MANAGEMENT OF ANOESTRUM IN CROSSBRED CATTLE USING SYNTHETIC GONADOTROPHIN RELEASING HORMONE

By

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THESIS

submitted in partial fulfilment of the
requirement for the degree

Master of Veterinary Science

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Mannuthy, Thrissur

1996

DECLARATION

I hereby declare that this thesis entitled **"MANAGEMENT OF ANOESTRUM IN CROSSBRED CATTLE USING SYNTHETIC GONADOTROPHIN RELEASING HORMONE"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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CERTIFICATE

Certified that this thesis, entitled **"MANAGEMENT OF ANOESTRUM IN CROSSBRED CATTLE USING SYNTHETIC GONADOTROPHIN RELEASING HORMONE"** is a record of research work done independently by **Dr. R. Gunaseelan**, 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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to my
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ACKNOWLEDGEMENT

I wish to express my sincere thanks and profound gratitude to Dr. E. Madhavan, Professor, Department of Animal Reproduction, College of Veterinary and Animal Sciences, Mannuthy and Chairman of the Advisory Committee for his meticulous guidance, constant encouragement, valuable suggestion and great affection shown to me during the entire period of the academic programme. It is a matter of great pleasure and pride to get an opportunity to work under the dynamic guidance of an able and affectionate academician of his calibre.

I am deeply indebted to Dr. C.P. Neelakanta Iyer, Professor and Head, Department of Animal Reproduction for his fruitful discussions, continuous encouragement, and professional guidance.

I am very much grateful to Dr. S.P. Suresh Nair, Assistant Professor of Department of Animal Reproduction for his helpful suggestions and inspiring guidance as members of the Advisory Committee.

I owe my deep sense of gratitude to Dr. D. Sreekumar, Assistant Professor of Department of Livestock Production Management for his valuable help and whole-hearted co-operation during the course of my research, as members of the Advisory Committee.

My sincere thanks are due to Dr. K. Prabhakaran Nair, Dr. V. Sudarsanan, Dr. E. Mathai, Dr. T. Sreekumaran, Dr. K.N. Aravinda

Ghosh, Dr. V. Vijayakumar, Dr. (Mrs) Metilda Joseph, and Dr. R. Ramachandran of Department of Animal Reproduction.

I gratefully acknowledge the help rendered by Dr. K.S. Anil, Cattle breeding Farm, Thumburmuzhi. Thanks also due to Dr. (Mrs) K. Ally, and Dr. A. Kannan, University Livestock Farm, Mannuthy.

I wish to express my thanks to the Dean, Faculty of Veterinary and Animal Sciences for providing facilities for the research work.

I sincerely acknowledge the invaluable help and encouragement rendered by the officers and staff of University Livestock Farms, Mannuthy and Cattle breeding Farm, Thumburmuzhi of Kerala Agricultural University.

Help rendered by the staff of the Department of Statistics is gratefully acknowledged.

The sincere help and co-operation rendered by Dr. S. Satheshkumar and Dr. S. Ramakrishnan, my fellow students for M.V.Sc. course are gratefully acknowledged.

I have no words to express my gratitude to my beloved parents and brothers for the encouragement and blessings showered on me in fulfilling this work.

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Introduction

INTRODUCTION

Livestock plays an important role in our economy. Despite recent decline in the value of output from agriculture as percentage GDP from 46.45 to 37.00 per cent, livestock output value of GDP has increased from 8.65 to 9 per cent. India is the second largest milk producer (54.9 million tons) in the world with cattle and buffalo population of around 206 and 61 million respectively. By 2000 A.D, the milk production target of 78.0 million tons has been projected by the planning commission. This progress in milk production can be achieved by intensive crossbreeding programme. But it has been seen that an improvement in genetic make up can contribute to a limited extent and the remaining is dependent on proper reproductive management resulting in optimum fertility.

Fertility is a complex expression of the outcome of both male and female reproduction. In the female, its objective is to maximise the productivity through effective management of oestrous cycle. Bovine oestrous cycle has been subjected to extensive investigation in recent times. The increasing understanding of physiological mechanism controlling bovine oestrous cycle has led to certain procedures which have been employed in many commercial situations in many advanced countries. The oestrous activity, especially of crossbred cows is not so intense and this is an important factor

adversely affecting the fertility. Several factors like season, geographical location, age, management and nutrition also control the bovine oestrous cycle. The complexity of mechanism which control the various events of oestrous cycle is still obscure.

Delay in resumption of cyclical activity after calving has long been recognised as a cause for prolonged intercalving interval resulting in great economic loss. Frequently anoestrum due to failure of cyclical sexual activity has been manifested as a serious problem affecting herd fertility. The seriousness of this condition causing infertility in cattle has been well documented in India (Luktuke and Sharma, 1978; Chetty and Rao, 1987; Jadhav *et al.*, 1992; Kumar and Kumar, 1993). In Kerala too, the picture is not much different. Iyer *et al.* (1992) and Ramachandran (1993) gave very alarming figures on the incidence of anoestrum in crossbred cattle of various exotic inheritance.

Several factors have been attributed to this condition and among them environmental, physiological and endocrinological assume paramount importance. In short, any factor affecting the central nervous system must be considered potentially capable of causing derangement of hypothalamo-hypophyseal function which in turn would lead to ovarian dysfunction and anoestrum.

Several therapeutic measures like hormonal and chemical have been tried to combat this malady. But none of these measures have been conclusively prooved to be effective in the treatment of anoestrum. Some drug, however, is needed as a "breakthrough therapy" for anoestrum in cattle to obtain progenies of higher production from such dams for economic gain.

Considerable attention has been paid in recent times in the use of gonadotrophin releasing hormone (GnRH) in the management of anoestrum. Trials were carried out using different products of GnRH for inducing cyclical activity in anoestrous cows. Fertility studies revealed varying results with conflicting views on duration and intensity of oestrus.

The present work was, therefore, taken up with the object of studying the efficacy of "Receptal", a gonadotrophin releasing hormone analogue, in the management of anoestrum and fertility in the induced oestrus in crossbred cows and heifers.

Review of Literature

REVIEW OF LITERATURE

The term fertility denotes the desire and ability to mate, the capacity to conceive, nourish the embryo, and expel a normal calf and foetal membranes. The desire and ability to mate which depends on regular ovarian cyclicity is the most important as far as the reproductive efficiency of herd is concerned. There is consensus of opinion that the delay in ovarian cyclicity in postpartum cow results in prolonged calving interval leading to heavy economic losses. With an acceptable rate of reproductive efficiency and with current management practices, a calving interval of 12 months or less can only be achieved by shortening the interval of first insemination to an average of 50-60 days postpartum (Britt, 1974). Holman *et al.* (1984) also reported that in lactating cows a 12-13 m calving interval was considered optimal under most management systems production levels. A herd average calving interval of 12 m requires that cows conceive by 85 d postpartum, since all cows are acyclic for a variable period postpartum and with a reported average conception rate of 50 per cent. Butler and Smith (1989) observed that the oestrous cycles should be reestablished early in postpartum and that a high percentage of cows be re-inseminated at each oestrus. In the case of heifers after the onset of puberty, cyclic ovarian activity should be maintained continuously. As a rule, functional forms of infertility tend to affect individual

animal within a herd but in the aggregate, they constitute an important cause of infertility. Among the functional forms of infertility, anoestrum resulting in failure of postpartum oestrus in cows and post-pubertal oestrus in heifers is of paramount importance. According to Arthur (1975) true anoestrus is a condition in which both ovaries are small and inactive with no palpable evidence of either follicular or luteal activity with small and flaccid uterus.

2.1 Economic importance

Economic loss due to anoestrum and prolonged calving interval has been widely reviewed. Speicher and Meadows (1967) observed that extension of calving interval from 12 to 14 m due to functional forms of infertility resulted in an average reduction of 8.8 per cent in the annual financial return. It was also observed with same extension of calving interval, there was an average loss of 144 kg of milk per cow and 0.15 calves per cow. Bozworth *et al.* (1972) stated that infertility due to anoestrum in high producing herds resulted in heavy economic loss which increased with modern management practices in large herds. In the United States, it has been reported to be ranging from $ 0.25 to 4.68 per day for cows not pregnant beyond 85 d postpartum because of anoestrus (Fetrow and Blanchard, 1987).

2.2 Incidence

Authentic data on the economic loss due to non-functional ovaries in India is, however, scanty. Alarming figures of culling rate of cows on account of infertility due to anoestrum have been reported in India. Rao and Murthy (1972) reported that physiological causes of infertility was 64.71 per cent among crossbred cows. Among these, the incidence of quiescent ovaries was 72.27 per cent. Rao and Kottayya (1976) reported that among the reproductive disorders in crossbred cattle, functional causes constituted the major incidence (65.38%) out of which, quiescent ovaries alone were 34.62 per cent. Luktuke and Sharma (1978), on a survey found that the incidence of postpartum anoestrum in cows and buffaloes was 43 and 32.82 per cent respectively. They also reported that true anoestrum in heifers and buffalo heifers was 36.16 and 56 per cent respectively. Chauhan and Mehar Singh (1979) also reported an incidence of 71 per cent anoestrum in buffalo, of which pre service and post service anoestrum were 46.6 and 24.4 per cent respectively. It was also observed that true anoestrum existed to the extent of 30.8 per cent. Chetty and Rao (1987) found that out of 49.42 per cent infertile cattle, anoestrum was 55.85 and 39.37 per cent in heifers and cows respectively. Jadhav *et al*. (1992) reported that among 1854 crossbred cows, the incidence of anoestrum was 7.68 per cent. According to Kumar and Kumar (1993) the incidence of true

anoestrus was 31.3 and 25.10 per cent respectively in cows and buffaloes. Pouilly *et al.* (1994) observed that primiparous cows had a higher anoestrus risk than multiparous cows.

In Kerala too, the incidence of infertility due to anoestrum is on the increase. This is particularly relevant when about 90 per cent of crossbred cows in the state are covered by artificial insemination programme. Sudarsanan (1979) observed true anoestrum to the extent of 70 per cent in crossbred cattle. On the other hand, Mathew and Namboothiripad (1979) observed 23.07 to 41.42 per cent anoestrus in cows and 20 to 51.72 per cent in heifers, depending upon the level of exotic inheritance of Brown Swiss crossbred cattle. Ghosh (1982) observed anoestrum with underdeveloped genitalia in 50.5 per cent heifers aged 2 to 3 years, 33.9 per cent heifers aged 3 to 4 and 26.6 per cent in those above 4 years. Iyer *et al.* (1992), on a survey of 3427 animals, observed an overall incidence of 30.36 per cent anoestrum in crossbred cattle. Ramachandran (1993) reported in a similar survey consisting of 1589 animals in Calicut district, an incidence of 11.65 per cent postpartum anoestrum in cows and 27.79 per cent in heifers.

2.3 Etiology

Etiological factors of anoestrum are multifold and in many cases the exact cause has not been well elucidated. Any factor affecting the central nervous system must be considered potentially capable of causing derangement of hypothalamo- hypophyseal function which inturn would lead to ovarian dysfunction and subsequent anoestrus (Jainudeen, 1978).

2.3.1 Nutritional

According to Lamond (1970), malnutrition or undernutrition could be one of the most important causes for anoestrum by reducing the secretion of pituitary gonadotrophin. Low energy ration could depress the ovarian function resulting in anoestrum (Boyd, 1970; King, 1971). Roberts (1971) found that deficiency of protein and carbohydrate might cause delayed onset of puberty in heifers and postpartum anoestrum in cows. Sane (1972) found that low serum glucose level could definitely affect sexual cycles in cows and opined that hypoglycemia could depress the hypothalamus which could reduce the gonadotrophin release from the pituitary. Jainudeen (1978) postulated that diets which were qualitatively complete but quantitatively deficient and vice-versa, if fed for a long time, could cause

anoestrum probably by depressing the hypothalamo-hypophyseal function. In milder forms, eventhough, gonadotrophins were synthesised uninterrupted, they were not released in sufficient quantities to induce ovarian activity. Samad *et al.* (1980) observed non-functional ovaries in cows due to wide calcium-phosphorus ratio in the feed. Similarly, deficiency of copper, iron and other trace elements have also been reported to cause anoestrum in cows and heifers. Butler *et al.* (1981) opined that in cattle energy balance during the first 20 days of lactation is important in determining the onset of postpartum ovarian activity. Prasad *et al.* (1984) reported that the mean calcium value (10.18 mg%) on the day of heat, was significantly higher than the value 9.97 mg per cent when the animals were in anoestrus. Arthur *et al.* (1989) reported that anoestrum could be due to inherited factors; nutritional deficiencies or excesses; social influences which arise from modern husbandry practices like the grouping of large number of cows, thus interfering with the establishment of a stable social hierarchy and the stress of production. Lucy *et al.* (1992) found that follicular dynamics are altered by negative energy balance and lactation that might be related to inefficient reproductive performance of cows producing high yield of milk. Sahu *et al.* (1995) reported that significantly low serum protein bound Iodine level in delayed mature heifers and suggested it as a contributory factor in delaying the onset of maturity.

2.3.2 Endocrinological

Boyd (1977) reported that failure of follicular growth through lack of endocrine stimulus can result in anoestrus. Lamming (1978) suggested that progesterone feedback in the hypothalamo-hypophysial axis plays an important part in the initiation of oestrus and luteal activity. Holness and Hale (1980) reported that long postpartum anoestrus period in Africander cows is associated with suppression of oestrus rather than a lack of luteal activity. According to Kaikini (1992) anoestrum might be due to insufficient release or production of gonadotrophins to cause folliculogenesis, or its failure of ovarian response. Pouilly *et al.* (1994) observed that postpartum anoestrus was higher in dark than light accommodated cows. AminuDeen (1995) found that insufficient asynchronous release or absence of preovulatory endocrine surge of gonadotrophines might produce a variety of functional reproductive disorders leading to infertility in cows and buffaloes. McDougall *et al.* (1995) opined that hypothalamic release of gonadotrophin releasing hormone rather than pituitary or ovarian insufficiency appeared to be a factor limiting resumption of cyclic activity in primiparous cows.

2.3.3 Suckling

The effect of high milk yield on ovarian rebound is debatable. Oxenreider and Wagner (1971) demonstrated that

high milk yield affects ovarian activity while others suggested that it is not a direct effect but result of a concomitant loss of body weight and nutritional deficiency. Karg and Schams (1974) observed that, the act of suckling stimulates prolactin secretion which might be responsible for the extension of the period of anoestrus. Prolactin might reduce ovarian sensitivity to normal levels of plasma LH or the prolactin inhibitory factor secretion might be insufficient to lift the factor, which suppresses gonadotrophin production (Hafez, 1975).

Liptrap and McNally (1976) reported that adrenal cortex played an important role in influencing the onset of postpartum oestrus which was confirmed by DaRosa and Wagner (1981). Echternkamp (1978) reported that lactation suppressed gonadotrophin secretion in early postpartum cows. He also observed that non-suckled heifers had an increased incidence of spontaneous LH release and increased minimal LH concentration at 30 days postpartum when compared to the nursed groups. Arthur *et al.* (1989) reported that the anterior pituitary appeared to be refractory to stimulation with gonadotrophin releasing hormone in the early postpartum period which was probably due to duration of progesterone-induced negative feedback during pregnancy. Roche *et al.* (1992) reported that both suckling and low level of nutrition were implicated in prolonged suppression of LH pulses in the

absence of progesterone and stated that failure of ovulation of dominant follicle was associated with infrequent LH pulses in the early postpartum period.

2.4 Management of anoestrum

Perusal of literature revealed that various drugs have been tried to combat the problem of anoestrum with varying results. Treatment based on haematological studies and providing deficient constituents in the feed or by additional supplementation has been widely reviewed (King, 1971; Hunter, 1977; Pillai, 1980; Samad *et al.*, 1980; Das, 1993). Management of oestrus must be economical and feasible to practice and should have a high response rate to treatments initiated at any stage. It should have a tight synchrony in time of oestrus and time of ovulation, normal fertility and a normal return to estrus and fertility at repeated services.

2.4.1 Management using exogenous hormones

Several reviews provide information related to management of anoestrum in cattle using exogenous hormones. But the success of hormonal therapy lies in accurate identification of the nature of imbalance and use of appropriate hormonal preparation in a judicious dose schedule. Releasing hormones such as gonadotrophin releasing hormones (GnRH), due to their smaller molecular size and poor antigenicity, do not possess

the property of antibody formation. Schally (1979) demonstrated that synthetic GnRH could release enough gonadotrophins for follicular maturation and ovulation in women with anovulation, resulting from idiopathic hypothalamic dysfunction. Reeves *et al.* (1972) were the first to report that GnRH caused release of LH and FSH in sheep. Subsequently, similar results were reported in mares (Evans and Irvine, 1976) and in cows (Kattenbach *et al.*, 1974). Since then, several trials were carried out in animals to induce follicular maturation and oestrus by using synthetic GnRH. Zolday and Szenci (1975) reported 84.4 per cent induction of oestrus in cows with 45.6 per cent conception rate by administering 5 ml of 'Lutal', a synthetic GnRH. Cummins *et al.* (1975) found that postpartum treatment of cow with GnRH is capable of giving a LH release similar in magnitude to that found at normal oestrus. Lamming and Bulman (1976) also observed that treatment of anoestrous cows with GnRH initiated oestrous cycle with normal levels of fertility. Humke and Zuber (1977) used new LHRH analogue 'Hoe 766' to treat acyclic cows and found that 105 out of 156 cows treated, exhibited oestrus and 93.7 per cent conceived. Zaied *et al.* (1980) pointed out that GnRH treatment as early as 12-14 days postpartum, could initiate cyclic ovarian activity and thus could be useful in reducing abnormal ovarian activity. However, they pointed out that an elevated preinjection concentration of oestradiol-17 B and follicular growth were

important for GnRH induced ovulation. Nash *et al.* (1980) opined that in well managed herds, injection of 250 ug of GnRH to lactating dairy cows two weeks after calving might increase fertility. Kodagali *et al.* (1981) found that in 20 anoestrous cows under LHRH treatment, subcutaneously, estrus could be induced in 85 per cent with 75 per cent conception rate. Riley *et al.* (1981), however, reported that administration of repeated small doses of GnRH (5 mg every 2 hour, for 48 hour) resulted in pulsatile pattern of LH release and better ovulation rate in anoestrous animals. Gupta and Dhoble (1983) found that administration of GnRH in anoestrous cows, resulted in ovarian function in 5 out of 6 animals with evidence of follicular development and ovulation. However, among these, the onset of oestrus was observed by day 14 in two animals after the first dose while in three animals after 62 days of second dose. Troxel and Kesler (1984) obtained a better response of induction of oestrum (83%) when cows were treated with GnRH. In buffaloes, Rao and Rao (1984) observed 71.25 per cent response by administration of GnRH with an average time interval of 13.28 $\pm$ 18.3 days. According to Benmrad and Stevenson (1984), GnRH administration in postpartum cows increased the frequency of observed oestrum by six weeks, and shortened the intervals to first ovulation and first observed oestrus. Dhoble and Gupta (1986) observed that the response of GnRH could be expected to peak by 11th day after the administration and remarked that a second dose

might be tried for a more favourable response. Pattabiraman *et al.* (1986) recorded that, when anoestrous buffaloes were subjected to GnRH treatment, 80 per cent buffalo cows and 60 per cent heifers responded at an average of 17.3 and 18 days respectively. Hideokamomae *et al.* (1988) reported that in heifers with quiescent ovaries, LHRH analogue could be successfully used to induce oestrus. Mujumdar (1989) by using "Receptal" 5 ml, intramuscularly found that 50 per cent of animals responded within 8-14 days. He also observed that conception rate could be increased by administration of the same drug 2.5 ml at the time of artificial insemination. In a detailed study, Rao (1991) found that administration of GnRH resulted in surge release of both FSH and LH from anterior pituitary causing significant elevation in serum concentrations. Rao (1991) also stated that GnRH analogue can be effectively recommended as a therapeutic measure for induction of oestrus in anoestrous cows and found that in these animals, estrus was induced in 2-3 d, 10-14 d and 17-20 d in 25 per cent, 58.4 per cent and 16.6 per cent respectively. Thakur *et al.* (1993) reported that intrauterine administration of "Receptal" at a rate of 2.5 ml to anoestrous buffaloes, was effective with induction of oestrus with an interval of 33.33 $\pm$ 2.11 days with 75 per cent fertility rate. Bishop and Wetteman (1993) could induce oestrus by pulsatile infusion of GnRH every hour. But, Grosselli *et al.* (1993) found that continuous infusion of GnRH seemed to be

more effective in stimulating long lasting pituitary response in prepubertal heifers in promoting ovarian activity although, this was not found to be effective in inducing ovulation. On a study of the blood levels of LH and FSH, Jana and Sobczak (1994) observed that by administration of 200 ug of GnRH, levels of LH and FSH increased in 15 minutes after administeration, reaching peak values after 24 hours, which returned to physiological level after 6 to 7 hours. Sonwane *et al.* (1995) observed, oestrus within 8 to 20 days in 87.5 per cent of the animals by administration of "Receptal" intramuscularly in anoestrous cows. They also obtained a conception rate of 85.71 per cent, and further remarked that the drug could be used by vulval submucosa route effectively with induction of oestrus within 10 to 21 days. Kudlac *et al.* (1995) also recommended the use of GnRH analogue for treatment of anoestrum with oestrus response within 10 days. AminuDeen *et al.* (1996) observed that continuous infusion of GnRH to pubertal crossbred heifers resulted in a rise in peripheral progesterone level in 33.3 per cent of animals and continuous follicular activity in the remaining 16.6 per cent animals with an overall response of 50 per cent in treated animals.

Perusal of literature also revealed conflicting reports on the efficacy of administration of GnRH in the induction of oestrus and fertility. Holeness and Hale (1980) observed that

GnRH injection at 30 days after calving was not successful in inducing oestrus. Khurana *et al.* (1982) reported that GnRH treatment neither induced oestrus nor was successful in reestablishing cyclic behavior of anoestrous buffalo cows and heifers. Madhavan and Raja (1983) observed that 75 per cent of the animals exhibited oestrus within 42 hours of injection of "Receptal" but with poor expression of oestrus. The percentage of ovulation and fertility was also reported to be poor. They observed that the oestrus following the treatment however, was intense. According to Ball and Lamming (1983) failure of induction of oestrus by administration of GnRH was partly due to poor ovarian response to injection and partly to failure in oestrus detection.

Singh *et al.* (1984) on the other hand, observed that single injection of GnRH was not effective in the treatment of anoestrus in buffaloes, and found that fertility was better when treatment was combined with GnRH and PRID than GnRH alone. Troxel and Kesler (1984) also confirmed that the combination of progestin and GnRH is more effective than GnRH alone in the treatment of postpartum anoestrum. Similarly Rao and Rao (1984) found that in buffaloes, 50 per cent responded by exhibition of oestrus within 31.07 $\pm$ 2.84 d after administration of a combination of progesterone, stilbersterol and GnRH. Etherington *et al.* (1984) however reported that GnRH treatment at day 15 postpartum was generally detrimental

whereas cloprostenol treatment at day 24 postpartum after GnRH was beneficial to improve reproductive performance. Okuda *et al.* (1988) remarked that combined treatment with GnRH and PGF_2 alpha might enhance ovarian activity in postpartum cows, resulting in improved reproductive performances. On the contrary, Stevenson and Call (1988) found that early postpartum treatment with either hormone (GnRH or PGF_2 alpha) failed to improve reproductive performances of dairy cows. But Rao (1990) observed that a priming dose of oestradiol 6 hours prior to GnRH in anoestrous cows had potentiating effect on pituitary with GnRH eliciting a greater LH release. Similarly Shams *et al.* (1991) remarked that "Receptal" treatment pretreated with "Tonophosphan" was best therapy, followed by "Receptal" primed with estradiol and "Receptal" alone for treatment of anoestrus with smooth ovaries. However, Rao (1991) observed that, although all GnRH treated cows responded with ovulation, a greater proportion of cows given oestradiol prior to GnRH responded with normal luteal function, subsequent to ovulation. Humblot and Saumande (1994) suggested that, for inducing ovulation in anoestrous females, GnRH and its analogues were less efficient than progesterone PMSG combination.

2.4.1.1 Early postpartum period

Reports on the effect of treatment with GnRH specifically during early postpartum period are varied. Cummins *et al.* (1975), opined that treatment of cows with GnRH was capable of giving an LH release similar in magnitude to that found at normal oestrus. According to Britt *et al.* (1977) there was a reduction in infertility and reproductive disorders after treatment with GnRH in early postpartum as a prophylactic measures. But Webb *et al.* (1977) found that LH release in response to GnRH was abrupt and biphasic and failed to induce normal ovarian activity in animals with reproductive disorders. According Fernandes *et al.* (1978) LH release in response to GnRH treatment was not restored fully until after 10 days postpartum. Leslie *et al.* (1984) opined that administration of GnRH in cows with retained placenta produced improvements in certain parameters of reproductive performance, provided early postpartum breeding was practiced. This was confirmed by Chen *et al.* (1986) and Wildeus *et al.* (1987). Contrary to this Peter *et al.* (1988) reported that intrauterine infections delayed postpartum follicular development and GnRH treatment in such cows was detrimental to resumption of ovarian activity. According to Roche *et al.* (1992) GnRH administration in early postpartum period, could ovulate the first dominant follicle but there was a high incidence of short silent cycles. Crowe *et al.* (1993) also

observed that single injection of GnRH analogue during the growing plateu or declining phase of the first postpartum dominant follicle of suckler cows, induced ovulation but did not alter the proportion of cows with short cycles. However, Heuwieser *et al.* (1994) stated that the efficacy of GnRH in early postpartum might not be consistent in all parities and body condition groups. They found decreased conception rate in cows with first lactation but beneficial for cows of second and higher lactation groups. Palta and Madan (1995) however, suggested that pituitary responsiveness to GnRH did not appear to be a limiting factor for resumption of oestrous cycle in early postpartum period.

Material and Methods

MATERIAL AND METHODS

The material for the study consisted of 40 crossbred cows and heifers belonging to University Livestock Farm, Mannuthy and Cattle Breeding Farm, Thumburmuzhi of Kerala Agricultural University. The study was conducted during the period from June 1995 to July 1996. The breeding history of all the animals were collected. Crossbred cows which failed to exhibit oestrus even after 60 days postpartum and heifers which did not exhibit oestrus even after 24 m of age, were identified as anoestrus. All the animals were apparently healthy and maintained under identical conditions of feeding and management. All the cows and heifers identified as anoestrus were subjected to detailed clinico-gynaecological examination at ten days interval and those having smooth inactive ovaries without any cyclical activity were declared as anoestrus and allotted randomly into the following treatment groups.

Group I

Ten crossbred heifers identified as anoestrus were administered synthetic gonadotrophin releasing hormone analogue *(Receptal 5 ml) intramuscularly and observed for oestrus signs.

Group II

Ten crossbred cows were administered synthetic gonadotrophin releasing hormone analogue (Receptal 5 ml) intramuscularly and observed for ovarian response and oestrus signs.

Group III

Ten crossbred heifers and ten crossbred cows declared anoestrus were watched for natural oestrus.

After commencement of the treatment, both experimental and control animals in all the three groups were kept under close observation for manifestation of heat symptoms. Detection of oestrus was also done by using a teaser bull. A positive response to treatment was assessed by induction of visible heat with behavioral signs and presence of graafian follicles in the ovary. All the animals in all the groups showing oestrus were inseminated with good quality frozen semen. Those animals which failed to settle with first insemination were reinseminated on subsequent oestrus. Pregnancy diagnosis was done by rectal examination 45-60 days after insemination.

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* Receptal (Inj.) 10 ml (Hoechst)

Each ml contains Buserelin acetate 0.004 2 mg equivalent to 0.004 mg Buserelin, 10 mg benzyl alcohol.

The following observation were made.

3.1 Oestrus response

The number and percentage of the animals which responded to the treatment by exhibition of oestrus sign was recorded.

3.2 Time taken from the administration of "Receptal" to the onset of oestrus

Each animal after administration of "Receptal" was closely observed physically by behavioural signs and by using a teaser bull daily and those found in oestrus were confirmed by rectal examination of the genital tract. The interval from the treatment to the onset of the oestrus was recorded as the time taken for induction of oestrus.

3.3 Duration of oestrus

Each animal in oestrus in all the groups was closely watched at an interval of 6 hours till the symptoms of oestrus subsided. The period from the beginning to the end of clinical and behavioural signs was considered as duration of oestrus.

3.4 Intensity of oestrus

The intensity of oestrus was graded as high, medium and low from the clinical and behavioral manifestation (Sharma *et al.*, 1968).

3.5 Artificial insemination

All the animals in the experimental and control group which exhibited oestrus were inseminated twice at 24 hour interval using thawed frozen semen.

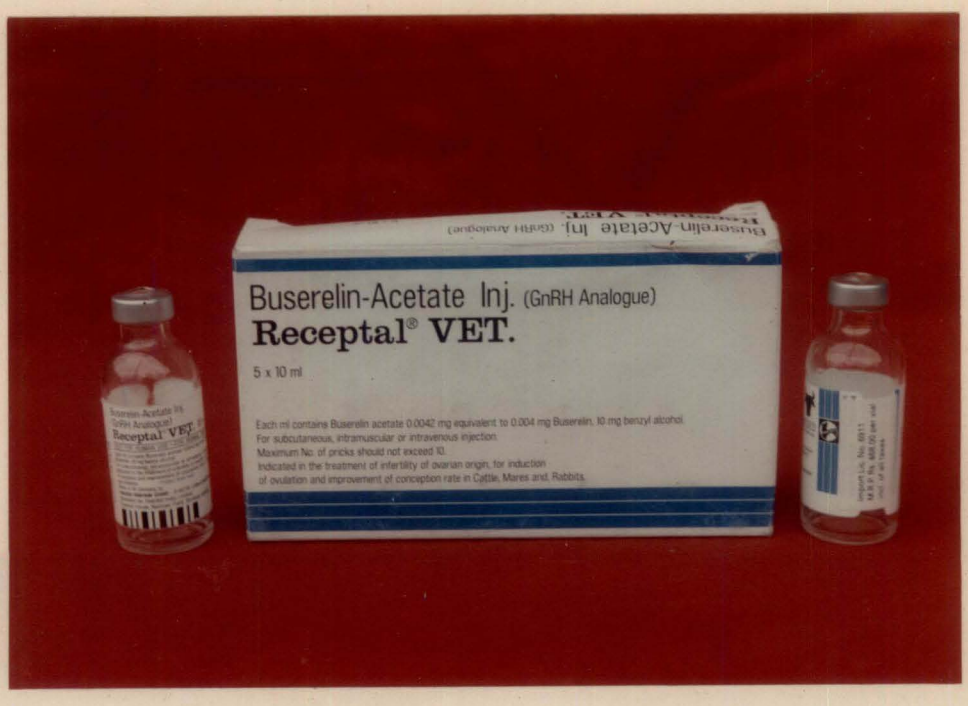
3.6 Number of inseminations per conception

All animals which failed to conceive in the induced oestrus were inseminated on subsequent oestrus. The number of inseminations required for conception was calculated in each group.

3.7 Conception rate

Conception rate and overall conception rate in each group was calculated.

"Receptal" (Inj) 10 ml (Hoechst)


Buserelin-Acetate Inj. (GnRH Analogue)
Receptal® VET.
5 x 10 ml
Each ml contains Buserelin acetate 0.0042 mg equivalent to 0.004 mg Buserelin, 10 mg benzyl alcohol.
For subcutaneous, intramuscular or intravenous injection.
Maximum No. of pricks should not exceed 10.
Indicated in the treatment of infertility of ovarian origin, for induction
of ovulation and improvement of conception rate in Cattle, Mares and, Rabbits.

Results

RESULTS

Results of the investigation on the management of anoestrum in crossbred cattle using "Receptal" are presented in Table 1 to 14 and Figures 1 to 7.

4.1 Oestrus response after administration of Receptal

Oestrus response after administration of "Receptal" is presented in Table 1 and Figure 1. In group I, out of 10 heifers, treated with "Receptal", eight evinced oestrus (80%). In group II, out of 10 cows treated with "Receptal", seven responded to treatment (70%). In the control group, out of 10 heifers, only two evinced oestrus (20%); in cows only one evinced oestrus (10%) during the period of study. Statistical analysis of data revealed this variation as highly significant ($P<0.01$). It was further noticed that oestrus response between cows and heifers in the experimental group was not significantly different.

Data furnished in Table 2 revealed that parity of cows did influence the oestrus response ($P<0.05$). It could be seen that among cows calved once, only 50 per cent responded to treatment, while all those which have calved more than once, evinced oestrus by administration of "Receptal".

4.2 Time taken for induction of oestrus

Time taken for induction of oestrus in animals belonging to group I and II is presented in Table 3 and Figure 2. It could be seen that among heifers, time taken for induction of oestrus ranged from 4 to 9 d with a mean of 8.00 d. Similarly in cows which responded to treatment, the mean time taken for induction of oestrus was 11.57 days and ranged between 8 to 15 d. Statistical analysis revealed that the time taken for induction of oestrus between cows and heifers are significantly different ($P<0.05$). When the data on time taken for induction of oestrus in cows and heifers were pooled together, it was found that, it ranged from 4 to 15 d with a mean of 9.60 d.

Parity of cows did not alter the time taken for induction of oestrus (Table 4). Time time taken for induction of oestrus ranged from 8 to 12 d (mean 9.66 d) and 10 to 15 d (mean 12.50 d), when the cows were grouped according to I parity and II and above respectively. Cows belonging to I parity, however, took lesser time for induction of oestrus.

4.3 Duration of oestrus

The duration of oestrus is presented in Table 5 and Figure 3. Duration of oestrus in heifers and cows ranged from

18 to 72 h (mean 25.25 h) and 32 to 48 h (mean 43.42 h) respectively, while the corresponding values being 18 to 22 h (mean 20 h) and 30 h in control group. The overall duration of oestrus in heifers and cows however, was 33.73 h and 23.33 h respectively in experimental and control groups. Significant difference in the duration of oestrus was observed between Group I and II ($P<0.05$). However, the duration of oestrus between control and experimental animals could not be compared statistically because the number of animals, which evinced oestrus in the control group was insufficient. However, it appeared that duration of oestrus was higher in the experimental animals than that of control.

Data presented in Table 6 revealed effect of parity on the duration of induced oestrus; the value being 42.66 h and 44 h respectively in the cows of parity I and II and above.

4.4 Intensity of oestrus

Intensity of oestrus among experimental and control animals is presented in Table 7 and Figure 4. In group I, 75 and 25 per cent of the heifers showed high and medium intensity of oestrus respectively. The corresponding figures in group II were 14.28 and 71.42 per cent, while only one animal (14.28%) showed low intensity of oestrus. In the control group, all animals showed only medium intensity of

oestrus. Analysis of data revealed that high intensity of oestrus was more in heifers than that in cows. Similarly medium intensity of oestrus was more in cows than in heifers. It is, therefore, evident that higher intensity of oestrus was noticed in significantly higher number of heifers than cows. However, the intensity of oestrus between control and experimental animals could not be compared statistically because of want of sufficient number of animals showing oestrus in the control group. But it may be noted that in the control group, none of the animals showed high intensity of oestrus. From this it could be inferred that therapeutic induction of oestrus with "Receptal" resulted in better expression of oestrus.

Effect of parity on intensity of oestrus is presented in Table 8. Among experimental cows of I parity, all the animals showed medium intensity of oestrus while those with II and above parity showed high and medium intensity of oestrus to the extent of 25 and 75 per cent respectively.

The rate of ovulation of experimental animals is furnished in Table 9. Among 8 heifers which responded to treatment, 7 ovulated (87.5%), while among 7 cows, 6 (85.71%) ovulated. Analysis of data did not reveal any significant difference between cows and heifers in ovulation rate at induced oestrus.

4.5 Conception rate

Conception rates in the experimental and control group are presented in Table 10 and Fig.5. In group I, the first insemination conception rate and overall conception rate were 25 and 75 per cent respectively as against 57.14 and 71.42 per cent in group II. The corresponding figures in group III (control) were 0 and 50 per cent in heifers, while none of the cows in the control group conceived. However, the variation in the conception rate between group I and II was not statistically significant. It could be seen that the percentage of conception in the first insemination and overall conception rate in the experimental animals was higher than that in the control groups, although, statistical analysis could not be done due to want of sufficient data in control animals. The number of inseminations required for conception was 2.16 in group I and 1.20 in group II, with an overall value of 1.72. In the control animals, the number of inseminations required for conception (2.00) was slightly higher than that of experimental group (1.72).

Effect of parity on conception rate in experimental animal is furnished in Table 11. The first insemination conception and overall conception rates in animals with first parity was 33.33 per cent, while the corresponding values for II parity and above was 75 and 100 per cent. Analysis of data

revealed no significant difference in the first insemination conception between parity but the overall conception rate was significantly higher in cows with parity II and above than those belonging to I parity.

Time taken for induction of oestrus in animals which conceived or not at induced oestrus is shown in Table 12 and Figure 6. The mean time taken for induction of oestrus in group I is higher (9 d) than those not conceived (7.66 d). Similarly, in group II, the time taken for induction of oestrus in the animals conceived was 11 d compared to 11.66 d in those which did not conceive. The overall time taken for induction of oestrus in those conceived was slightly higher (10.33 d) than those not conceived (9 d).

Duration of oestrus in animals conceived or not at induced oestrus is presented in Table 13 and Figure 7. It could be seen that the mean duration of oestrus in heifers conceived and not were 19 h and 27.33 h respectively, while the values in cows were 40 h and 48 h respectively. The overall values for those conceived was slightly lesser (33 h) than those not conceived (34.22 h).

Similarly intensity of oestrus in experimental animals conceived is furnished in Table 14. It may be noted that

among experimental animals, all the heifers which had conceived had high intensity of oestrus. Among cows, 25 per cent of the animals had high intensity of oestrus while 75 per cent had medium intensity of oestrus.

Tables

Table 1. Oestrus response after administration of Receptal

	Experimental		Control	
	Group I	Group II	Group III	
	Heifers	Cows	Heifers	Cows
Number of animals treated	10	10	10	10
Number of animals evinced oestrus	8	7	2	1
Percentage	80	70	20	10

Inferences: Oestrus response in heifers and cows between experimental and control groups was significantly different ($P<0.01$). Oestrus response between heifers and cows in the experimental animal was not significant.

Table 2. Effect of parity of cows on oestrus response

	Parity	
	I	II and above
Number of animals treated	6	4
Number of animals evinced oestrus	3	4
Percentage	50	100

Inference: Oestrus response between parity I and II and above was significantly different ($P<0.01$).

Table 3. Time taken for induction of oestrus

Groups		Number of animals	Time taken for induction of oestrus (Days)	
			Range	Mean
Group I	Heifers	8	4-9	8.00
Group II	Cows	7	8-15	11.57
Overall		15	4-15	9.60

Inference: Time taken for induction of oestrus between heifers and cows was significantly different ($P<0.05$).

Table 4. Effect of parity on time taken for induction of oestrus

Parity	Number of animals	Time taken for induction of oestrus (Days)	
		Range	Mean
I	3	8-12	9.66
II and above	4	10-15	12.50

Inference: Parity cow did not alter the time taken for induction of oestrus

Table 5. Duration of oestrus

Groups		Number of animals	Duration of oestrus (Days)	
			Range	Mean
Experimental				
Group I	Heifers	8	18-72	25.25
Group II	Cows	7	32-48	43.42
Overall		15	18-72	33.73
Control				
Group III	Heifers	2	18-22	20.00
	Cows	1	30	30.00
Overall		3	18-30	23.33

Inference: Duration of oestrus between heifers and cows in experimental group was significantly different ($P<0.05$).

Table 6. Effect of parity on duration of oestrus

Parity	Number of animals	Duration of oestrus (Days)	
		Range	Mean
I	3	32-48	42.66
II and above	4	32-48	44.00

Table 7. Intensity of oestrus

Groups		Number of animals	Intensity of oestrus					
			High		Medium		Low	
			No.	%	No.	%	No.	%
Experimental								
Group I	Heifers	8	6	75.00	2	25.00	-	-
Group II	Cows	7	1	14.28	5	71.42	1	14.28
Overall		15	7	46.66	7	46.66	1	6.66
Control								
Group III	Heifers	2	-	-	2	100	-	-
	Cows	1	-	-	1	100	-	-
Overall		3	-	-	3	100	-	-

Inference: High intensity of oestrus between heifers and cows in experimental group was highly significantly different ($P<0.01$). Medium intensity of oestrus between heifers and cows in experimental group was significantly different ($P<0.05$)

Table 8. Effect of parity on intensity of induced oestrus

Parity	Number of animals	Intensity of oestrus					
		High		Medium		Low	
		No.	%	No.	%	No.	%
I	3	-	-	3	100	-	-
II and above	4	1	25	3	75	-	-

Table 9. Ovulation rate at induced oestrus

	Heifers	Cows
Number of animals	8	7
Number ovulated	7	6
Percentage	87.5	85.71

Inference: Ovulation rate between heifers and cows was not significantly different

Table 10. Conception rate and number of inseminations per conception

Groups	Experimental						Control					
	Number of animals	First insemination conception		Overall conception		Average number of inseminations per conception	Number of animals	First insemination conception		Overall conception		Average number of inseminations per conception
		No.	%	No.	%			No.	%	No.	%	
Heifer	8	2	25.00	6	75.00	2.16	2	-	-	1	50.00	2
Cow	7	4	57.14	5	71.42	1.20	1	-	-	-	-	-
Overall	15	6	40.00	11	73.33	1.72	3	-	-	1	33.33	2

Inference: First insemination conception rate between heifers and cows in experimental group was not significantly different.

Overall conception rate between heifer and cows in experimental group was not significantly different.

Table 11. Effect of parity on conception rates

Parity	Number of animals	First insemination conception		Overall conception	
		No.	%	No.	%
I	3	1	33.33	1	33.33
II and above	4	3	75.00	4	100.00

Inference: First insemination conception rate between Parity I and II and above, was not significantly different. Overall conception rate between Parity I and II and above, was significantly different ($P<0.05$)

Table 12. Time taken for induction of oestrus in animals conceived/not conceived at induced oestrus

Groups	Number of animals	Time taken for induction of oestrus (Days)	
		Range	Mean
Group I Heifer			
Conceived	2	9	9.00
Not conceived	6	4-9	7.66
Group II Cow			
Conceived	4	9-15	11.00
Not conceived	3	8-15	11.66
Overall			
Conceived	6	9-15	10.33
Not conceived	9	4-15	9.00

Table 13. Duration of oestrus in animals conceived/not conceived at induced oestrus

Groups	Number of animals	Duration of oestrus (hours)	
		Range	Mean
Group I Heifer			
Conceived	2	18-20	19.00
Not conceived	6	18-72	27.33
Group II Cow			
Conceived	4	32-48	40.00
Not conceived	3	48-00	48.00
Overall			
Conceived	6	18-48	33.00
Not conceived	9	18-72	34.22

Table 14. Intensity of oestrus in animals conceived at induced oestrus

Groups	Number of animals	Intensity of oestrus					
		High		Medium		Low	
		No.	%	No.	%	No.	%
Group I Heifer	2	2	100	-	-	-	-
Group II Cow	4	1	25	3	75	-	-
Overall	6	3	50	3	50	-	-

Plates

Fig.1 OESTRUS RESPONSE AFTER ADMINISTRATION OF RECEPTAL

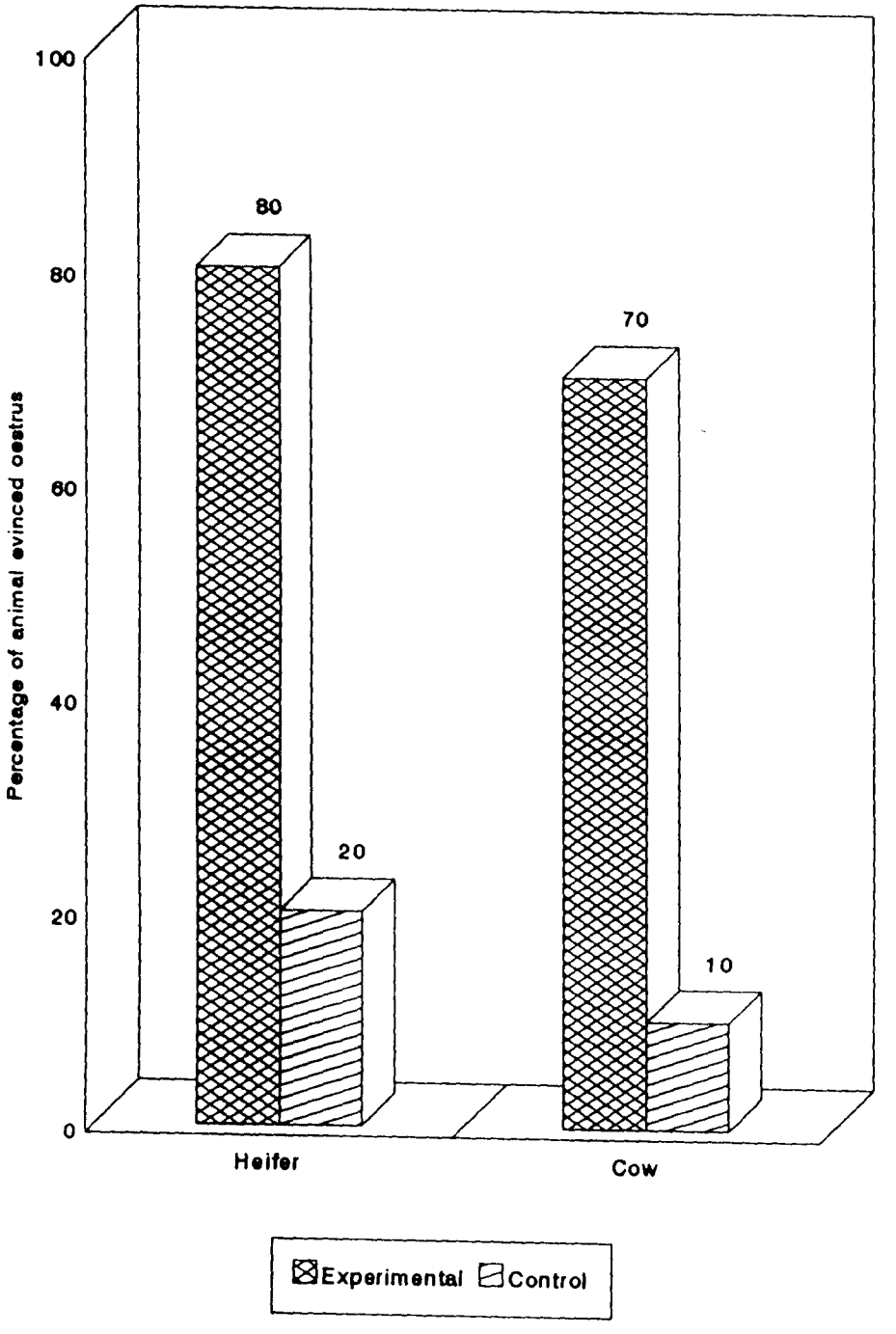


Fig.2 TIME TAKEN FOR INDUCTION OF OESTRUS

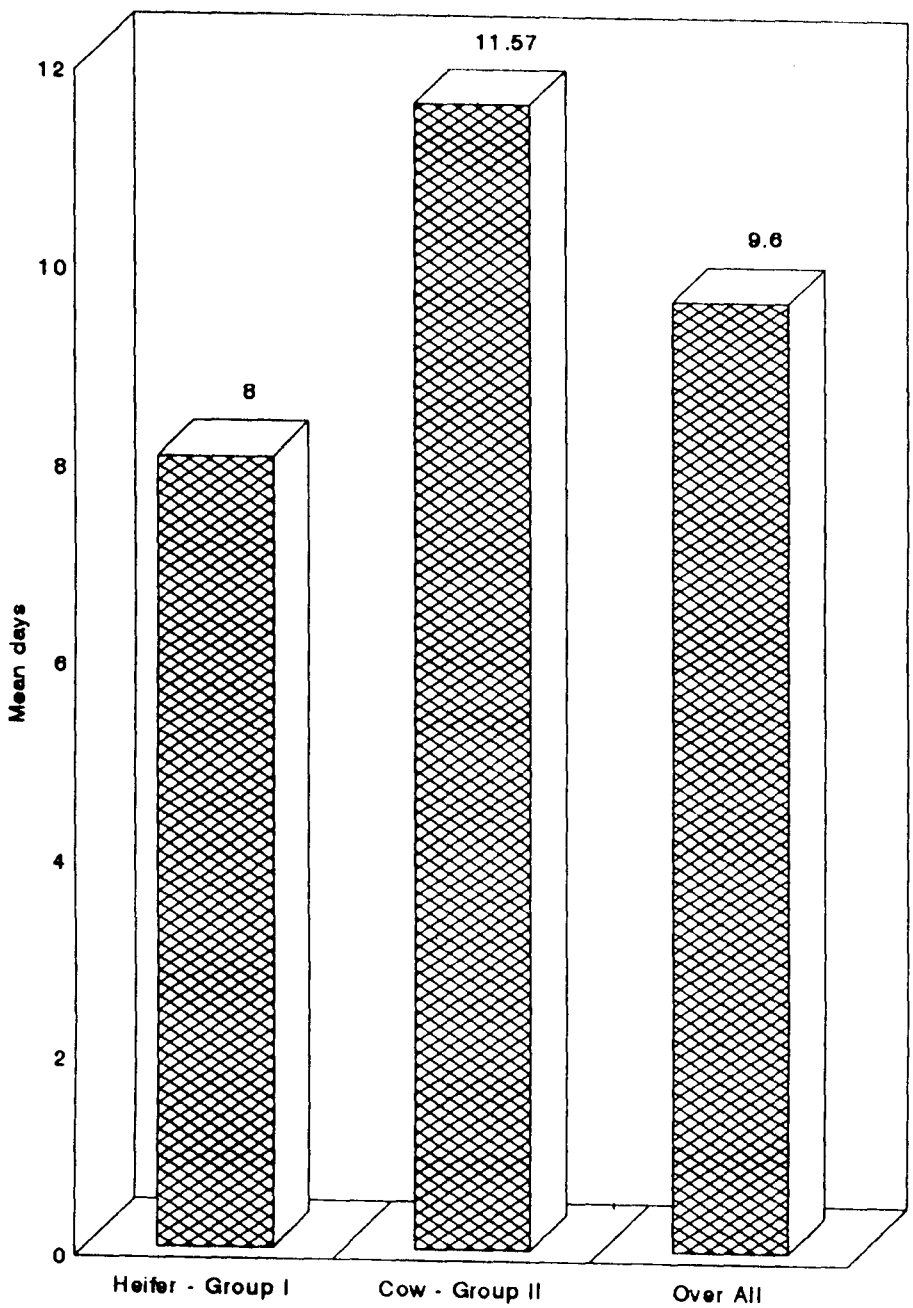


Fig.3 DURATION OF OESTRUS

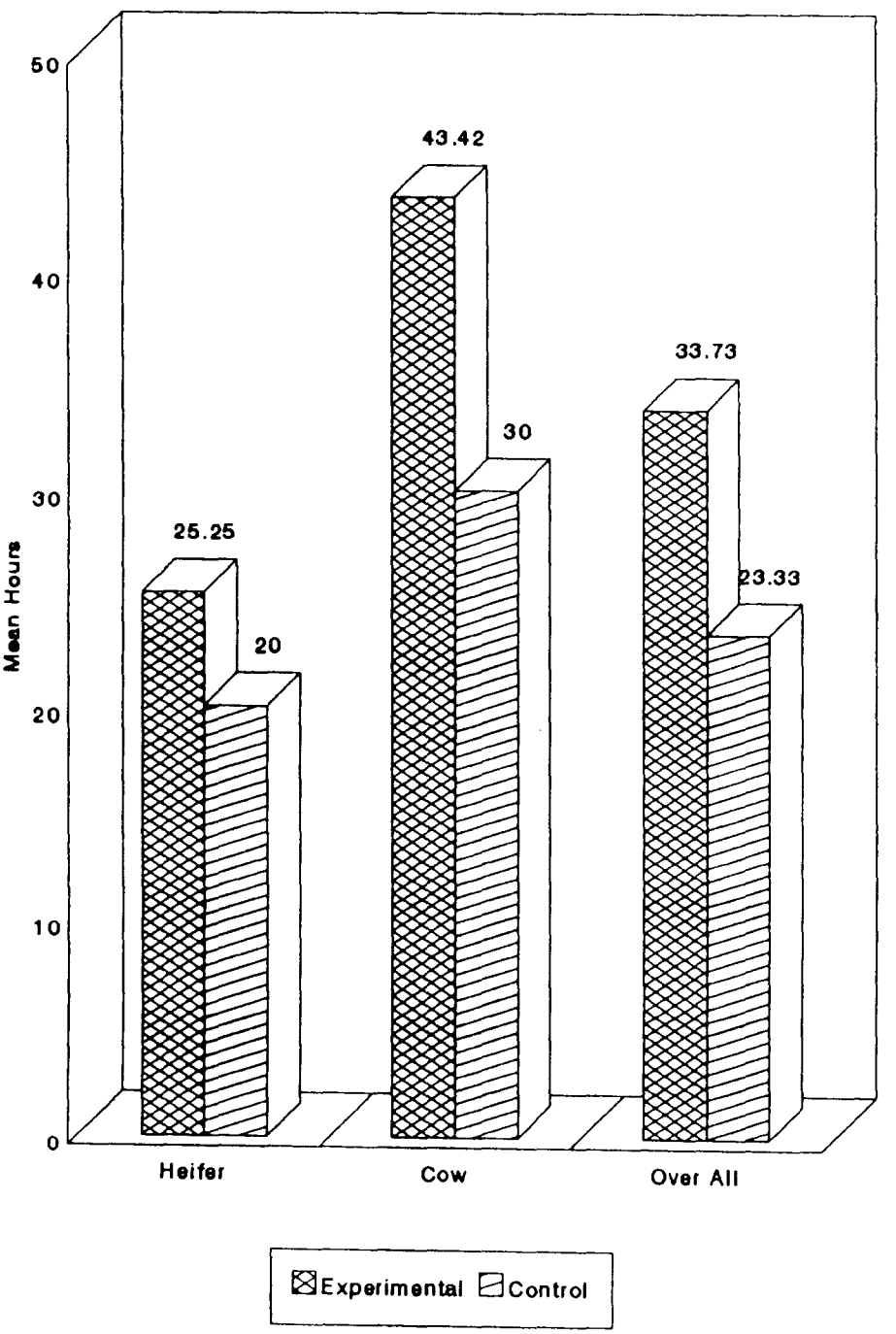


Fig.4 INTENSITY OF OESTRUS

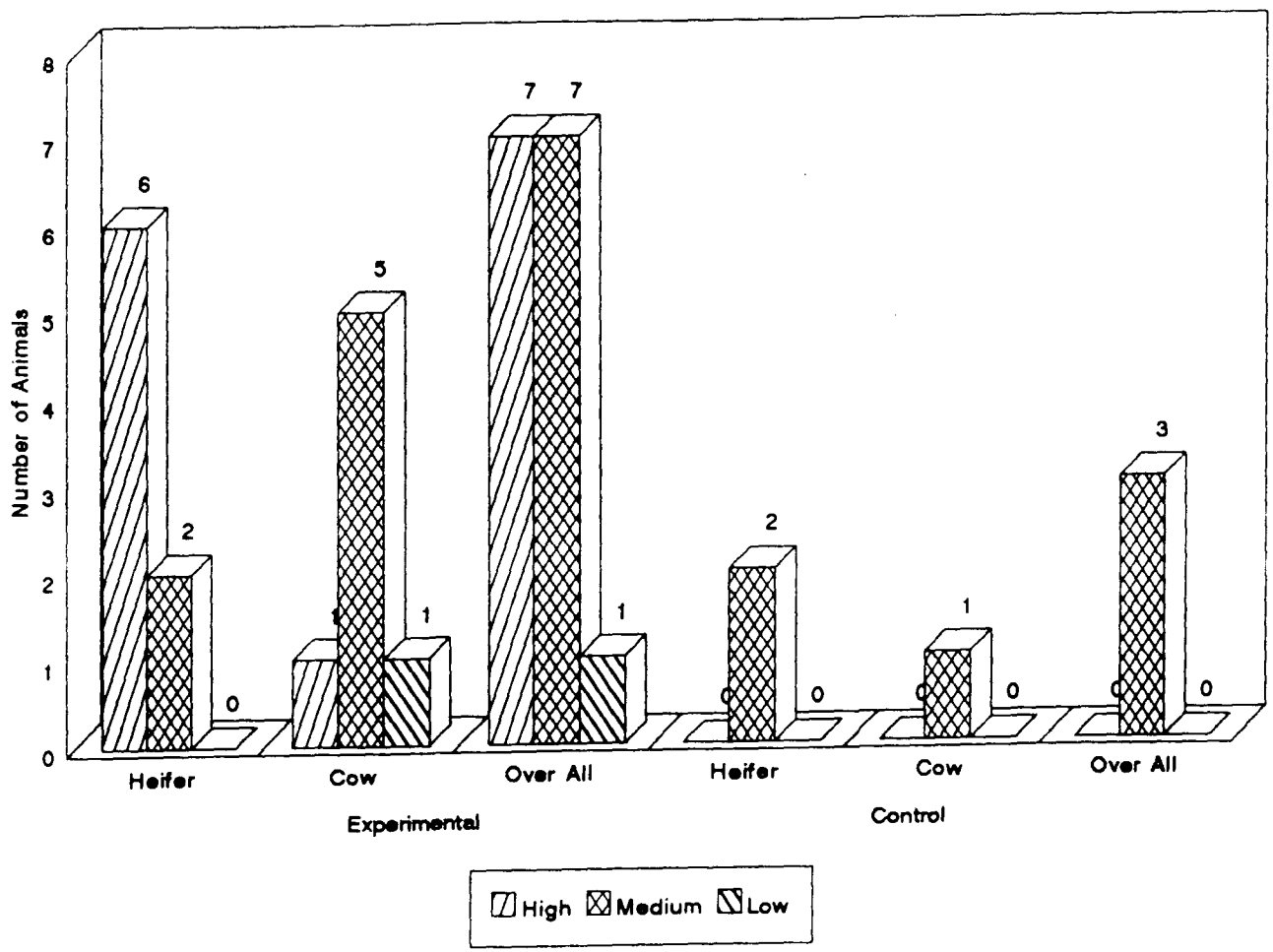


Fig.5 CONCEPTION RATES AND OVER ALL CONCEPTION RATES

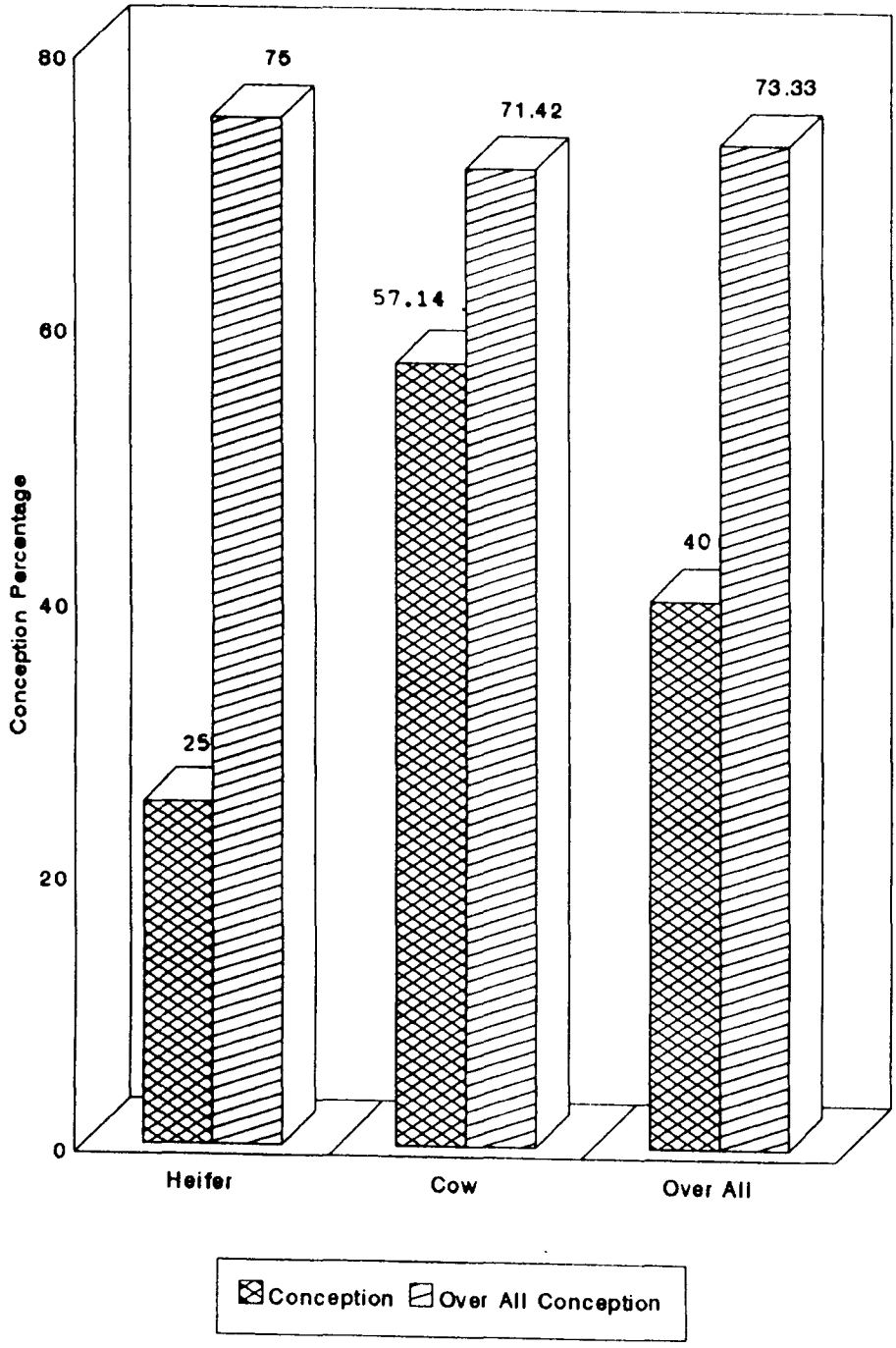


Fig.6 TIME TAKEN FOR INDUCTION OF OESTRUS IN ANIMALS CONCEIVED / NOT CONCEIVED AT INDUCED OESTRUS

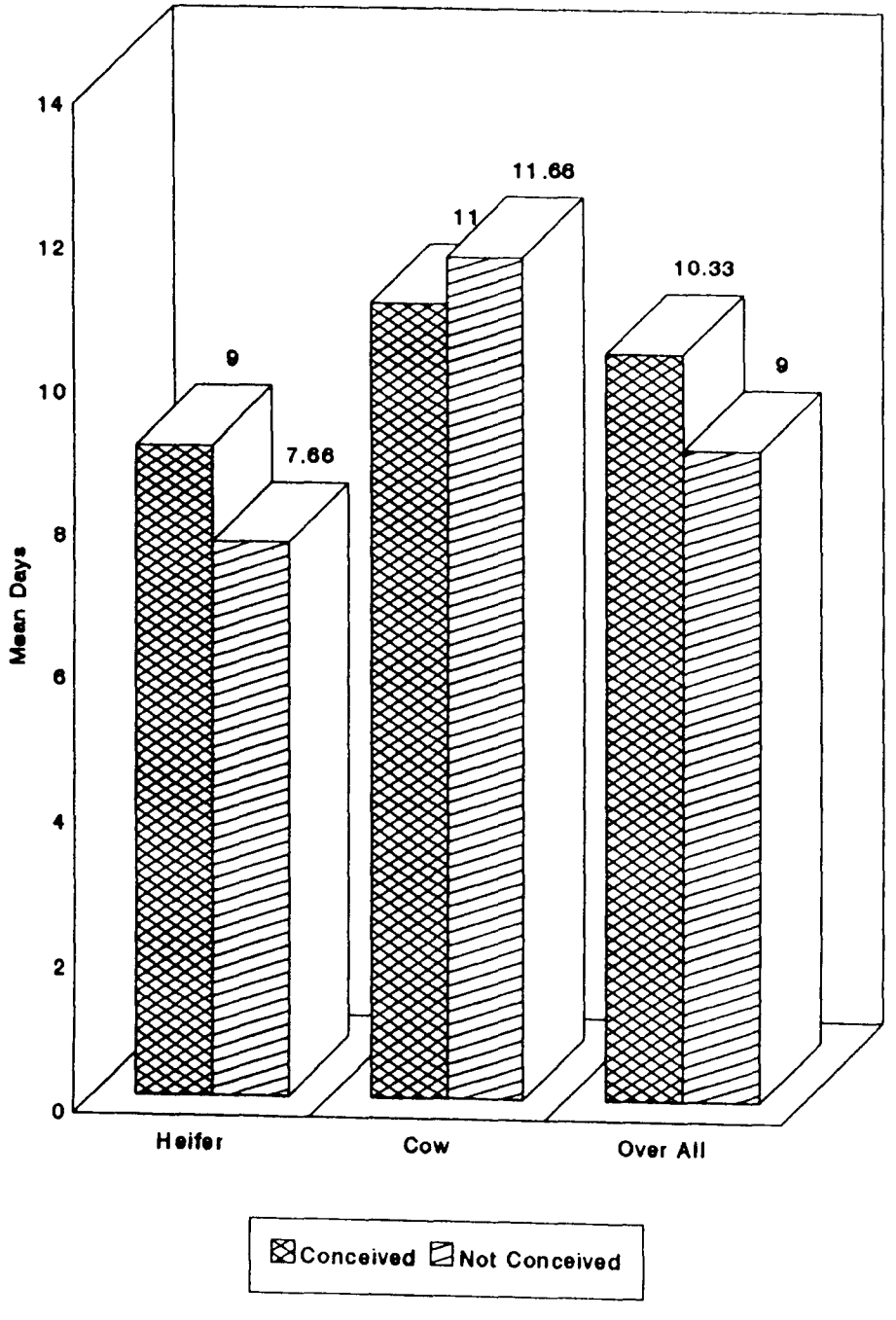
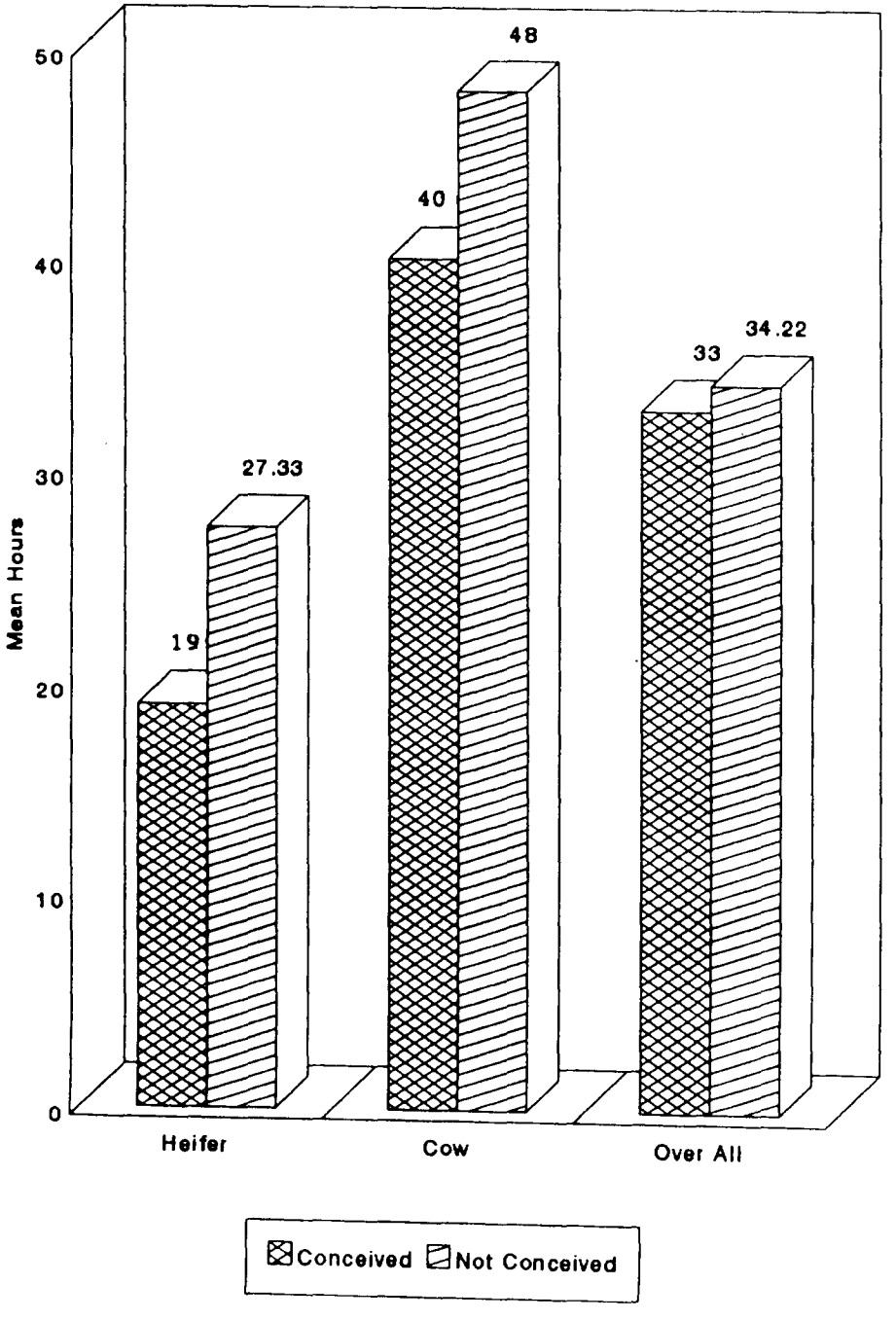


Fig.7 DURATION OF OESTRUS IN ANIMALS CONCEIVED / NOT CONCEIVED AT INDUCED OESTRUS



Discussion

DISCUSSION

Anoestrum constitutes an important cause of infertility and needs specialised attention because the etiological factors are multifold. In many cases, it is difficult to ascertain the exact cause with limited facilities available for quick and reliable diagnosis. Probably because of the complex causes of this problem treatment aspects remained varied and in general received limited attention. It may be noted that an acceptable approach in the management of anoestrum should include a high response rate to treatment, a tight synchrony of oestrus and ovulation and normal fertility. In recent times, tremendous work has been done in understanding the complex physiological mechanism that control bovine oestrous cycle. There is consensus of opinion that a rational approach to be evolved in the selection of drug, route and nature of administration to obtain maximum response with satisfactory fertility in the induced oestrus. Gonadotrophin releasing hormone (GnRH) is a decapeptide hormone synthesised in cell bodies of neurosecretory neurons located in the mediobasal hypothalamus and secreted into the primary capillary bed of the median eminenece. GnRH is responsible for release of leutinizing hormone (LH) and follicle stimulating hormone (FSH) from the pituitary. With the chemical identification of GnRH and its synthesis, a new

and powerful drug became available for reproductive management of cattle. Alterations in the chemical structure of native GnRH molecule have led to the synthesis of potent GnRH analogue. But owing to the alteration in chemical structure, marked differences exist between various GnRH analogues in releasing LH and FSH in cattle (Nawito *et al.*, 1977; Chenault *et al.*, 1990). Buserelin which is the ingredient of "Receptal" is 50 times more potent than gonadorelin. Beneficial effects of GnRH and its analogue ("Receptal") in the management of anoestrum in cows and heifers have been reported by Zolday and Szenci (1975), Lamming and Bulman (1976), Humke and Zuber (1977), Kodagali *et al.* (1981), Gupta and Dhoble (1983), Rao (1991) and AminuDeen *et al.* (1996). This type of observation indicates that physiological and hormonal events associated with oestrus, restore uterine and ovarian function to a state more conducive to subsequent establishment of pregnancy and thus regulate ovarian and uterine function in a manner that improves postpartum reproductive efficiency. The present investigation was, therefore, taken up with the object of studying the efficacy of administration of "Receptal" a GnRH analogue in the induction of oestrus in anoestrous cows and heifers and to study fertility in induced oestrus.

The material used for the present study consisted of 40 crossbred heifers and cows belonging to livestock farms of

Kerala Agricultural University. All the animals were maintained under identical conditions of feeding and management. Heifers of breedable age and cows which failed to exhibit oestrus even after 60 days post partum, were allotted into three different treatment groups. Ten crossbred heifers in group I identified as anoestrus were administered intramuscularly "Receptal" 5 ml and observed for signs of oestrus. Ten crossbred cows in group II, identified as anoestrus were also administered "Receptal" similarly and observed for signs of oestrus. Ten crossbred heifers and 10 crossbred cows in group III declared anoestrus were watched for natural oestrus and formed the control.

5.1 Oestrus response after administration of Receptal

Perusal of data shown in Table 1 and Figure I, revealed that out of 10 heifers in group I which were treated with "Receptal", 8 evinced oestrus while in group II, out of 10 cows, only 7 responded to treatment. In group III, (control) out of 10 heifers and 10 cows, only two heifers and one cow evinced oestrus during the period of study. Statistical analysis revealed significant difference in oestrus response between heifers and cows of experimental and control groups. The present study thus indicates that administration of "Receptal" is effective in inducing oestrus in crossbred cattle as reported by Zolday and Szenci (1975), Lamming and

Bulman (1976), Humke and Zuber (1977), Kodagali *et al.* (1981), Gupta and Dhoble (1983), Rao (1991), Bishop and Wetteman (1993), Sonwane *et al.* (1995). The present study revealed about 80 per cent of the heifer and 70 per cent of the cow responded to treatment with GnRH. This is in concurrence with the reports of Zolday and Szenci (1975), Humke and Zuber (1977). It was further observed that the response in cows was low than that in heifers. This might be due to poor ovarian response at the time of administration of GnRH as reported by Ball and Lamming (1983). Peter *et al.* (1988) opined that mild intrauterine infection during early postpartum period might affect the ovarian response to GnRH. According to Roche *et al.* (1992) GnRH administration in early postpartum period, resulted a high incidence of short silent cycles. However, Hauwieser *et al.* (1994) stated that efficacy of GnRH in early postpartum period, might not be consistent in all cows and different body condition groups. Further, Roy *et al.* (1995), from their observations, opined that more favourable response was obtained in heifers than in cows by using GnRH and remarked that the heifers suffer only from hormonal disturbances and not under lactational stress as in the case of early postpartum cows. The comparatively lower response of cows to "Receptal" might therefore be attributed to the early postpartum period of the cows in the present study.

Parity of cows significantly influenced the oestrus response (Table 2). It may be noted that among cows calved once, only 50 per cent responded to treatment while all those which calved more than once evinced oestrus. This is in accordance with the findings of Heuwieser *et al.* (1994), who remarked that efficiency of GnRH in early postpartum might not be consistent in all parities. They found decreased response rate in cows with first lactation than among cows of second and higher lactation group. Cows in I and II and above lactation, might have responded differently because of their ovarian status at the time of treatment. It might be possible that cows in II and above parity might have follicles which were responsive to GnRH than those in the first lactation, which did not show much response as reported by Stevens *et al.* (1993).

5.2 Time taken for induction of oestrus

Time taken for induction of oestrus in animals belonging to group I and II is presented in Table 3 and Figure 2. It could be seen that among heifers time taken for induction of oestrus ranged from 4 to 9 d with a mean of 8.00 d, while cows responded to treatment within 11.57 d (Range 8 to 15 d) statistical analysis of data revealed that cows took significantly higher duration for induction of oestrus. But it was further observed that when the values were pooled

together, irrespective of the group, it ranged from 4 to 15 d with a mean of 9.60 d. This is in agreement with the findings of Dhoble and Gupta (1986) and Kudlac *et al.* (1995). However, conflicting views were expressed regarding the time taken for induction of oestrus in cows and heifers. Madhavan and Raja (1983) reported a shorter period of duration (42 h) between administration of Receptal and induction of oestrus. On the contrary, Pattabiraman *et al.* (1986) reported a long period (16.7 d) for induction of oestrus. Mujumdar (1989) reported that time taken for induction of oestrus was 8 to 14 d after administration of "Receptal". Rao (1991), on the other hand, stated that oestrus could be induced in anoestrous cows in varying period of time, viz. 2 to 3 d, 10 to 14 d, 17 to 20 d respectively in 25, 58.4 and 16 per cent animals respectively. According to Sonwane *et al.* (1995) 87.5 per cent of the animals treated with "Receptal" evinced oestrus, within a period of 8 to 20 d. These variations in the time taken for induction of oestrus after administration of GnRH might partly be due to variations in ovarian response at the time of administration of the drug as reported by Ball and Lamming (1983). It may also be attributed to the variation in the time of administration of "Receptal" in the postpartum period and agreed favourably with the reports of Zaied *et al.* (1980), Brown (1985) and Pattabiraman *et al.* (1986).

Parity of cows did not alter the onset of oestrus (Table 4). The time taken for onset of oestrus ranged from 8 to 12 d (mean 9.66 d) and 10 to 15 d (mean 12.50 d) when the cows were grouped according to I parity and II and above respectively. Although, perusal of literature did not reveal any significant influence of parity on time of onset of oestrus after administration of "Receptal" it could be stated that marginally lesser time required for onset also be attributed to the quick and better ovarian response in these animals.

5.3 Duration of oestrus

The duration of oestrus in heifers and cows ranged from 18-72 h (25.25 h) and 32-48 h (43.42 h) respectively, while the corresponding value being 18-22 h (20 h) and 30 h in the control groups. The overall duration of oestrus in heifers and cows, however, was 33.73 h and 23.33 h respectively, in experimental and control animals. Significant difference in the duration of oestrus was observed between group I and II. The duration of oestrus was marginally higher in the experimental than in control groups. There is paucity information regarding the duration of oestrus in heifers and cows after administration of GnRH. The present study did not reveal any variation from natural oestrus as evident from the fact that the duration of oestrus between control and

experimental animals was not significantly different. However, significantly longer period of duration of oestrus in cows compared to heifers noticed, might be due to non-availability of the appropriate sized follicle at the time of treatment, failure of exogenous GnRH to mimic the gonadotrophin secretion occurring in the natural course and the possible lack of maturation of hypothalamo-hypophyseal gonadal axis as reported by AminuDeen *et al.* (1996). Moreover, Short *et al.* (1988) remarked that follicle appeared to require an increasing amount of LH for 2 to 3 days before becoming fully response to endocrine surge. Thatcher *et al.* (1993) concurred that physiological events which followed treatment with GnRH were not distinguishable from those which followed the natural oestrus. However, it was further observed that response of GnRH in terms of duration of oestrus and onset of oestrus might be variable especially in early postpartum cows, depending on the ovarian status at the time of administration of GnRH. Roche *et al.* (1992) reported that longer duration of oestrus in lactating cows might be associated within frequent LH pulses in the early postpartum period, and both milking and level of nutrition are implicated in prolonged suppression of LH pulses. In the present investigation, all experimental cows were in early lactation and the variation in the duration of oestrus between heifers and cows might be due to the lactational stress as reported by Roy *et al.* (1995).

Parity did not influence the duration of oestrus in experimental animals (Table 6), the values being 42.66 h and 44 h respectively in cows of I and II and above parity. Perusal of literature revealed scanty information on the influence on duration of GnRH induced oestrus.

5.4 Intensity of oestrus

Date presented in Table 7 and Figure 4 revealed that in group I, 75 and 25 per cent of heifers showed high and medium intensity of oestrus respectively while in group II, the corresponding values were 14.28 and 71.42 per cent. In the control group, on the otherhand, all animals showed only medium intensity of oestrus. Analysis of data revealed that the intensity of oestrus was significantly high in heifers than in cows. It may also be noted that in natural oestrus, none of the animals showed high intensity of oestrus compared to experimental animals indicating that induction of oestrus with "Receptal" resulted in better expression of oestrus. Shams *et al.* (1991) observed maximum number of intense heat signs when oestrus was induced with "Receptal". Sonwane *et al.* (1995) also observed that intense heat signs in six cows (85.71%) with copious discharge within 8 to 20 days after treatment with "Receptal" in anoestrous cows. Mauer and Rippel (1972) however, reported, no behavioural signs in cows. Madhavan and Raja (1983) also reported poor expression of

oestrus when treated with "Receptal". Dhoble and Gupta (1986) also observed that GnRH treated cows did not exhibit external symptoms of oestrus and attributed this to an inadequate GnRH dose or to the need for closer observation. However, Pattabiraman *et al.* (1986) noticed that moderate and mild signs of oestrus were more common in "Receptal" treated animals. They also reported that about 65 per cent of the cows subjected to "Receptal" administration, showed moderate or mild signs of oestrus indicating that intense manifestation of oestrus was not a common feature in cows. The better expression of oestrus noticed in the present study might be due to correct dosage and better observation as reported by Dhoble and Gupta (1986). It may also be noted that percentage of mild oestrus was more in natural oestrus than in induced oestrus indicating beneficial effects of "Receptal" in the detection of oestrus by better and pronounced oestrus signs. Parity did not influence the intensity of oestrus (Table 8).

The rate of ovulation of experimental animals furnished in Table 9, showed that 87.5 per cent among heifers and 85.71 per cent of cows ovulated. Britt *et al.* (1974) reported good success in inducing ovulation when treated with GnRH in early postpartum cows. Rao (1991) also observed good ovulation rate in anoestrus cows treated with GnRH. On the contrary, Madhavan and Raja (1983) however, reported a poor ovulation rate.

5.5 Conception rate

The conception rate in the first insemination and overall conception rate in the experimental and control are presented in Table 10 and Figure 5. In group I, the first insemination conception and overall conception rate was 25 and 75 per cent respectively as against 57.14 and 71.42 per cent in group II.

In group III (control) none of the heifers conceived at first insemination while the overall conception rate was 50 per cent. None of the cows in the control group conceived during the period of study. However, the variation in the conception rate between group I and II was not statistically significant. It may be noted that the percentage of conception in the first insemination and overall conception rate was higher than that in control group. The number of inseminations per conception was 2.16 in group I and 1.20 in group II, with an overall value of 1.72 which was found to be slightly lower than the control animals. Lamming and Bulman (1976) reported normal levels of fertility in anoestrous cows treated with GnRH. Humke and Zuber (1977) also obtained good percentage of fertility when acyclic cows were treated with LHRH analogue. Nash *et al.* (1980) also opined that injection of 250 ug of GnRH to lactating dairy cows might be useful in increasing the fertility. Kodagali *et al.* (1981), Gupta and Dhoble (1983), Mujumdar (1989) also reported similarly. Rao (1991) also stated that GnRH analogue can be effectively recommended as a

therapeutic measure for induction of oestrus in anoestrous cows with satisfactory fertility. Results comparable to the present study was also reported by Sonwane *et al.* (1995) in anoestrous cows. On the contrary, Khurana *et al.* (1982) observed a poor conception rate and attributed this to poor ovarian response of cows in early postpartum period and also due to mild subclinical infection of the uterus as remarked by Leslie *et al.* (1984). However, Heuwieser *et al.* (1994) stated that efficacy of GnRH with regard to fertility might not be consistent in all parities and body condition groups.

Effect of parity on conception rate (Table 11) revealed no significant difference in the first insemination conception rate between parity but the overall conception rate was slightly higher in cows with parity II and above, than those belonging to parity I. This variation in the conception rate is in accordance with finding of Heuwieser *et al.* (1994).

Time taken for induction of oestrus in animals conceived (Table 12 and Figure 6) was slightly higher than those not conceived. Similarly the duration of oestrus for those conceived (Table 13 and Figure 7) was slightly lesser than those animals which did not conceive. It may also be noted that the intensity of oestrus in experimental animals conceived (Table 14) was high in heifers while in cows the majority animals conceived showed medium intensity of oestrus.

From the foregoing paragraphs, it could be professed that "Receptal", a GnRH analogue could be successfully used for induction of oestrus in anoestrous heifers and cows. It may be seen that the nature of GnRH induced oestrus in terms of physical characters and duration was similar to natural oestrus. Better expression of oestrus was noticed in induced oestrus. Time taken for induction of oestrus was lower in heifers than in cows. However, duration of oestrus was higher in cows than in heifers. Percentage of conception was satisfactory, compared to control. However, marginal differences in the conception rate was observed between experimental animals. Overall conception rate did not show much variation between cows and heifers of experimental animals. Number of inseminations required per conception was lower in induced oestrus than control.

Present investigation points out that "Receptal" can be used as a therapeutic measure for management of anoestrum in crossbred cattle. However, further studies with more number of animals and studies on hormonal profiles of the treated animals are warranted for conclusive proof of its efficacy.

Summary

SUMMARY

The objective of the present investigation was to evaluate the efficacy of administration of gonadotrophin in crossbred cattle.

The material for the present study consisted of 40 crossbred heifers and cows belonging to livestock farms attached to Kerala Agricultural University. Heifers of breedable age and cows which failed to exhibit oestrus even after 60 days postpartum were allotted into three different treatment groups. Ten crossbred heifers in group I identified as anoestrus were administered "Receptal" 5 ml intramuscularly and observed for signs of oestrus. Ten crossbred cows in group II identified as anoestrus were also administered Receptal similarly and observed for signs of oestrus. Ten anoestrous crossbred heifers and cows in group III were watched for normal oestrus and formed the control.

Results obtained and inferences drawn are summarised below. In group I out of ten heifers which were treated with "Receptal", eight evinced oestrus, while in group II, out of ten cows, only seven responded to treatment. In group III (control) out of ten heifers and 10 cows, two heifers and one cow evinced oestrus during the period of study. Statistical analysis revealed significant difference in oestrus response

between heifers and cows of experimental and control groups. Parity of cows significantly influenced oestrus response, while 50 per cent of the cows which have calved once responded to treatment, all those which calved more than once evinced oestrus. Time taken for induction of oestrus in heifers ranged from 4-9 d with a mean of 8.00 d, while the values in respect of cows were 11.57 d (Range 8 to 15 d). Analysis of data revealed that the time taken for induction of oestrus, was more in cows than in heifers. Parity of cows did not alter the time taken for onset of oestrus. The duration of induced oestrus in heifers and cows ranged from 18 to 72 h and 32 to 48 h respectively, while the corresponding values were 18 to 22 h and 30 h in the control group. Significant difference was observed in the duration of oestrus between group I and II. The duration of oestrus was marginally higher in the experimental than control groups. Parity did not influence duration of oestrus in experimental animals. Physical changes of reproductive tract were similar or better than natural oestrus. In group I, 75 per cent of the heifers showed high intensity of oestrus, while 25 per cent showed medium intensity of oestrus. But in the case of cows, majority of the animals (71.42%) showed medium intensity of oestrus. In the control group, all animals showed only medium intensity of oestrus. Analysis of data revealed that high intensity of oestrus is significantly more in heifers than in cows. In the experimental group, 87.5 per cent of the heifers

and 85.71 per cent of the cows ovulated. In group I (heifer), the first insemination conception and overall conception rates were 25 and 75 per cent, as against 57.14 and 71.42 per cent in group II. In the control group, none of the heifers conceived at first insemination. But the overall conception rate was 50 per cent. None of the cows in control group conceived during the period of study. The percentage of conception, however, in the experimental group was higher than the control group. The number of insemination per conception was 2.16 in group I and 1.20 in group II with an overall value of 1.72, which was found to be lower than control group. Time taken for induction of oestrus in animals conceived was slightly higher than those not conceived, while the duration of oestrus for those conceived was lesser than those animals which did not conceive. Similarly the high intensity of oestrus in experimental animals conceived was more in heifers while in cows, majority animals (75%) conceived showed medium intensity of oestrus.

To sum up it may be stated that gonadotrophin releasing hormone (GnRH) could be successfully used for induction of oestrus in anoestrous heifers and cows, with satisfactory fertility. However, further studies with larger number of animals and with the hormonal profiles of treated animals are warranted.

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MANAGEMENT OF ANOESTRUM IN CROSSBRED CATTLE USING SYNTHETIC GONADOTROPHIN RELEASING HORMONE

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ABSTRACT OF A THESIS

submitted in partial fulfilment of the
requirement for the degree

Master of Veterinary Science

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Mannuthy, Thrissur

1996

ABSTRACT

With the object of studying the efficacy of gonadotrophin releasing hormone (GnRH) in the management of anoestrum in crossbred cattle, 40 crossbred heifers and cows which were declared anoestrus, selected from Kerala Agricultural University Livestock Farms, were allotted to three different treatment groups. Ten heifers and ten cows in group I and II were administered 5 ml of Receptal intramuscularly while ten heifers and ten cows in groups III were considered as untreated control. Among experimental animals eight heifers and seven cows responded to treatment. Analysis of data revealed significant variation in the oestrus response between experimental and control group. However, the response between cows and heifers in the experimental group was not significantly different. The time taken for induction of oestrus was 8.00 d in heifers, and 11.57 d in cows. This variation was found to be statistically significant. Parity of cows did not alter the time taken for induction of oestrus. Significant difference in the duration of oestrus was observed among heifers and cows of experimental group, the values being 18 to 72 h (mean 25.25 h) and 32 to 48 h (mean 43.42 h). Duration of oestrus was also slightly higher in the experimental than that of the control group. Majority (75%) of the heifers in the experimental group evinced high intensity of oestrus, while the majority (71.42%) of cows in

the experimental group showed only medium intensity of oestrus. In the control group, however, all animals showed only medium intensity of oestrus. In the experimental group 87.5 per cent of the heifers and 85.71 per cent of the cows ovulated. The first insemination conception and overall conception rates were 25 and 75 per cent respectively in group I as against 57.14 and 71.42 per cent in group II. The corresponding values in group III (control) were zero and 50 per cent in heifers, while none of the cows in control group conceived. It could be seen that percentage of conception in the first insemination and overall conception rates in the experimental animals were higher than that in the control group. The number of inseminations required for conception in the experimental animals was slightly lower than that in control group. Overall conception rate was significantly higher in cows with II parity and above than those belonging to I parity. All the heifers which conceived had high intensity of oestrus. Similarly among cows, only 25 per cent which conceived had high intensity of oestrus, and 75 per cent showed medium intensity. The present investigation, therefore revealed that gonadotrophin releasing hormone is a potential drug, that might regulate ovarian, and uterine functions and thus would improve post pubertal and postpartum reproductive efficiency. However, studies on endocrine profiles of the animals treated with gonadotrophin releasing hormone will enlighten more on the efficacy of this drug in the management of anoestrum.