows, Purbey and Sane, (1979) recorded first post-partum oestrus at 159.2 ± 8.1 days and first fertile heat in 185.0 ± 9.7 days.

Many workers conducted post-partum studies in cows with respect to ovarian activity and involution of uterus. Morrow et al. (1966) observed that the size of uterus decreased slowly during four to nine days post-partum and from ten to fourteen days the rate of decrease was rapid. The involuting uterus approached almost its former non-gravid size by 25 days in normal and 30 days in abnormal calvers. Johanns et al. (1967) reported complete involution of uterus in 21 to 44 days in dairy cows. Gier and Marion (1968) opined that due to vasoconstriction and muscular contractions after parturition the gravid horn showed rapid decrease in the dimensions. Length of uterus was reduced to half of its gravid size in 15 days, to a third in 30 days and complete involution after 50 days. Weight of the uterus was also found to reduce from nine kg at parturition to one kg at 30 days and to 0.75 kg at 50 days.

Morrow et al. (1969) reported that the gravid horn remained slightly thickened and never involuted to its pre gravid position. The involuting uterus approached its former size by 25 days in normal calvers and by 30 days in abnormal calvers. The first oestrus after calving was noticed in dairy and beef cattle from 32 to 76 days and 46 to 104 days respectively (Hafez and Jainudeen, 1974). Roberts (1971) observed complete involution of uterus at 26 to 52 days and post-partum oestrum at 30 to 76 days in dairy cattle, and 38 to 56 days and 40 to 48 days respectively in beef cows. Itamer and Schindler (1977) observed that about 90 per cent of the first oestrous period occurred in less than 60 days after calving in 197 animals observed.

The ovarian activity of the post-partum cow is influenced by the uterine changes like involution of uterus and regression of the corpus luteum of pregnancy. Maturation of follicles in the ovary is also related to the regression of the corpus luteum of the previous pregnancy (Buchhalz and Busch, 1977). Benjaminsen and Tomasgarrd (1978) observed that, following regression of pregnancy corpus luteum, the first corpus luteum was formed between 11 and 20 days after calving in more than 15 per cent and between 51 to 60 days in 80 per cent and in 71 to 80 days in 100 per cent of the animals. Agarwal et al. (1978) reported negligible follicular development on the day of parturition.

In normal cows, first ovulation was observed at about 10 to 15 days and two ovulations were recorded within 30 to 35 days post-partum whereas, abnormal cows had only one ovulation during the period (Morrow et al., 1966). Johanns et al. (1967) noticed ovulation and corpus luteum formation within 30 days of calving in normal cows. In early post-partum period, high occurrence of (18 to 44 per cent) silent or unobservable oestrum accompanied by ovulation was recorded by Morrow et al. (1969). Uscanga (1973) opined that expression of oestrus was quickly followed or preceeded by a period of follicular atresia and one or more unobserved ovulations.

Perusal of literature revealed that several factors like breed of cow, parity, season, milk production and abnormal calvings significantly influenced involution of uterus and onset of post-partum heat in animals. Beef cattle tended to have a longer interval from parturition to first succeeding oestrus than in dairy cattle. Roberts (1971) reported that the first post-partum oestrus in dairy and beef breeds varied from 32 to 76 days. In dairy cows, Baker (1969) observed post-partum ovulation from 20 to 45 days, while in beef cows the interval ranged from 36 to 71 days. Similar observation were also made by Roberts (1971). He observed complete involution of uterus in dairy and beef cattle by 26 to 52 and 38 to 58 days respectively.

While studying the effect of parity of the cow on the onset of post-partum oestrum, Marion et al. (1968) noticed an interval of 40.6 and 34.0 days respectively for pluriparous and primiparous cows. Raja and Patel (1972) observed shorter intervals with succeeding calvings in Kankrej cattle. Uscanga (1973) opined that the interval was longest for primipara, shortest for middle aged cows and again increased for cows over seven years. Hammond and Sanders, as cited by Morrow et al. (1969), observed that the length of time decreased with parity to the third or fourth parturition and then increased. On the contrary, no effect of age on post-partum oestrus was observed by Yadava et al.(1976). Jana and Mishra (1978) observed 41.00 ± 2.27 and 50.64 ± 4.31 days respectively as post-partum oestrum interval for pluriparous and primiparous cows of Sindhi, Sahiwal and Tarparker breeds. The values for Sahiwal x Bos taurus cows (Brown swiss, Holstein, Jersey) were 63.58 ± 5.05 and 40.07 ± 3.99 days for primipara and pluripara respectively. Panday (1979) also observed similar differences.

Singh et al. (1965) observed no significant influence of season on post-partum oestrus, but Baker (1969) observed that month of calving had direct effect on post-partum oestrus interval. In Africander cows, Steenkamp et al. (1975) noticed that month of calving had influence over the next conception and as date of calving advanced from September to April, conception chances were reduced. They surmised that this may be due to the seasonal effect on post-partum ovarian activity. In buffaloes, El-Sheikh and Mohamed (1977) did not observe any significant effect of season on uterine involution. Post-partum uterine involution in two groups of buffaloes during Rainy, Winter and Summer season were 22.1, 23.0 and 20.7; and 27.54, 26.17 and 25.45 days respectively (Gudi and Deshpande, 1977). In Dangi breeds of cows, Purbey and Sane (1978) observed significant effect of season on post-partum oestrus. Seasonal distribution of heat was 40.4 per cent, 25.6 per cent and 33.9 per cent during Summer, Monsoon and Winter respectively. Cows calving during Spring in Ireland were found to have short interval from calving to first oestrum (Sherington et al.,1978).

Onset of post-partum oestrum was found significantly correlated with level of milk production of the previous lactation. Donaldson et al. (1967) observed an increase in fertility in lactating animals (32 per cent) than in nonlactating (19 per cent) animals. Interval from parturition to first heat was reduced from 90 to 72 days in these animals. Similar observations were reported by Baker (1969) also. Olds and Seath, as cited by Uscanga (1973), reported that there was significant relationship between interval to first oestrum and milk production. But no significant influence of lactation on post-partum oestrum was observed by Yadava et al. (1976).

Reports on the influence of sex of the calf on the onset of post-partum oestrum in cows are contradicting. Yadava et al.(1976) observed that cows that had male calves had longer post-partum oestrus interval. On the contrary Singh et al.(1965) and, EI-Sheikh and Mohamed (1977) observed no such influence in cows and buffaloes respectively.

Good nutrition before and after calving reduces the duration of post-partum oestrus (Baker, 1969). Steenkamp et al. (1975) reported that heavy cows could conceive even though they failed to increase or lost weight, but smaller cows remained barren unless they gained weight considerably. Yadava et al. (1976) observed that first oestrus after calving was not affected by the difference in body condition. Topps (1977) reported that sexual activity was directly correlated to gain in body weight during post-partum period. Yaudan and King (1977) have also concurred with the same. Raising level of feed 45 days pre-partum to levels above recommended allowance had no significant influence on post-partum oestrus and conception rate. But raising levels of feed intake during post-partum, increased reproductive performance of cows which were on levels below recommended allowance (Bond and Weinland, 1978).

Influence of minerals on reproductive efficiency in cows were studied by Hignett and Hignett (1951). They observed a direct relationship between fertility and calcium-phosphorus intake in dairy animals. Mathai *et al.* (1973) observed that administration of phosphorus compounds and vitamin A helped normal involution of genitalia and also hastened the resumption of oestrous cycle. Ghannam and Abd-Elraheem (1978) reported that though vitamin A supplementation failed to show any apparent effect on conception rate or gestation length it helped early onset of post-partum heat in dairy cows.

Johanns *et al.* (1967) opined that hormonal therapy after parturition did not accelerate uterine involution. But Marion *et al.* (1968) found that administration of 30 mg of progesterone each day significantly increased the involution period in both intact and ovariectomised cows. Mathai *et al.* (1971) reported that injection of 50 iu of oxytocin six hour after calving promoted contraction of myometrium and enhanced involution of uterus. Kesler (1978) observed no significant effect on treatment with 100 mcg gonadotrophic release hormone from day one to day 19 post-partum on first oestrum after calving.

Pathological conditions affecting uterine involution and post-partum oestrum were studied by many workers.

Morrow et al.(1966) observed that milk fever, dystocia and retained placenta, delayed uterine involution. Menge et al. (1962) reported that though uterine involution was largely independent of ovarian activity, pathology of uterus as in pyometra and mucometra retained the corpusluteum and affected the follicular formation in the ovary. Johanns et al. (1967) observed that bacteria in large number or their powerful toxins may affect fertility in the post-partum period. Roy and Luktuke (1962) opined that, abnormal parturition causing damage to the uterus may delay its involution for several days. Morrow et al. (1969) also reported that mild uterine infection delayed normal involution for seven to ten days and postponed the onset of post-partum oestrum. Studies on Swedish Friesian cows by Philipson (1976) revealed that any pathological changes in the uterus or trauma while calving delayed involution of uterus. The genital tract of post-partum cows revealed Corynebacterium pyogenes, Coliformis, Streptococci or combination thereof, as the main pathogens (Studer and Morrow, 1978).

MATERIAL AND METHODS

MATERIAL AND METHODS

One hundred and fifteen cross bred cows (Jersey x Sindhi and Jersey x local) calved during the period from February 1978 to March 1979, belonging to the University Livestock Farm, Mannuthy, formed the material for this study. All the animals were maintained under identical conditions of feeding and management and were stallfed. The data of calving and other calving particulars of these animals were recorded. Subsequently, all the cows were observed daily for vulval involution and lochial discharge. Rectal palpation of the cows were done on day five post-partum, and subsequently at varying intervals to observe the stage of regression of pregnancy corpus luteum and development and ovulation of the follicle. Cows which had dystocia, abortion, retained placenta and metritis were grouped as abnormal calvers and all other animals were grouped as normal calvers. The animals were grouped into three, as low (below 4 lit of milk), medium (4 to 6 lit) and high (above 6 lit) on the basis of average daily yield upto 90 days post-partum. The seasons were grouped into three as summer, rainy and winter (Mathai et al., 1973). For studying the effect of parity, cows were grouped as first calvers (primiparous) second calvers and those calved thrice and above. The following observations were made during the study.

Lochial discharge

All the cows were observed for the period of cessation of lochial discharge. The period of lochial discharge was assessed from the day of parturition till the day of stoppage of lochia even after gentle rectal massage.

Pregnancy corpus luteum

The interval from the day of parturition till the disappearence of pregnancy corpus luteum in the ovary, as assessed by rectal palpation was considered as the time for complete regression of pregnancy corpus luteum.

Uterine involution

The completeness of involution was considered by the return of uterus to the normal location in pelvic or near pelvic region, approximately normal size of uterine horns and attainment of normal uterine tone (Buch et al., 1955; Roy and Luktuke, 1962).

Ovulation

The occurrence of first ovulation was ascertained by recurrent rectal palpation of ovaries for follicles. This was later confirmed by palpation of corpus luteum after four to six days of the suspected day of ovulation. The date of occurrence of second ovulation was also noted as above and the interval from the day of parturition was recorded.

heat detection was done by visual observation and later confirmed by rectal examination of genitalia.

Vulval involution

The measurement of vulval lips was made from the dorsal commissure to the ventral commissure immediately after parturition and subsequently at weekly intervals till no more reduction in size was noticed. Vulval regression was presumed to be completed when no further reduction in size and no additional appearence of folds on vulval lips was noticed.

The data were classified according to the normality of calving, breed, parity, season, milk yield, weight and sex of calf to study the effect of these factors on the different parameters observed. The data collected were tabulated and analysed according to Snedecor and Cochran (1967)

RESULTS

RESULTS

With the object of studying the post-partum oestrus and factors affecting it in crossbred cows, a detailed investigation was conducted on 115 cross bred cows belonging to the University Livestock Farm, Mannuthy during the period from February 1978 to March, 1979. The observations on the period for, 1. cessation of lochial discharge 2. degeneration of pregnancy corpus luteum, 3. uterine and vulval involution, 4. first and second ovulations and 5. onset of post-partum oestrum are presented in Tables 1, 3, 5, 7, 9, 11 and 13. Influence of normalcy of calving, breed, parity, season, milk yield, sex and weight of calf on each of the above parameters has also been studied.

Lochial discharge

In normal and abnormal calvings lochial discharge ceased in 18.15 ± 0.59 days and 29.35 ± 1.07 days respectively (Table 1). The difference was found to be highly significant (Table 2). Jersey x Sindhi and Jersey x local cows took 18.08 ± 0.73 and 18.25 ± 0.98 days respectively (Table 3) for cessation of lochia. On analysis, the variation was found to be not significant (Table 4). The lochial flow continued upto 18.43 ± 0.93, 19.00 ± 0.92 and 17.54 ± 2.84 days respectively in primiparous, those calved twice and for those calved thrice or more (Table 5). Statistical analysis revealed that parity had significant influence on the cessation of lochia (Table 6). The duration of lochial flow was observed to be maximum (18.57 ± 0.68 days) in rainy season, intermediate (18.44 ± 0.95 days) in summer and minimum (16.71 ± 1.08 days) in winter calvers (Table 7); the variation being statistically significant (Table 8). However, the variation in lochial discharge in cows grouped according to milk yield was found to be not significant (Table 10); the values being 19.00 ± 1.38, 17.45 ± 0.81 and 18.01 ± 0.82 days for low, medium and high yielding cows respectively (Table 9). Cows with male calves took 17.97 ± 0.83 days and those with female calves took 18.31 ± 0.79 days for cessation of lochia (Table 11). Analysis of data revealed that the variation was not significant (Table 12). Weight of the calf also showed no significant influence on lochial discharge (Table 14). Cows with calves weighing 20 kg or below took 18.17 ± 0.98 days while those with calves weighing above 20 kg took 18.14 ± 0.74 days for complete stoppage of lochial discharge (Table 13).

Pregnancy corpus luteum

The mean interval for the regression of pregnancy corpus luteum in the animals presently studied is given in Table 1. Abnormal calvers were found to persist the pregnancy corpus luteum for longer period than normal calvers. Regression of corpus luteum of pregnancy was found to occur by 12.40 ± 0.39 and 20.75 ± 0.71 days in normal and abnormal calvers respectively, the variation being highly significant (Table 2). Jersey x Sindhi and Jersey x Local cows showed 12.33 ± 0.49 and 12.54 ± 0.66 days respectively (Table 3) for the complete regression of corpus luteum of pregnancy. The difference in days was not significant (Table 4). Primiparous cows, those calved twice and those with three or more calvings took 13.14 ± 0.65 12.27 ± 0.65 and 12.15 ± 0.96 days respectively for regression of pregnancy corpus luteum (Table 5). Analysis of the data revealed that parity had no influence on the regression of pregnancy corpus luteum (Table 6). During summer, rainy and winter seasons, the mean days taken for the regression were 13.17 ± 0.75, 13.46 ± 0.54 and 10.61 ± 0.88 days respectively (Table 7). The data, on analysis, revealed significant influence of season on the regression of corpus luteum (Table 8). Regression of pregnancy corpus luteum occurred at 12.02 ± 1.08, 12.00 ± 0.64 and 13.05 ± 0.65 days respectively in low, medium and high yielding cows (Table 9). The variation of period in the three groups statistically significant (Table 10). Cows with male calves took 12.44 ± 0.57 days and those with female calves took

12.37 ± 0.55 days for the regression of corpus luteum of pregnancy (Table 11); the variation being not significant (Table 12). Mean days for the regression of corpus luteum for cows with calves weighing 20 kg or below and cows with calves weighing above 20 kg were 12.75 ± 0.70 and 12.21 ± 0.52 days respectively (Table 13). This variation was not statistically significant (Table 14).

Involution of uterus

Involution of uterus was observed to be delayed by abnormal calvings. In normal and abnormal calvers, uterus involuted in 28.70 ± 0.60 and 37.15 ± 1.09 days respectively (Table 1). The difference between the two groups was highly significant (Table 2). Jersey x Sindhi and Jersey x Local cows took 28.40 ± 0.36 and 29.05 ± 0.48 days respectively for the involution of uterus (Table 3). Analysis of data revealed no significant variation between breeds of the cow (Table 4). Uterine involution was complete at 28.07 ± 0.97, 29.75 ± 0.97 and 28.65 ± 1.43 days in primiparous, those calved twice and thrice or more (Table 5). Statistical analysis showed that parity significantly influenced the uterine involution (Table 6). During summer, rainy and winter seasons, the uterus was found to involute in 28.78 ± 1.19, 28.74 ± 0.86 and 28.46 ± 1.40 days respectively (Table 7). Statistical analysis revealed that involution of uterus was not influenced by season (Table 8). Duration of 29.10 ± 1.54, 28.90 ± 0.91 and 28.14 ± 0.92 days (Table 9) were noticed for low, medium and high yielding cows for complete uterine involution. However, this variation was not found to be significant (Table 10). Those cows with male and female calves took 28.72 ± 0.89 and 28.97 ± 0.85 days respectively for uterine involution (Table 11); the difference being not significant (Table 12). An average period of 29.21 ± 1.00 and 28.42± 0.75 days was observed in cows with calves weighing 20 kg or below and those with calves weighing above 20 kg respectively (Table 13). Analysis of the data showed no significant variation due to the weight of calf on uterine involution (Table 14).

First ovulation

The mean days for the first ovulation in normal and abnormal calvers were 29.01 ± 1.07 and 41.20 ± 1.96 respectively (Table 1). Analysis of the data revealed significant difference in the period for first ovulation between normal and abnormal calvings (Table 2). First ovulation after calving in Jersey x Sindhi animals was noticed in 28.04 ± 1.32 days and in Jersey x Local at 30.03 ± 1.77 days (Table 3). The variation of time taken between the two types of animals was not significant (Table 4). In primiparous cows, ovulation was observed in 28.60 ± 1.68

days and in cows calved twice and thrice or more at 28.62 ± 1.68 and 31.31 ± 2.46 days respectively (Table 5). On analysis, no significant influence was noticed between first ovulation and parity status of the cows (Table 6). Ovulation occurred in 31.11 ± 1.90, 25.49 ± 1.36 and 32.15± 2.24 days respectively during summer, rainy and winter seasons (Table 7). This variation in the different seasons was observed to be highly significant (Table 8). Average duration for first ovulation for low, medium and high yielding cows were 29.00 ± 2.84, 28.41 ± 1.67 and 30.20 ± 1.70 days respectively (Table 9); however, this variation was not significant (Table 10). Cows with male calves took 28.84 ± 1.56 days and those with female calves took 29.54 ± 1.50 days (Table 11) for post-partum first ovulation. On analysis, sex of calf was not found to influence the first ovulation period (Table 12). Similarly, cows with calves weighing 20 kg or below had 30.08 ± 1.78 days while those with calves weighing above 20 kg had 28.42 ± 1.33 days (Table 13). This difference was also found to be not significant showing that weight of calf did not influence the onset of first ovulation (Table 14).

Post-partum oestrum

It could be seen from Table 1 that abnormal calvers took more time (60.68 ± 7.55 days) for the onset of post-partum oestrum than normal calvers (52.40 ± 3.86 days). This variation was found to be highly significant (Table 2). Jersey x Sindhi and Jersey x Local cows had 54.09 ± 4.33 and 50.80 ± 5.92 days respectively for the onset of first oestrum (Table 3). Analysis of data revealed that post-partum oestrum was not significantly influenced by the breed of the cow (Table 4). Post-partum oestrum was observed at 58.24 ± 4.53, 44.02 ± 7.97 and 55.55 ± 5.92 days (Table 5) respectively for primiparous, cows calved twice and for those calved thrice and more. Statistical analysis of the data revealed that parity influenced the post-partum oestrum significantly (Table 6). During summer, rainy and winter seasons, the first heat symptoms after calving were observed at 50.96 ± 6.52, 52.56 ± 4.97 and 53.41 ± 7.11 days (Table 7) respectively. This, on anal revealed that seasonal variation did not affect signific the onset of post-partum oestrum (Table 8). First oestrum in low, medium and high yielding oows were observed at 51.00 ± 8.14, 51.55 ± 5.76 and 54.78 ± 5.44 days (Table 9) respectively. Statistical analysis revealed that onset of post-partum oestrum was not influenced by the milk yield of the cow (Table 10). Cows with male calves took 52.10 ± 5.04 days and those with female calves took 52.73 ± 4.76 days for the onset of post-partum oestrum (Table 11). Analysis of the data revealed no significant difference in the onset of post-partum oestrum due to the sex of the calf (Table 12). Cows with calves weighing 20 kg or below took 55.63 ± 5.32 days, while those with calves weighing above 20 kg took 52.29 ± 4.78 days for post-partum oestrum (Table 13). Analysis of data revealed no significant difference in the post-partum oestrum interval between the two groups (Table 14).

Second ovulation

Second ovulation within 60 days post-partum was noticed only in normal calvers at a mean interval of 41.57 ± 1.70 days (Table 1). Jersey x Sindhi and Jersey x Local cows took 39.80 ± 2.05 and 43.38 ± 3.24 days respectively for the second ovulation after parturition (Table 3). Analysis of the data revealed that the variation was not significant (Table 4). Second ovulation was observed at 47.03 ± 3.59, 38.00 ± 4.25 and 40.25 ± 6.73 days (Table 5) in primiparous, cows calved twice and those calved thrice or more respectively. Statistical analysis revealed no significant difference in the duration between the three groups (Table 6). During summer, rainy and winter seasons, second ovulation was noticed at 45.17 ± 3.60, 38.89 ± 2.02 and 40.33 ± 5.09 days respectively (Table 7), without any significant difference in the duration (Table 8). In high yielding cows second ovulation was observed at 42.00 ± 2.68 days and in low and medium yielders at 44.00 ± 4.64 and 38.58 ± 2.68

days respectively (Table 9). Statistical analysis did not reveal any significant difference between the three groups (Table 10). Cows with male calves and female calves took 41.78 ± 2.58 and 41.47 ± 2.40 days respectively (Table 11) for second ovulation; the difference being statistically not significant (Table 12). Similarly, cows with calves weighing 20 kg or below and those with calves weighing above 20 kg had 45.09 ± 2.53 days and 38.06 ± 2.20 days respectively (Table 13) and this difference was also not significant (Table 14).

Involution of vulva

Involution of vulva to its pregravid stage was found to be delayed by abnormal calvings and post partum complications. In normal and abnormal calvings, vulval involution was complete in 23.31 ± 0.51 and 30.00 ± 0.94 days respectively (Table 1). Analysis of the data revealed significant variation between the two (Table 2). However, the breed of the cow did not have any significant influence on vulval involution (Table 4). In Jersey x Sindhi cows 23.64 ± 0.64 days were required for vulval involution while the same for Jersey x Local cows were 22.97 ± 0.86 days (Table 3). Similarly, parity of the cow was also not observed to effect significant variation in the vulval involution period (Table 6). In primiparous cows, vulval involution was complete by 23.68 + 0.85 days and in second calvers and cows calved thrice or more the values were 23.09 ± 0.85 and 23.31 ± 1.25 days respectively (Table 5). Involution of vulva was observed in 23.06 ± 1.01 days in summer, 23.20 ± 0.73 days in rainy and 24.08 ± 1.19 days in winter seasons.(Table 7). Statistical analysis did not reveal any significant variation between the three seasons (Table 8). Average days taken by low, medium and high yielding cows were 25.10 ± 1.28, 22.02 ± 0.75 and 23.01 ± 0.77 days respectively (Table 9). Analysis of the data showed significant influence of milk yield on duration of vulval involution (Table 10). Cows with male and female calves took 22.94 ± 0.75 and 23.66 ± 0.72 days respectively (Table 11) for involution but the variation was not significant (Table 12). Similarly, cows with calves weighing 20 kg or below took 24.46 ± 0.91 days and those with calves weighing above 20 kg took 22.23 ± 0.68 days (Table 13). This difference was also not found to be significant (Table 14)

Aberrations of post-partum oestrum

During the course of the study, observations were also made on the incidence of aberrations of oestrum in the animals studied (Table 15). It was found that out of 115 cows, silent oestrum was observed in four (3.48 per cent), delayed ovulation in two (1.74 per cent) and anovulatory oestrum in nine (7.83 per cent) cows. The total aberrations were observed to be 13.04 per cent.

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

Type of calving	Lochial discharge	Regression of pregnancy corpus lutemm	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
Normal calving	18.15 ± 0.59 (67)	12.40 ± 0.39 (67)	28.70 ± 0.60 (67)	29.01 ± 1.07 (67)	52.40 ± 3.86 (89)*	41.57 ± 1.70 (28)	23.31 ± 0.51 (67)
Abnormal calving	29.35 ± 1.07 (20)	20.75 ± 0.71 (20)	37.15 ± 1.09 (20)	41.20 ± 1.96 (20)	60.68 ± 7.55 (22)	Nil	30.00 ± 0.94 (20)

* Four animals showed silent oestrum

Parenthesis denote number of observations.

Table 2. Between normal and abnormal calvings analysis.

Source	ss	df	Mss	df	F
Lochial discharge	1932.321	1	23.094	85	83.671**
Pregnancy corpus luteum	1073.119	1	10.210	85	105.104**
Uterine involution	1099.374	1	23.936	85	45.929**
First ovulation	2286.872	1	76.755	85	29.794**
First oestrum	1208.563	1	132.772	109	9.102**
Vulval involution	688.639	1	17.699	85	38.908**

** Significant at 1 per cent level.

Table 3. Influence of breed on post-partum changes.
(in days)

Breed of cow	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
Jersey x Sindhi	18.08± 0.73 (43)	12.33± 0.40 (43)	28.40± 0.36 (43)	28.04± 1.32 (43)	54.09± 4.33 (58)**	39.80± 2.05 (20)	23.64± 0.64 (43)
Jerset x Local	18.25± 0.98 (24)	12.54± 0.66 (24)	29.05± 0.48 (24)	30.03± 1.77 (24)	50.80± 5.92 (31)**	43.38± 3.24 (8)	22.97± 0.86 (24)
Overall	18.16± 0.59 (67)	12.43± 0.39 (67)	28.72± 0.60 (67)	29.03± 1.07 (67)	52.44± 3.86 (89)	41.59± 1.70 (28)	23.30± 0.51 (67)

Table 4. Between breed group analysis.

Source	ss	df	Mss	df	F
Lochial discharge	3.485	1	994.705	2	0.003
Pregnancy corpus luteum	0.092	1	540.474	2	0.0001
Uterine involution	17.772	1	566.856	2	0.031
First ovulation	105.408	1	1219.491	2	0.086
First oestrum	3.452	2	278.324	107	0.012
Second ovulation	73.032	1	84.041	26	0.869
Vulval involution	3.691	1	359.469	2	0.010

Table 5. Influence of parity on post-partum changes.
(in days)

Parity	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
First calving	18.43 ± 0.93 (28)	13.14 ± 0.65 (28)	28.07 ± 0.97 (28)	28.60 ± 1.68 (28)	58.24 ± 4.53 (34)**	47.03 ± 3.59 (14)	23.68 ± 0.85 (28)
Second calving	19.00 ± 0.92 (26)	12.27 ± 0.65 (26)	29.75 ± 0.97 (26)	28.62 ± 1.68 (26)	44.02 ± 7.97 (35)*	38.00 ± 4.25 (10)	23.09 ± 0.85 (26)
Three or more calving	17.54 ± 2.84 (13)	12.15 ± 0.96 (13)	28.65 ± 1.43 (13)	31.31 ± 2.46 (13)	55.55 ± 5.92 (20)*	40.25 ± 6.73 (4)	23.31 ± 1.25 (13)
Overall	18.22 ± 0.59 (67)	12.42 ± 0.39 (67)	28.72 ± 0.60 (67)	29.44 ± 1.07 (67)	52.41 ± 3.86 (89)	41.64 ± 1.70 (28)	23.36 ± 0.51 (67)

** Two silent oestrum

* One silent oestrum

Table 6. Between parity status analysis.

Source	ss	df	Mss	df	F
Lochial discharge	69.959	4	24.136	81	2.898*
Pregnancy corpus luteum	29.596	4	11.997	81	2.466
Uterine involution	86.281	4	26.614	81	3.241*
First ovulation	72.108	4	78.941	81	0.913
First oestrum	50.596	4	17.009	105	2.974*
Second ovulation	61.917	4	188.796	23	0.327
Vulval involution	5.417	4	20.222	81	0.267

* Significant at 5 per cent level.

Table 7. Seasonal influence on post-partum changes.
(in days)

Seasons	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
Summer	18.44 ± 0.95 (18)	13.17 ± 0.75 (18)	28.78 ± 1.19 (18)	31.11 ± 1.90 (18)	50.96 ± 6.52 (25)	45.17 ± 3.60 (6)	23.06 ± 1.01 (18)
Rainy	18.57 ± 0.68 (35)	13.46 ± 0.54 (35)	28.74 ± 0.86 (35)	25.49 ± 1.36 (35)	52.56 ± 4.97 (43)	38.89 ± 2.02 (19)	23.20 ± 0.73 (35)
Winter	16.71 ± 1.08 (13)	10.61 ± 0.88 (13)	28.46 ± 1.40 (13)	32.15 ± 2.24 (13)	53.41 ± 7.11 (21)	40.33 ± 5.09 (3)	24.08 ± 1.19 (13)
Overall	18.66 ± 0.59 (67)	12.37 ± 0.39 (67)	28.73 ± 0.60 (67)	29.21 ± 1.07 (67)	52.39 ± 3.86 (89)	41.48 ± 1.70 (28)	23.34 ± 0.51 (67)

Table 8. Between season analysis.

Source	ss	df	Mss	df	F
Lochial discharge	95.754	4	16.346	81	5.857**
Pregnancy corpus luteum	32.851	4	10.185	81	3.225*
Uterine involution	4.632	4	25.669	81	0.180
First ovulation	233.606	4	65.035	81	3.592**
First oestrum	1284.521	4	1062.216	105	1.209
Second ovulation	156.408	2	77.811	25	2.010
Vulval involution	15.972	4	18.515	81	0.862

Table 9. Influence of milk yield on post-partum changes.
(in days)

Milk yield	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
Low (6 lit and below)	19.00 ± 1.38 (10)	12.02 ± 1.08 (10)	29.10 ± 1.54 (10)	29.00 ± 2.84 (10)	51.00 ± 8.14 (17)**	44.00 ± 4.64 (4)	25.10 ± 1.28 (10)
Medium (4 to 6 lit)	17.45 ± 0.81 (29)	12.00 ± 0.64 (29)	28.90 ± 0.91 (29)	28.41 ± 1.67 (29)	51.55 ± 5.76 (34)*	38.58 ± 2.68 (12)	22.02 ± 0.75 (29)
High (above 6 lit)	18.01 ± 0.82 (28)	13.05 ± 0.65 (28)	28.14 ± 0.92 (28)	30.20 ± 1.70 (28)	54.78 ± 5.44 (38)*	42.00 ± 2.68 (12)	23.01 ± 0.77 (28)
Overall	18.14 ± 0.59 (67)	12.35 ± 0.39 (67)	28.71 ± 0.60 (67)	29.20 ± 1.07 (67)	52.44 ± 3.86 (89)	41.53 ± 1.70 (28)	23.34 ± 0.51 (67)

Table 10. Between milk yield analysis.

Source	ss	df	Mss	df	F
Lochial discharge	32.493	4	22.630	81	1.435
Pregnancy corpus luteum	36.398	4	10.694	81	3.403*
Uterine involution	25.514	4	23.858	81	1.069
First ovulation	9.509	4	80.547	81	0.118
First oestrum	154.812	4	1126.544	105	0.137
second ovulation	58.595	2	85.936	25	0.681
Vulval involution	42.813	4	16.413	81	2.608*

Table 11. Influence of sex of calf on post-partum changes.

(in days)

Sex of calf	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
Male	17.97 ± 0.83 (32)	12.44 ± 0.57 (32)	28.72 ± 0.89 (32)	28.84 ± 1.56 (32)	52.10 ± 5.04 (42)**	41.78 ± 2.58 (13)	22.94 ± 0.75 (32)
Female	18.31 ± 0.79 (35)	12.37 ± 0.55 (35)	28.97 ± 0.85 (35)	29.54 ± 1.50 (35)	52.73 ± 4.76 (47)**	41.47 ± 2.40 (15)	23.66 ± 0.72 (35)
Overall	18.14 ± 0.59 (67)	12.41 ± 0.39 (67)	28.73 ± 0.60 (67)	29.11 ± 1.07 (67)	52.41 ± 3.86 (89)	41.64 ± 1.70 (28)	23.30 ± 0.51 (67)

Table 12. Between sex of calf analysis.

Source	ss	df	Mss	df	F
Lochial discharge	51.623	2	22.407	83	2.303
Pregnancy corpus luteum	0.261	2	10.449	83	0.024
Uterine involution	9.558	2	25.300	83	0.377
First ovulation	12.712	2	78.298	83	0.162
First oestrum	1367.617	2	1064.818	107	1.284
Second ovulation	13.450	1	86.332	26	0.155
Vulval involution	6.828	2	18.141	83	0.376

Table 13. Influence of weight of calf on post-partum changes.
(in days)

Weight of calf	Lochial discharge	Regression of pregnancy corpus luteum	Uterine involution	First ovulation	First oestrum	Second ovulation	Vulval involution
20 kg and below	18.17 ± 0.98 (24)	12.75 ± 0.70 (24)	29.21 ± 1.00 (24)	30.08 ± 1.78 (24)	55.65 ± 5.32 (42)**	45.09 ± 2.53 (12)	24.46 ± 0.91 (24)
Above 20 kg	18.14 ± 0.74 (43)	12.21 ± 0.52 (43)	28.42 ± 0.75 (43)	28.42 ± 1.33 (43)	52.29 ± 4.78 (47)**	38.06 ± 2.20 (16)	22.23 ± 0.68 (43)
Overall	18.15 ± 0.59 (67)	12.44 ± 0.39 (67)	28.74 ± 0.60 (67)	29.03 ± 1.07 (67)	52.43 ± 3.86 (89)	41.57 ± 1.70 (28)	23.34 ± 0.51 (67)

Table 14. Between weight of calf analysis.

Source	ss	df	Mss	df	F
Lochial discharge	15.510	2	23.277	83	0.666
Pregnancy corpus luteum	8.918	2	11.651	83	0.765
Uterine involution	12.870	2	24.202	83	0.531
First ovulation	117.610	2	75.770	83	1.552
First oestrum	1631.254	2	1190.309	107	1.370
Second ovulation	322.005	1	77.113	26	4.175
Vulval involution	21.733	2	20.015	83	1.085

Table 15. Aberrations of post-partum oestrum.

	No. of observations	No. of Animals	Percentage
1. Silent oestrum	115	4	3.48
2. Delayed ovulation	115	2	1.74
3. Anovulatory oestrum	115	9	7.83
Total	115	15	13.04

DISCUSSION

DISCUSSION

Reduction in the length of service period depends mainly on the resumption of oestrous cycle after calving and fertility status during the period. A host of factors originating during the post-partum period have been found to influence this. It is aimed, in the present study, to understand the occurrence of first post-partum heat and factors influencing it in cross bred cows. Duration of lochial discharge, persistence of pregnancy corpus luteum, time taken for genital involution, occurrence of first ovulation and observable heat, were the parameters studied. Influence of pathology of calving, parity status of cows, seasons of calving, milk yield and sex and weight of calf on each of the above parameters have been analysed by close observation on an experimental herd of cross bred cows.

From the data presented in Table 1, 5 and 7 it could be seen that duration of lochial flow was influenced by normality of calving, parity status and season of calving. Lochial discharge persisted significantly for longer period (29.35 $\pm$ 1.07 days) consequent to abnormal calvings than normal calvings (18.15 $\pm$ 0.59 days). Rasbech (1950) observed that cattle often contracted spontaneous puerperal infection causing maximal growth in the uterine lochia. Tennant *et al.* (1967) observed that about 30 to 35 per cent of all cows had upto 200 ml of lochia between 10 to 20 days post-partum, whereas only two to five per cent had this much volume by 30 to 50 days post-partum. The flow of lochial discharge for prolonged period was attributed by him to pathology of uterus due to infection during post-partum period. Roberts (1971) reported that abnormalities of calving increased the chances of uterine infection during puerperal period. It could therefore be inferred that prolonged vulval discharge presently observed in abnormal calvers was due to prolonged infection of uterus. The present study also revealed that the lochial discharge persisted for longer period in abnormal calvers.

It may be observed from Table 6 that parity of the cows significantly influenced the duration of lochial discharge. The duration was longest in second calvers followed by primipara and those calved more than thrice. This variable duration of lochial discharge in different parous animals is in agreement with the findings of Roberts (1971).

It could be seen from Table 7, that season of calving significantly influenced the time taken for cessation of lochial discharge. The period of lochial discharge was shorter during winter and longer in summer and rainy seasons. Perusal of literature did not reveal any significant influence of season on the cessation of lochial discharge. However, uterine involution being concomitant with lochial discharge (Morrow et al. 1966) the variation presently observed could be attributed to the variation in the duration of uterine involution in different seasons.

It may be observed from Table 1 that pregnancy corpus luteum degenerated by 12.40 ± 0.39 days in normal calvers and persisted for longer period (20.75 ± 0.71) in abnormal calvers. In normal cows, the period ranged from 8 to 17 days. The present finding is in agreement with Morrow et al. (1969) who observed that regression of corpus luteum occurred in 14 days post-partum in normal calvers. On the other hand, Menge et al. (1962) and Morrow et al. (1969) observed prolonged life of corpus luteum when the uterus was infected. It may be concluded from the present investigation that corpora lutea tend to persist in abnormal calvers due to uterine pathology. Pregnancy corpus luteum regressed in 10.61 ± 0.88 days in winter, 13.46 ± 0.54 days in rainy and 13.17 ± 0.75 days in summer seasons. It was revealed that season of calving had significant influence on the regression of pregnancy corpus luteum. This is in concurrence with the findings of Morrow et al. (1969). The present observation revealed that high yielding cows retained the corpus luteum for longer period (13.05 ± 0.65 days) than low (12.02 ± 1.08 days) and medium yielders (12.00 ± 0.64 days). Morrow et al. (1969) also stated that corpus luteum of pregnancy remained unchanged for a longer period after parturition. secondary to high production. But factors like sex and weight of the calf, parity and breed of the cow were not found to influence the duration of regression of corpus luteum in this study.

In normal and abnormal calvers, uterus involuted in 28.70 + 0.60 and 37.15 ± 1.09 days respectively (Table 1), the difference being highly significant. Rasbech (1950). Buch et al. (1955), Norwood (1963) and Boyed (1925) and Khar (1969) as cited by Jana and Mishra (1978) and Jana and Mishra (1978) also observed that abnormal calvers took significantly more days for uterine involution. The present observation that normal calvers took 28.70 ± 0.60 days for uterine involution is in keeping with the findings of Johanns et al. (1967) Morrow et al. (1969) and Roberts (1971). The time taken for uterine involution in abnormal calvers in this study is comparable to the findings of Jana and Mishra (1978) in cross bred cows. Gier and Marion (1968) put forward the hypothesis that these delays in abnormal cases were due to decrease in the uterine motility immediately after parturition, thus inhibiting the normal rapid regression of the uterus brought about by frequent muscular contractions of the myometrium in the initial 24 hours. The period for uterine involution was shorter in primipara (28.07 ± 0.97 days) than bipara (29.75 ± 0.97 days) and those calved more than thrice (28.65 + 1.43 days).

This is in accordance with the findings of Casida and Wisnicky (1950), Buch et al. (1955), Marion et al. (1968), Morrow et al. (1966 & 1969) and Hafez and Jainudeen (1974) in Bos taurus and Jana and Mishra (1978) in cross bred cows who have observed that the duration of involution of uterus was less in primiparous cows than in pluripara. Roy and Luktuke (1961) also observed a positive correlation between involution time and number of calving in buffaloes. On the contrary, Bhalla et al. (1966) in buffaloes observed that calving sequence had no significant influence on genital involution. It was also observed that the breed of the cow, season of calving, milk yield and sex and weight of the calf did not have any significant influence on uterine involution. Bhalla et al. (1967) and Jana and Mishra (1978) also observed no marked influence of breeds on uterine involution. Chauhan et al. (1976) indicated that the involution of uterus was significantly faster during spring and winter in buffaloes than in other seasons. On the contrary, Roy and Luktuke (1962) observed no such influence in buffaloes. The present observation that milk yield has no effect on uterine involution is in concurrence with the findings of Morrow et al. (1966). The observation that neither sex nor weight of the calf influenced the uterine involution is in agreement with the findings of Francis and Raja (1971) in Sindhi cows and Bhalla et al. (1966) in buffaloes.

Data presented in Table 1 revealed that the onset of first ovulation was significantly delayed in abnormal calvers. This is comparable to the reports of Morrow _et al_. (1969) who also observed a significant variation in the onset of first ovulation between normal and abnormal calvers. However, the duration for first ovulation in the present study in normal calvers was longer (29.01 ± 1.07 days) than the period (15 days) reported by Morrow _et al_. (1969). This longer duration could probably be attributed to the managemental and breed differences of the herds. Similar variation has also been observed in normal cows by Benjaminsen and Tomasgarrd (1978). It could also be seen that, occurrence of first ovulation in normal calvers ranged from 11 to 54 days which is comparable to the reports of Menge _et al_. (1962) and Morrow _et al_. (1966). The longer interval for the onset of first ovulation in abnormal calvers could be attributed to the delayed regression of pregnancy corpus luteum. Data presented in Table 7 showed a significant influence of season on the onset of first ovulation. In rainy season, ovulation was observed earlier than in summer and winter. Morrow _et al_. (1969) also observed a significant variation in the onset of ovulation due to seasons. However, breed and parity of the cow, milk yield and sex and weight of the calf were not found to influence the onset of first ovulation.

Perusal of data in Table 1 revealed that the first post-partum oestrum occurred at 52.40 ± 3.86 days and 60.68 ± 7.55 days respectively in normal and abnormal cows. Analysis of the data showed that the interval between parturition and first oestrum was significantly altered by abnormal parturition. The first post-partum oestrum occurred 8.28 days earlier in normal than in abnormal cows. Chapman and Casida (1937) noted that first oestrum occurred 2.1 days (69.3 Vs 71.4) earlier in cows with normal parturition than those with abnormal parturition, while Buch et al. (1955) reported a three day (33 Vs 36) longer interval in the latter group. Similarly, Menge et al. (1962), Morrow et al. (1966 and 1969) and Jana and Mishra (1978) also noted variation in the post-partum oestrous interval between normal and abnormal calvings. Morrow et al. (1969) attributed this wide variation to the effect of disease at or near parturition. The number of days required for the onset of post-partum oestrum in primiparous, biparous and those calved thrice and more were 58.24 ± 4.53, 44.02 ± 7.97 and 55.55 ± 5.92 days respectively. The average interval from calving to the occurrence of first detectable heat was significantly higher in primiparous cows compared to the other two groups. Herman and Edmondson (1950) as cited by Morrow et al.(1966), also found that the age of cow was a factor that influenced the interval from parturition to first oestrus. They also stated that this period was longest in primiparous cows (75 days), shortest in middle aged cows (50-60 days) and increased (60-70 days) for cows over 7 years of age. Wiltbank and Cook (1958), Uscanga (1973) and Jana and Mishra (1978) also stated that post-partum oestrous interval decreased with increase of parity. However, Clapp (1937), Buch et al. (1955), Warnick et al. (1955) and Foote et al. (1960) did not find any effect of parity on the post-partum oestrous interval. The interval from calving to first oestrus was noted to be 54.09 ± 4.33 days in Jersey x Sindhi cows and 50.80 ± 5.92 in Jersey x Local cows. However, the difference in the interval between the two groups was not significant. Observation similar to this has been recorded by Jana and Mishra (1978) in cross bred cows. It could be seen from Table 10, that milk yield had no significant influence on the onset of first oestrum. Clapp (1937), Herman and Edmondson (1950) as cited by Morrow et al.(1960)and also Morrow et al. (1969) indicated that there was no significant correlation between the interval to first oestrum and milk production. On the other hand, Old and Sheath (1953) reported a statistically significant relationship between the interval to first oestrum and milk production. It was also reported that, for each additional 1000 lb of milk with four per cent fat produced, during the first 120 days of first location, there was a period of 1.5 more days between calving and first oestrus. The present study also revealed a non significant difference in the post-partum oestrus interval between seasons (Table 8). This is essentially in keeping with the findings of Herman and Edmondson (1950) as cited by Morrow et al. (1966), Warnick et al. (1955) and Wiltbank Cook (1958) who reported that this interval was not correlated with season. In contrast, Chapman and Casida (1937) suggested that the post-partum oestrus interval tended to be longer in spring than in other seasons of the year. Similarly, Buch et al. (1955) observed marked variation in this period between spring, summer fall and winter. Supporting the above findings, Carman (1955) also indicated that cows calving during March required longer interval than cows calving during September. The present observation that there is no significant difference between seasons might be due to the negligible variation in temperature existing in this area between seasons. In cows with male and female calves the post-partum oestrum was observed to occur at 52.10 ± 5.04 and 52.73 ± 4.76 days respectively (Table 11). Analysis of the data revealed no significant difference in the onset of post-partum oestrum due to the sex of the calf. Similarly weight of calf also was not found to influence the onset of post-partum oestrus interval (Table 14). Perusal of available literature does not throw much light on the above factors influencing the post-partum oestrus interval in cross bred cows.

Second ovulation was observed at a mean interval of 41.57 ± 1.70 days in normal cows whereas it was not observed within 60 days in abnormal calvers. The possible etiological factors leading to the delayed onset of first ovulation in abnormal calvers could be attributed to the delay in the second ovulation as well.

The average values presented in Table 1 and 9 revealed that duration of involution of vulva was significantly delayed in abnormal calvers. Roberts (1971) opined that inflammation of uterus would affect vagina and vulva also leading to delayed vulval involution. Jana and Mishra (1978) also indicated a positive correlation between vulval and uterine involution in normal and abnormal calvers. The present findings, that vulval involution is delayed in abnormal calvers, support the above view. A significant correlation was observed between milk yield and vulval involution (Table 10). Duration of vulval involution was prolonged in low than in medium and high yielding cows. Factors like breed of the cow, sequence and season of calving and sex and weight of the calf had no influence on the duration of vulval involution. On these aspects, the behaviour of the cross bred cows is comparable to those of buffaloes (Bhalla _et al._ 1966) and Sindhi cows (Francis and Raja, 1971).

During the course of the study, an incidence of 3.48 per cent of silent oestrus, 1.74 per cent of delayed ovulation and 7.83 per cent of anovulation were recorded. The incidence of various aberrations currently observed is lower when compared to the earlier reports of Labhsetwar *et al.* (1963) and Morrow et al. (1969) in cows and Namboothiripad (1976) in buffaloes. This low incidence might be due to breed, climate and managerial conditions. It could also be attributed to the practice of weaning at birth in the herd. Thibault and Levasseur (1974) indicated that the incidence of silent ovarian cycle was high in suckled cows.

From the foregoing paragraphs, it may be concluded that the lochial discharge was prolonged in abnormal calvings than in normal ones. The period of uterine involution, onset of first and second ovulations and the first post-partum oestrus were also significantly delayed in cows with abnormal parturition. The corpus luteum of pregnancy regressed early in normal ones. The above variation in the abnormal cows could be attributed to the pathology of uterus associated with abnormal calvings as corroborated in the literature cited. The study also revealed that the breed and sex and weight of calf exerted no influence on any of the reproductive parameters currently observed. Parity was found to influence the cessation of lochial discharge, uterine involution and the onset of post-partum oestrus. Significant variations between season were also noted for the duration of lochia discharge, time taken for regression of pregnancy corpus luteum and for the onset of first ovulation. Milk yield during the first 90 days was also found to influence the regression of pregnancy corpus luteum and vulval involution. The incidence of aberrations of oestrum (13.04 per cent) presently observed was low compared to earlier reports.

SUMMARY

SUMMARY

The aim of the present investigation was to study the various reproductive parameters that influence the onset of post-partum oestrum in cross bred cows. Factors like cessation of lochial discharge, regression of pregnancy corpus luteum, period for uterine involution, onset of first and second ovulation, occurrence of first oestrum and the period for vulval involution were considered for the study. The influence of normalcy of calving, breed, season of calving, milk yield and weight and sex of the calf on the above parameters were also observed.

The material used in the present study consisted of 115 cross bred cows of Jersey x Sindhi and Jersey x local breeds belonging to the University Livestock Farm attached to the Kerala Agricultural University, Mannuthy. They were maintained under identical conditions of feeding and management and were stall-fed. After calving, they were grouped into normal and abnormal calvers based on the normalcy of parturition.

The time required for cessation of lochia in normal and abnormal calvings was observed to be 18.15 ± 0.59 and 29.35 ± 1.07 days respectively; the variation being significant. The duration for cessation of lochia, 18.43 ± 0.93, 19.00 ± 0.92 and 17.54 ± 2.84 days respectively for primipara,

bipara, and for those calved thrice or more were found to vary significantly between the groups. The lochial discharge ceased at 18.57 ± 0.68 days in rainy, 18.44 ± 0.95 days in summer and 16.71 ± 1.08 days in winter seasons. Analysis of the data showed significant variation between seasons. However, the duration for cessation of lochia in cows grouped according to breed. milk yield and sex and weight of the calve was not found to vary significantly.

Abnormal calvers were found to persist the pregnancy corpus luteum for a significantly longer period (20.75 ± 0.71 days) than normal ones (12.40 ± 0.39 days). The duration for complete regression of pregnancy corpus luteum in summer (13.17 ± 0.75 days), rainy (13.46 ± 0.54 days) and winter (10.61 ± 0.88 days) seasons also showed significant variation. Similarly, the time taken for complete regression of pregnancy corpus luteum ie. 12.02 ± 1.08, 12.00 ± 0.64 and 13.05 ± 0.65 days respectively in low, medium and high yielding cows was also found to vary significantly. However, factors like breed, parity of the cow and sex and weight of the calf showed no significant influence on the regression of the pregnancy corpus luteum.

Involution of uterus was significantly delayed in abnormal parturition (37.15 ± 1.09 days) than normal ones (28.70 ± 0.60 days). The period required for complete involution of uterus was significantly low in primiparous than in pluriparous cows. Breed of the cow, season of calving, milk yield and sex and weight of the calf were observed not to influence the involution of the uterus.

The mean days for the onset of first ovulation in normal and abnormal calvers were 29.01 ± 1.07 and 41.20 ± 1.96 days respectively; the variation being being significant. Similarly, significant variation was also observed in the onset of first ovulation between seasons in the experimental animals studied; the values being 31.11 ± 1.90 days, 25.49 ± 1.36 days and 32.15 ± 2.24 days respectively during summer, rainy and winter seasons. But, the variations due to breed, parity, milk yield and sex and weight of calf were not significant.

Cows with abnormal parturition took significantly more days (60.68 ± 7.75 days) than normal ones (52.40 ± 3.86 days) for exhibiting first observable post-partum oestrus. Primiparous cows also took significantly more days (58.24 ± 4.53) than bipara (44.02 ± 7.97) and those calved more than twice (55.55 ± 5.92) for exhibiting oestrum. However, the duration for the onset of post-partum oestrus was not significantly altered by the breed and milk yield of the cow, season of calving and sex and weight of calf.

The interval between calving and the onset of second ovulation was not found to be altered significantly by any of the factors studied.

Vulval involution was significantly delayed in abnormal calvers (30.00 ± 0.94 days) than in normal ones (23.31 ± 0.51 days). The time taken for vulval involution in low, medium and high yielding cows averaged at 25.10 ± 1.28, 22.02 ± 0.75 and 23.01 ± 0.77 days respectively. The data on analysis, showed that the high yielding cows took significantly more time for vulval involution. On the other hand, factors like breed and parity of the cow, season of calving and sex and weight of the calf were not found to influence vulval involution. During the course of study, an incidence of 13.4 per cent of aberrations of oestrum like silent oestrus, delayed ovulation and anovulation were also observed.

To sum up, it could be stated that all the parameters studied were adversely affected by abnormal parturition. In normal cows, parity significantly influenced cessation of lochia, involution of uterus and onset of post-partum oestrum. Significant seasonal variation was observed in cessation of lochia, regression of pregnancy corpus luteum and first ovulation. The milk yield of the cow was found to influence significantly the regression of pregnancy corpus luteum and vulval involution. However, breed of the cow and sex and weight of the calf had no influence on any of the reproductive parameter studied.

REFERENCES

REFERENCES

Agarwal, K.P., Raizada, B.C. and Pandey, M.D.(1978). Post-parturitional Changes in the Uterus of Buffaloe Cows. Indian J. Anim. Sci. 48(7): 492-503.

Baker, A.A. (1969). Post-partum Anoestrus in Cattle. Aust. vet. J. 45: 180-183.

Benjaminsen, E., and Tomasgarrd, G.(1978). Corpora lutea and follicular Cysts in the first three months after calving. Anim. Breed. Abstr. (1978). 46(7) abst. 3273.

Bhalla, R.C., Soni, B.K., and Sengar, D.P.S.(1966). Studies on Reproduction in Murrah Buffaloes. II. Involution of uterus. Indian vet. J. 43 (10): 892-896.

Bond, J., and Weinland, B.T.(1978). Effect of level of feeding on Growth Reproductive performance and Milk production of Beef Females. Livestock Prod.Sci.5(2):159-169.

Buch, N.C., Tyler, W.J., and Casida, L.E.(1955). Post-partum Estrus and Involution of the Uterus in an Experimental Herd of Holstein-Friesian Cows. J. Dai.Sci. 38: 73-79.

Buchhalz, G.W., and Busch, W. (1977). Relationships between Ovarian activity and post-partum uterus involution in the cow. Mh.Vet. Med. 32(3): 95-97. C.f. Vet. Bull. (1977). 47(9) Abst. 5200.

Carman, G.M. (1955). Interrelationships of milk production and breeding efficiency in Dairy cows. J. Anim. Sci 14: 753-759.

Casida, L.E., and Wisnicky, W. (1950). Effects of diethyl stilbestrol dipropionate upon post-partum changes in the cow. J. Anim. Sci 9: 238-242.

Chapman, A.B., and Casida, L.E.(1937). Analysis of variation in the sexual cycle and some of its component phase with special reference to cattle. J. Agr. Res. 54: 417.

Chauhan, F.S., Singh, N., and Singh, M. (1977). Involution of the uterus and Cervix in Buffaloes. Indian J. Dairy Sci. 30 (4): 1977.

Clapp, H., (1937). A factor in breeding efficiency of dairy cattle. Proc. Am. Soc. An. Prod 37: 259. C.f. Res. Bull. (1968). 270: 3-4.

Donaldson, L.E., Ritson, J.B., and Copeman, D.B. (1967). The Reproductive Efficiency of Several North Queensland Beef herds. Aust. vet. J. 43: 1-6.

El-Sheikh, A.S., and Mohamed, A.A. (1977). Uterine Involution in the Egyptian Buffalo. Indian J. Anim. Sci. 47(4): 165-169.

Fallon, G.R. (1958). Some aspects of Oestrum in cattle with reference to Fertility on A.I. 1. The pattern of Oestrous cycle. The Queensland J. Agr. Sci. 15: 25. C.f. Res. Bull.(1968). 270: 3-4.

Foote, W.D., Hauser, E.R., and Casida, L.E.(1960). Influence of progesterone treatment on post-partum reproductive activity in beef cattle. J. Anim. Sci 19: 674-680.

Fosgate, O.T., Cameron, N.W., and McLeod, R.J. (1962). Influence of 17-alpha hydroxyprogesterone-n-caporate upon post-partum reproductive activity in the bovine. J. Anim. Sci. 21: 791-801.

Francis,E.C., and Raja, C.K.S.V. (1971). A study on the Genital Involution in Sindhi Cows. Kerala J. vet. Sci 2(2): 113-118.

Ghannam, S.A.M., and Abd-Elraheem, S.N. (1978). The effect of Vitamin A supplementation on the Reproductive performances of Friesian Crossbred cows under Semi-Arid conditions. (1978). Wld Rev. Anim. Prod. 14(1): 27-31.

Gier, H.T., and Marion, G.B. (1968). Involution changes in the Bovine Uterus after Parturition. Am. J. vet. Res. 29(1): 83-89.

Gudi, A.K., and Deshpande, B.R.(1977). A note on Transport and Involution of Uterus in Buffaloes. Indian J. Anim. Sci. 47(12): 842-843.

Hignett, S.L., and Hignett, P.G. (1951). The influence of Nutrition on Reproductive Efficiency in Cattle. Vet. Rec. 63 (38): 603-611.

Hafez, E.S.E., and Jainudeen, M.R. (1974). Gestation, Prenatal Physiology and Parturition. Reproduction in Farm Animals. Lea and Fibiger Philadelphia. 3rd Ed. pp. 166-202.

Itamer, U., and Sehindler, H. (1977). Oestrus and Oestrous cycle of high-yielding Post partum Dairy Cows. Agric Res. org. 58(4): 703-707.

Jana, D., and Mishra, R.R. (1978). Studies on Uterine Involution and Post-partum estrum in Dairy cows. Indian J. Dairy Sci. 31(2): 145-149.

Johanns, C.J., Clark, T.L., and Herrick, J.B. (1967). Factors Affecting Calving Interval. J. Am. vet. med Ass. 151(12): 1962-1973.

Kesler, D.J. (1978). Endocrine and Ovarian response and Reproductive performance in Dairy cows following GnRH and PGF_2 in cows with ovarian cysts. Dissertation Abstracts International. 38(10): 4666-4667.

Labhsetwar, A.P., Collins, W.E., Tyler, W.J. and Casida, L.E. (1964). Some Pituitary-Ovarian Relationships in the Periparturient cow. J. Reprod. Fertil. 8: 85-90.

Menge, A.C., Mares, S.E., Tyler, W.J., and Casida, L.E. (1962). Variation and Association among Post-partum reproduction and production characteristics in Holstein Friesian Cattle. J. Dai. Sci. 45(1): 233-240.

Marion, G.B., Norwood, J.S., and Gier, H.T. (1968). Factors affecting Regression of the Bovine Uterus after Parturition. Am. J. vet. Res. 29: 71-84.

Mathai, E., Bharathan, T.R.N., and Raja, C.K.S.V. (1971). Effect of Oxytocin therapy on Post-partum heat in cows. Kerala Vet. Coll. Res. Institute Magazine. 15: 50-53.

Mathai, E., Namboothiripad, T.R.B., and Raja, C.K.S.V. (1973). A note on the Efficiency of Administration of Phosphorus compound and Vitamin A. on the onset of Post-partum heat in cows. Kerala J. vet. Sci. 4 (1): 70-72.

Morrow, D.A., Roberts, S.J., McEntee, K., and Gray, H.G. (1966). Post-partum Ovarian Activity and Uterine nvolution in Dairy Cattle. J. Am.vet. med. Ass. 49(12): 1596-1608.

Morrow, D.A., Roberts, S.J., and McEntee, K. (1969). A review os Post-partum Ovarian activity and Involution of the uterus and cervix of cattle. Cor. Vet. 59(1): 134-199.

Namboothiripad, T.R.B. (1976). Studies on certain aspects of Subfertility and Infertility in Buffaloe (Bubalus Bubalis) Females. Thesis submitted to Agra University for the award of Degree of Doctor of Philosophy in Gynaecology: 50-51.

Norwood, J.S. (1963). Factors affecting Post-partum regression of Bovine Uterus. Diss. Abstr. 24: 361. C.F. Anim. Breed. Abstr. 1964 32 Abst. 1982.

Olds, D., and Cooper, T. (1970). Effect of Post-partum Rest period in Dairy Cattle on the Occurrence of Breeding Abnormalities and on calving Intervals. J. Am. vet. med. Ass. 157 (1): 92-97.

Olds, D., and Seath, D.M. (1953). Repeatability, Heritability and Effect of Level of Milk Production on the occurrence of First Estrus After Calving in Dairy Cattle. J. Anim. Sci 12: 10-14.

Pandey, H.N., Koul, G.L., and Katpatal, B.G. (1979). Post-partum oestrus and weight of calving in cross-bred cows. Indian J. Dairy Sci. 32(1): 11-15.

Patel, A.R. (1976). Milk for Millions. Fd Fmg. Agri.8 (2): 27-30.

Philipson, J. (1976). V. Effect of calving performance and still birth in Swedish Friesian heifers on productivity in subsequent lactation. Acta. Agric. Scand. 26 (3): 211-234. C.f. Vet. Bull (1977) 47(2): Abst.1127.

Purbey, L.N., and Sane, C.R. (1978). Studies on oestrous cycle in Dangi Breed of cow. Indian vet. J. 55(7): 532-535.

Purbey, L.N., and Sane, C.R. (1979). Post-partum Oestrus interval in Dangi Breed of cows. Indian vet. J. 56(1): 67-68.

Raja, C.A.R., and Patel, U.G. (1972). Post-partum interval to first oestrus in Kankrej Cattle. Kerala J. vet.Sci. 3(1): 34-39.

Rasbech, N.O. (1950). The Normal Involution of the Uterus of the cow. Nord. Vet. Med. 2 (8): 655-660.

Roberts, S.J. (1971). Veterinary Obstetrics and Genital Diseases. Scientific Book Agency Calcutta-1, 2nd Ed. pp.381-387.

Roy, D.J., and Luktuke, S.N.(1962). Studies on involution of uterus in buffaloes. Indian J. Anim. Sci 32(3): 204-210.

Sherington, J., Roche, J.F., Cunningham, J.F., and Mitchell, J.P. (1978). Reproductive efficiency in Spring calving Dairy cows. Irish Vet. J. 32 (8): 137-142.

Singh, O.N., Singh, R.N., and Srivastava, R.P. (1965). Study on Post-partum Interval to first service in Tharparkar Cattle. Indian J. vet. Sci. 35(3): 245-248.

Snedecor, G.W., and Cochran, W.G. (1967). Statistical Methods. Oxford & IBH Publishing Co., Calcutta-5. 6th Ed. pp.163-171.

Steenkamp, J.D.G., Horst, C., Van, D., and Andrew, M.J.A. (1975). Reconception in Grage and Pedigree Africander cows of different size - Post-partum factors influencing reconception. S. Afr. J. Anim. Sci. 5(2): 103-110. C.f. Vet. Bull.1977. 47(3): Abst. 1672.

Studer, E., and Morrow, D.A. (1978). Post-partum evaluation of bovine reproductive potential: comparison of finding from Genital tract examination per rectum, uterine culture and endometrial biopsy. J. Am. vet. med. Ass. 172(4): 489-494.

Tenant, B., Kendrick, J.W., and Petticard, R.G. (1967). Uterine Involution and Ovarian Function in the Post-partum Cow: A retrospective Analysis of 2338 Genital Organs Examinations. Cor. Vet. 57(4): 543.

ibault, C., and Levasseur, M.C. (1974). Reproductive Life cycle. Reproduction in Farm Animals, Lea and Febiger, hiladelphia 3rd Ed. pp.82-100.

Topps, J.H. (1977). The relationship between Reproduction and Under nutrition in Beef Cattle. Wld Rev. Anim. Prodt. 13(2): 43-49.

170065

Trimberger, G.W., and Fincher, M.G. (1956). Regularity of estrus, ovarian function and conception rates in Dairy Cattle. Corn. Univ. Agr. Exp. Sta. Bull. 911. C.f. Res. Bull (1968). 270: 3-4.

Uscanga, G. (1973). Ovarian Activity in the Post-partum Dairy and Beef cows. Tenth F.A.O. Swedish International Post Graduate Veterinary Course on Animal Reproduction. Royal Vet. College, Stockholm., VI: 2-9.

Warnick, A.C. (1955). Factors associated with the Interval from Parturition to first Oestrus in Beef Cattle. J. Anim. Sci. 14: 1003-1011.

Whitemore, H.L., Tyler, W.J., and Casida, L.E. (1974). Incidence of Cystic Ovaries in Holstein-Friesian Cows. J. Am. vet. med. Ass. 165(8): 693-694.

Wiltbank, J.N., and Cook, A.C. (1958). The comparative reproductive performance of nursed cows and milked cows. J. Anim. Sci. 17: 640-646.

Yadava, R.K., Conrad, H.R., and Gilmore, L.O' (1976). Effect of Body Condition of calving on Reproductive Performance in Dairy Cow. Indian J. Dairy Sci. 29: 139-141.

Yaudan, P.G., and King, O.L. (1977). The effect of Body weight changes on Fertility during the post-partum period in Dairy Cows. Br. vet. J. 133(6): 635-641.

STUDIES ON POST-PARTUM OESTRUM IN CROSS BRED COWS

BY

S. P. SURESAN NAIR

ABSTRACT OF A THESIS

Submitted in partial fulfilment of the requirement for the degree

MASTER OF VETERINARY SCIENCE

Faculty of Veterinary and Animal Sciences
Kerala Agricultural University

Department of Animal Reproduction

COLLEGE OF VETERINARY AND ANIMAL SCIENCES
Mannuthy - Trichur.

1979

ABSTRACT

The object of the study was to find out the various reproductive parameters that influence the onset of post-partum oestrus in cross bred cows. With this object in view, a detailed investigation was undertaken in a herd of 115 cross bred cows of Jersey x Sindhi and Jersey x Local breeds belonging to the University Livestock Farm of the Kerala Agricultural University, Mannuthy during the period from February 1978 to March, 1979. After parturition, they were grouped into normal and abnormal calvers based on the normalcy of calving. All the cows were stall fed and were under identical conditions of feeding and management.

The observations made and inferences drawn are summarised below:

There were significant variations in the cessation of lochial discharge, regression of pregnancy corpus luteum, period of uterine and vulval involution, onset of first and second ovulations and the post-partum oestrus interval between normal and abnormal parturitions. Duration of lochial discharge, regression of pregnancy corpus luteum and onset of first ovulation were found to be significantly influenced by the season of calving. Parity of the cow

was found to influence the period of lochia, involutions of uterus and also the post-partum oestrus interval. Milk yield of the cow significantly influenced regression of pregnancy corpus luteum and vulval involution. However, the breed of the cow and sex and weight of calf were not found to have any significant effect on the reproductive parameters studied. An incidence of 13.4 per cent of aberrations of oestrum was also observed.