INFLUENCE OF DEXTROSE ON FERTILITY OF REPEAT BREEDING COWS

By

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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

1983

DECLARATION

I hereby declare that this thesis entitled "INFLUENCE OF DEXTROSE ON FERTILITY OF REPEAT BREEDING 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.

Signature of the Candidate:

Mannuthy,

28- 2-1983.

Name of the Candidate: P.K.Naveen.

CERTIFICATE

Certified that this thesis entitled "INFLUENCE OF DEXTROSE ON FERTILITY OF REPEAT BREEDING COWS" is a record of research work done independently by Dr. P.K. Naveen, 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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Mannuthy,
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Dedicated to the

Loving Memory of

My beloved Mother

Smty. Sundaram Keshava Pai

ACKNOWLEDGEMENTS

Dr. E.Mathai, Associate Professor, Department of Animal Reproduction and Chairman of the Advisory Board has been extremely helpful throughout the period of implementation of this research project and in the preparation of thesis. But for his earnest enthusiasm and constant guidance, I would not have succeeded in completing the work within the time limit. I express my sincere thanks to him.

Dr. K.Prabhakaran Nair, Professor-in-charge of Department of Animal Reproduction, Dr. A.Rajan, Professor and Head of the Department of Pathology, Dr. Joseph Mathew, Assistant Professor, Department of Animal Reproduction, Members of the Advisory Board, have been immensely helpful at all stages of my work. I record my deep sense of gratitude to them.

Dr. E.Madhavan, Associate Professor, Department of Animal Reproduction, a man of great charm, affable manners and enviable intellectual pursuits has proved himself to be a windfall to me during the course of my work. I thank him from the bottom of my heart.

I am thankful to Dr. T.Sreekumar, Dr. V.Vijayakumar, Assistant Professor and other members of the Department of Animal Reproduction and also to the staff of the University

Livestock Farm, Mannuthy, for their friendly association and co-operation.

I wish to place on record my sincere thanks to Dr. K.V. Athman and Dr. M.R.Sasindranath, Junior Assistant Professors for their sincere help at all stages of my work.

I am grateful to Dr. T.K. Thomas, Senior Veterinary Officer, Sri. V.A.Abdul Khader and other staff of the Cross Breeding Scheme, and Veterinary Hospital, Chalakudy, for they have missed no opportunity to come to my aid during the course of my work. My thanks are due to Dr. K.C.Sunny, Dr. P.Muraleedharan and Dr. K.I. Abraham, Veterinary Surgeons. They have endeavoured always to extend helping hands in the process of implementation of my research programme.

I wish to extend my thanks to Dr. P.U. Surendran, Professor and Head of the Department of Statistics and Sri. N.Ravindranathan, Assistant Professor, Department of Statistics for their kindness in helping me in the statistical analysis of the data.

I wish to record my thanks to the Government of Kerala and the Director of Animal Husbandry for giving me the opportunity to undertake higher studies.

Dr. C.K.S.V. Raja, Professor and Head of Department of

Animal Reproduction was of immense help to me right from the early stage of the studies till the date of his sudden demise. And with a heavy heart I record my gratitude and pay homage to him.

Dr. M.Krishnan Nair, Dean, Faculty of Veterinary and Animal Sciences has been very kind to provide facilities for undertaking the work and I thank him from the bottom of my heart.

I express my thanks to Sri. V.S.Skandakumar, for elegant typing of the manuscript.

My thanks are also due to Sri. T.K.Gopalan, Farm Assistant (Vety), Department of Poultry Science for the help rendered.

Dr. R.Rajagopalan Nair and Dr. M.I.Alexander,my friends and fellow students shared the same concern and feeling during the entire course of studies. They have been helpful to me always in all ventures. I extend my gratitude to them.

And, last but not least, I wish to thank my wife Pushpakumari and my children Nisha and Syamesh for their concern, inspiration and persuasion.

INTRODUCTION

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Intensive cross-breeding programme with the avowed objective of augmenting the production potential of cattle has been sagaciously carried out in Kerala for the last two decades. At present, around eight lakhs of breedable cows are cross-breds. The production capacity of the cross-bred cattle of Kerala has increased considerably, but their susceptibility to infection, stress conditions of inadequate nutrition and adverse climate has gone up. Consequently the incidence of infertility among cross-breds has increased causing heavy economic loss to cattle owners.

Repeat breeding is one of the most important reproductive hazards faced by farmers. A repeat breeder cow is described as a 'Cyclic non breeder', a type of infertile cow, which despite the possession of an apparently normal reproductive tract returns repeatedly to fertile insemination (Arthur, 1975). In Kerala, the incidence of repeat breeding was reported to be 37 per cent among various infertility conditions of cross-bred Swiss Brown and 18 per cent among cross-bred Jersey cows (Mathew and Namboothiripad, 1979; Ghosh, 1982).

Nutritional imbalances and deficiencies are frequently implicated as causes of repeat breeding in cattle. In Kerala, limited extent of land holding and prevailing agro-climatic

condition cause great strain on the availability of nutritional imputs necessary for dairy animals. With the result, majority of animals receive only a sub-maintenance ration and thereby face problems of under-nutrition. Inadequate diet, causes a deficiency in energy, and leads to reproductive failures.

Various workers have indicated the profound influence of dextrose on reproductive function (McClure, 1965a; Downie and Gelman, 1976; Deshpande et al. 1978; Enkhia et al. 1982). Animals which are provided with extra energy ration appear to have elevated levels of glucose in the blood and luminal fluid. In repeat breeders the level of glucose in the blood and that in the luminal fluid is reported to be much lower compared to the normal breeders. Post-parturient cows in negative energy balance with a reduced level of blood glucose are often subjects of repeat breeding.

Increased blood glucose at oestrus or shortly after service enhances the level of glucose or glycogen in the mucosa of the genital tract and it furnished energy to the spermatozoa or fertilized ova (Roberts, 1971). Animals having elevated level of glucose in the blood are more fertile and require less services per conception (McClure, 1965a; Downie and Gelman, 1976; Konstantinov and Radoslavov, 1977; Deshpande et al. 1978; Savoiski et al. 1980; Enkhia et al. 1982).

Reports on the efficacy of intra-uterine dextrose therapy to improve fertility are scanty. The present study was undertaken to assess the influence of post-insemination intra-uterine infusion of dextrose in repeat breeding cows.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Bovine infertility was mostly attributed to genital infections, hereditary and congenital defects, endocrine imbalance and nutritional and managemental factors (Roberts, 1971 and Arthur, 1975).

Repeat breeder or a cyclic non breeder cow is one having a normal reproductive cycle with no clinical abnormalities, but still does not settle with more than two fertile services (Casida, 1961; Roberts, 1971 and Arthur, 1975).

The causes of repeat breeding were extensively reviewed by various workers (Casida, 1961; Roberts, 1971 and Arthur, 1975). Major causes of repeat breeding were reported as failure of fertilization and embryonic mortality (Casida, 1961 and Arthur, 1975). Roberts (1971) classified the causes of repeat breeding into congenital defects of genital tract, congenital or acquired defects of ova, spermatozoa or early zygote, infections or traumatic inflammatory processes, endocrine disfunction, managemental and nutritional factors.

A low grade infection, specific or nonspecific that may lead to sub clinical endometritis or salpingitis was considered as a cause of repeat breeding (Casida, 1961).

Nutritional deficiency leading to hypoglycemia and low level of glucose in the luminal fluid resulted in repeat

breeding due to early embryonic mortality (McClure, 1968a; 1968b; Roberts, 1971 and Enkhia et al. 1982). McClure (1967) subjected mice to starvation for over 36 hours and showed that they were more susceptible to an acute carbohydrate deficiency causing hypoglycemia, failure of oestrum and ovulation, death of ova and failure of implantation resulting in infertility. Majority of reproductive failures in cattle occured before implantation and clinical signs and lesions similar to those observed in mice were reported in infertile cows with blood glucose concentration below 30 mg/100 ml (McClure, 1967; 1968a). Olds (1969) reported 28.5 per cent of early embryonic mortality in repeat breeders and indicated increased mortality rate with embryo sired by bulls with low fertility.

Nutritional deficiencies and imbalances frequently caused infertility in cattle (McClure, 1965a, 1968a; Boyd, 1970, Lamond, 1970; Brochart et al. 1972; Velhankar, 1973; Deshpande et al. 1978 and Morrow, 1980). Deficiencies of protein, carbohydrates, phosphorus, cobalt, copper, iodine, manganese, iron and vitamin A were suggested to cause infertility (Roberts, 1971; Arthur, 1975; Sudarsanan, 1979; Morrow, 1980). Majority of the causes of infertility of nutritional origin were considered to be due to multiple deficiencies of protein, carbohydrates, vitamins and minerals (Roberts, 1971 and Morrow, 1980). Experimental evidences

indicated that the reproductive performance of cows improved and conception took place most readily when body weight was increased due to high plane of nutrition during the breeding season (Wiltbank et al. 1954; McClure, 1965a; 1965b; Swanson, 1967; McClure, 1968a; 1968b; Dunn et al. 1969; Boyd, 1970; Lamond, 1970; Brochart et al. 1972; Moller and Stannon, 1972; Broster, 1973; Sonderegger and Schurch, 1977; Downie and Gelman, 1976; Deshpande, 1978; Laing, 1979; Patil and Deshpande, 1979; Somerville et al. 1979; Avdar et al. 1980; Francos et al. 1980 and Morrow, 1980).

The blood glucose level in cow was reported to have good correlation with fertility (McClure, 1965a; Lamothe et al. 1972; Sane, 1972; Downie and Gelman, 1976; Hunter, 1977; Konstantinov and Radoslavov, 1977; Deshpande et al. 1978; Velhankar, 1978 and Savoiski et al. 1980). The glucose level in healthy animals ranged from 35 to 60 mg/100 ml (Dukes, 1955; Gonzaga and Vergara, 1956; Horrocks and Paterson, 1960; Setty and Razdan, 1966; Blood et al. 1979; Enkhia et al.1982). Higher values upto 81.66 mg/100 ml were reported by Reihart (1939).

The concentration of glucose in the blood varied according to the age, stage of oestrum, pregnancy, lactation, season, environment and nutritional status of animal (Setty and Razdan, 1966; McClure, 1968a; Sane, 1972). Blood glucose

of normal cows increased significantly during oestrum (Downie and Gelamn, 1976; Deshpande et al. 1978; Rao and Rao, 1982). Deshpande et al. (1978) recorded a glucose concentration of 48 to 57 mg/100 ml during oestrus in normal cows. A significant increase in the glucose concentration in cross-bred heifers during oestrum (45.90mg/100 ml) in comparison to that in dioestrum (42.40 mg/100 ml) was observed by Rao and Rao (1962). Velhankar (1978) reported seasonal variation in blood glucose level in Gir cows. The lowest value of 46.93 mg/100 ml was recorded in summer and the highest value of 54.06 mg/100 ml in spring.

In repeat breeder cows the concentration of glucose in blood was reported to be 30 to 59 mg/100 ml which was found to be low in comparison to that recorded in fertile cows (McClure, 1968 a ; Downie and Gelman, 1976). McClure (1965a) reported that in early post-parturient cows with blood glucose concentration of 25 mg/100 ml, the conception rate was zero whereas at 48 mg/100 ml or more the conception rate was 77 per cent. In mating season McClure (1968a) observed dairy herd infertility syndrome, characterised by blood glucose level below 30 mg/100 ml and 5 to 10 per cent body weight loss and low conception rate during the first three months after calving. McClure (1968b) supported the finding with insulin therapy before oestrum, which resulted in decreased blood glucose levels and fertility rates. By

providing additional energy diet, Sane (1972) could increase the blood glucose level of anoestrous cows from 39.40 to 53.00 mg/100 ml and this was associated with improvement of fertility. Downie and Gelman (1976) observed an initial fall in plasma glucose level of beef cows following four weeks of lowered dietary intake. The plasma glucose level increased and almost reached its original level by the tenth week of restricted feeding. Glucose level in plasma showed a significant rise before insemination of fertile cows and a significant decline in infertile cows. On the contrary, Enkhia et al. (1982) did not find significant difference between the serum glucose levels of fertile and repeat breeding cows.

The luminal fluid of cows was analysed by several workers for the presence of glucose and its concentration was reported to have correlation with fertility (Gupta et al. 1962; Lamothe et al. 1972; Thangaraj, 1976; Khullur et al. 1978 and Enkhia et al. 1982). The concentration of glucose in the luminal fluid of fertile cows in oestrum was reported to vary from 13.80 to 160 mg/100 ml (Gupta et al. 1962 and Lamothe et al. 1972). Gupta et al. (1962) estimated the reducing sugar content of luminal fluid of cows and the values were found to be 44.30 and 41.30 mg/100 ml in cervical and uterine fluids. Muco-polysaccharides detected in the luminal fluid were considered as important factors in the nutrition of blastocyst

before attachment to the uterine wall (Heap and Laming, 1962). Greater concentration of glucose in the luminal fluid indicated higher fertility (Gorohv, 1964; Goel and Rao, 1972).

In repeat breeders the level of glucose in the luminal fluid was reported to range from 7.1 to 106.08 mg/100 ml (Lamothe et al. 1972; Thangaraj, 1976 and Enkhia et al. 1982). Lamothe et al. (1972) observed highly significant difference in the concentration of glucose in the luminal fluid of repeat breeder cows (106.08 mg/100 ml) and in normal cows (160.1 mg/100 ml) during post-oestrum. They recorded average concentration of glucose in uterine secretions to be higher than that in plasma. Thangaraj (1976) reported a low content of glucose (15.68 mg/100 ml) in cervical secretions of repeat breeding animals and a high concentration (24.26 mg/100 ml) in the cervical secretions of regular breeders. Khullur et al. (1978) recorded significant difference in the glucose content of cervical mucus of fertile and infertile cows in the age group of five to six years. Enkhia et al. (1982) observed significantly higher glucose value in luminal fluids of normal breeder cows as against repeaters.

Several workers have reported that hypoglycemia adversely affected the hypothalamo-hypophysial function and reduced the fertility (McClure, 1968a; 1978a; Black et al. 1968; Lamond, 1970a; Sane, 1972; Boyd, 1977 and Mathai, 1982). Mice were

reported to be more susceptible to an acute carbohydrate deficiency due to deprivation of feed. The carbohydrate deficiency caused hypoglycemia, infertility, failure of oestrum, failure of ovulation, death of fertilized ova and failure of implantation. These effects of deprivation of feed were prevented by the administration of HCG or progesterone. This indicated that primary disturbance is hypoglycemia, which inhibited pituitary gonadotrophic function (McClure, 1967). Most of the clinical signs and lesions similar to that observed in hypoglycemic mice were reported in infertile cows having a blood glucose concentration of less than 30 mg/100 ml (McClure, 1968a). Pituitary gland appeared to tolerate severe malnutrition without loosing their ability to produce or react to gonadotrophins whereas the hypothalamus was sensitive to interference and induced series of changes in the reproductive tract leading to infertility (McClure, 1968a). Lamond (1970a) opined that the level of nutrition directly affected the genital tract and the growth of follicle and secretion of ovarian steroids, which in turn influenced hypothalamo-pituitary function.

Higher energy diet and post partum weight gain were found to increase the blood glucose level and fertility in cows. By providing extra energy to cows McClure (1965a) could increase blood glucose level from 25 to 48 mg/100 ml and

the fertility from zero to 77 per cent. It was reported that a blood glucose level of 30 mg/100 ml may not affect the manifestation of oestrum but adversely affect fertility (McClure, 1965b). Sane (1972) observed anoestrous condition in cows often associated with a blood glucose level of 39.4 mg/100 ml. Such anoestrous condition could be corrected, by increasing the blood glucose level to 53 mg/100 ml by providing additional energy ration. Downie and Gelman (1976) found that lowering the dietary intake of lactating beef cows by five per cent of maintenance ration for a period of ten weeks, resulted in reduction in body weight and a fall in blood glucose level after four weeks. The plasma glucose level was found to reach almost original level by the end of ten weeks. The glucose level in plasma in the case of fertile cows had shown a significant rise before service and a significant decline in the case of infertile cows, indicating a correlation of plasma glucose level and fertility. Hunter (1977) improved the conception rate in cows at mating period by raising the blood glucose and phosphate levels. Konstantinov and Radoslavov (1977) could raise the conception rate by 12.56 per cent by increasing the blood sugar levels of ewes by 20 to 23 per cent by feeding glucose in three doses of 100 g each at eight hour interval on the day of oestrum. Deshpande *et al.* (1978) observed gradual increase of blood glucose level from 48 to 58.35 mg/100 ml in Gir cows, exhibiting oestrus in

post partum period whereas blood glucose decreased from 47.88 to 43.44 mg/100 ml during post-partum period in anoestrous cows. Velhankar (1978) noted that the composition of diet had significant influence on blood glucose and with higher energy diet animals exhibited better and consistant reproductive performance. Savoiski et al. (1980) observed lowest concentration of blood glucose in cows kept under low level of feeding in stall. On transferring the cows to pasture their blood glucose concentration gradually increased and attained almost normal value in 20 to 25 days. Enkhia et al. (1982) recorded in Rathi fertile cows an average blood glucose value of 45.38 mg/100 ml whereas in repeaters the value was only 40.41 mg/100 ml.

Feeding animals a few hours around service was found to increase the fertility (McClure, 1966; Cooper et al. 1970; Brooster, 1973; Konstantinov and Radoslavov, 1977). McClure (1966) observed infertility in mice starved for over 36 hours. The littering rate of these females, mated around the fasting period was found to be significantly low. The reduction in littering rate was prevented by administration of glucose in drinking water. McClure (1967) further observed that the infertility in starved mice was due to death of ova before implantation and that the blood glucose of starved mice tended to decrease by four hours. The fall could be delayed by about 24 hours by administration of glucose solution in drinking water.

Cooper *et al*. (1970) observed that reduced nutrition decreased ovulation rate and number of foetuses in sheep. Changing to *ad-libitum* feeding 12 hours before expected ovulation significantly increased ovulation rate without increasing the number of viable foetuses. Broster (1973) remarked that feeding few hours around service can be regarded as critical to fertility. Konstantinov and Radoslavov (1977) raised the fertility rate in ewes by feeding glucose on the day of oestrum. But Youdan and King (1977) could not improve fertility in cows by increased level of feeding at or around the time of service.

Roberts (1971) suggested that hypoglycemia at oestrum or shortly after service may exert a harmful effect on conception by lowering of the glucose and glycogen level in the mucosa of the genital tract resulting in lack of energy of spermatozoa or fertilized ova. Moghissi (1973) observed that spermatozoa possessed only a negligible reserve of endogenous glycogen and they depended on extracellular carbohydrates for energy during their passage through mucus. Schineider *et al*. (1976) reported that from morula to blastocyst stage mouse embryos utilized glucose for the synthesis of nine aminoacids. Glucose was suggested as a major precursor of glycogen synthesis in *in vitro* culture of mouse embryos (Pike and Wales, 1982). The level of glucose in the luminal fluid had

significant effect on the amount of glycogen synthesised by embryos during development in uterus (Pikes and Wales, 1982).

Various studies to improve fertility with intra-uterine administration of antibiotics after insemination showed an increase in conception rate of repeat breeders (Lindley, 1954; Namboothiripad and Mathai, 1970; Namboothiripad *et al.* 1976; Ramadas, 1978).

Gorohv (1962) obtained 100 per cent conception rate in 21 repeater cows by irrigation of uterus and cervix with a sugar solution prior to insemination. Mathew *et al.* (1980) obtained significant improvement in conception rate of repeat breeders with post-insemination infusion of dextrose and antibiotics as against 45 per cent in those treated with antibiotics alone and 25 per cent in those not treated at all.

MATERIALS AND METHODS

MATERIALS AND METHODS

A study on the efficacy of intra-uterine administration of dextrose was carried out in repeat breeder cows brought for insemination at the Cross-Breeding scheme, Chalakudy, University Livestock Farm, Mannuthy and Artificial Insemination Centre, Kokkalai, Trichur, during the period from first July to 31st December, 1982. Animals not settled with two or more inseminations were subjected to detailed gynaeco-clinical examinations and from among them 160 animals having clinically normal reproductive system, showing regular oestrous cycles and clear luminal discharge were selected for the study. The data on parity, age, date of last calving and number of infertile inseminations during the service period, were collected with respect to each animal. Out of the 160 animals selected, 147 were alloted to the treatment group and 13 to the control group, at random.

Inseminations of the animals in the treatment and control groups were carried out using chilled EYC semen, CME semen and frozen semen from cross-bred bulls. Samples of semen with more than 45 per cent motile sperms in the case of chilled semen and CME semen and 35 per cent motile sperms in the case of frozen semen at the time of insemination were only utilized for the study.

From among the animals in the treatment group, 69 were inseminated using semen extended with egg yolk citrate (EYC) 46 with semen diluted with coconut milk extender (CME) and 32 using frozen semen.

Six hours after insemination, 5 ml of blood was collected from jugular vein of each cow, in test tubes, containing 50 mg of sodium fluoride. Plasma was seperated after centrifuging and estimation of glucose was carried out by O-Toludine Method of Hurltman (1959) modified by Dubowski (1962) and Hyvarinen and Nikkala (1962).

For comparison, the blood glucose level of 30 normal cows in heat was estimated. The conception rate with respect to 15 cows from the above group which settled with one or two inseminations was collected and compared with blood glucose level of animals in the treatment group.

Immediately after collection of blood, 50 ml of 15 per cent dextrose solution was infused intra-uterine to each cow in the treatment group and 50 ml of normal saline intra-uterine to each animal in the control group.

It was assured that the treatment and control animals were closely watched for onset of subsequent heat symptoms. Pregnancy was confirmed by per rectum examination 45 to 60 days after insemination. Data on conception rate and the

blood glucose level of the treated and control animals were collected and tabulated.

Based on the blood glucose level, the repeaters were classified into three groups viz: animals having a blood glucose level of upto 45 mg/100 ml, 46 to 55 mg/100 ml and 56 mg/100 ml or more. The conception rate in each group was calculated.

Subsequent to dextrose therapy the repeater animals that settled to service were separately classified according to their blood glucose levels previously estimated.

On the basis of parity, the data were grouped as heifer (H), the cows that have calved once (C_1), calved twice (C_2), calved thrice (C_3) and calved four times (C_4) and more. The respective conception rate and the blood glucose level for each group were calculated.

Depending on the age of animals, the data on blood glucose level and fertility were classified into three groups, viz: upto 4 years, 5 to 6 years and 7 years and above. The conception rate and glucose level with respect to each group were found out.

All the cows selected were beyond three months of calving. On the basis of the data collected with respect to the interval from calving to treatment, the animals were

grouped into four, such as 3 to 5 months, 6 to 8 months, 9 to 11 months and 12 and more months after last calving. The conception rate and the blood glucose level of each group were tabulated.

From among the 77 animals that did not settle to insemination following dextrose therapy, 44 were again selected at random and 34 of the animals in this group were given at random second treatment of 50 ml of 15 per cent dextrose with 500 mg Campicillin*, six hours after insemination. The remaining ten animals were considered as controls and no treatment was given to them. These animals also were watched for onset of subsequent symptoms of heat. Pregnancy was confirmed by rectal examination after 45 to 60 days of insemination. The data on conception rate were calculated.

The data collected were subjected to statistical analysis (Snedecor and Cochran, 1967).

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*Ampicillin injection. Cadila Veterinary, Ahmedabad, India.

RESULTS

RESULTS

The study on post insemination intra-uterine administration of dextrose was carried out to improve fertility in repeat breeders. The data collected are presented in tables 1 to 11 and Fig. 1 to 9.

Intra-uterine infusion of dextrose was given to 147 animals of which 70 conceived giving a conception rate of 47.62 per cent, whereas the controls registered a conception rate of only 15.38 per cent. The overall conception rate of animals was found to be 45.00 per cent (Table 1 and Fig. 1). On statistical analysis, the difference in conception rates between the treatment and control groups was highly significant ($P < 0.01$). The blood glucose levels of experimental animals selected for the study ranged from 30.55 to 67.86 mg/100 ml with a mean of 53.11 $\pm$ 0.65 mg/100 ml. The blood glucose levels of the treatment and control groups were 53.02 $\pm$ 0.69 mg/100 ml and 54.13 $\pm$ 0.85 mg/100 ml respectively.

The data on the blood glucose values of the treated animals were grouped into three viz., upto 45 mg/100 ml, 46 to 55 mg/100 ml and 56 mg and above/100 ml (Table 2). The conception rates for the respective groups were observed to be 66.67 per cent, 46.34 per cent and 41.77 per cent. Maximum conception rate of 66.67 per cent was found in the

group of animals that had a blood glucose level upto 45 mg/ 100 ml. The lowest conception rate of 41.77 per cent was noted for the animals in the group of 56 mg and above/100 ml of blood. Statistical analysis of the data revealed a significant association ($P \leq 0.01$) between the conception rate and blood glucose level (Table 2 and Fig. 2).

Animals settled to insemination followed by glucose therapy recorded an average blood glucose level of 51.92 $\pm$ 1.09 mg/100 ml whereas the animals which did not settle to inseminations followed by intra-uterine glucose infusion registered a blood glucose level of 54.03 $\pm$ 0.86 mg/100 ml. The blood glucose level of control animals was 54.13 $\pm$ 2.12 mg/100 ml. Statistical analysis of the data on blood glucose level revealed no significant difference between the groups (Table 3 and Fig. 3).

The data on blood glucose levels of normal fertile cows and treatment animals were 59.79 $\pm$ 1.63 mg/100 ml and 53.02 $\pm$ 0.69 mg/100 ml respectively (Table 4). There was highly significant difference between the blood glucose levels of normal and treatment groups of animals ($P \leq 0.01$).

Treated animals comprised of 53 heifers and 94 cows. The conception rates for heifers and cows were 39.62 per cent and 52.13 per cent respectively. Proportion analysis revealed that conception rate was much higher in cows than in heifers.

The average blood glucose values of heifers and cows were 53.33 ± 1.11 mg/100 ml and 52.85 ± 0.88 mg/100 ml respectively (Table 5 and Fig. 4). There was no significant difference in the blood glucose values of cows and heifers.

The experimental animals were classified according to parity into five groups viz: heifers (H), cows after first calving (C_1) , second calving (C_2), third calving (C_3) and fourth calving (C_4) and above. The conception rates were 39.62 per cent, 53.13 per cent, 38.24 per cent, 71.43 per cent and 57.14 per cent respectively in the five groups. The highest conception rate of 71.43 per cent was observed in C_3. Positive association was noted between parity and fertility (Degree of association = 0.7119). Significant difference was observed in conception rates between heifers and C_3 as well as between C_2 and C_3. The blood glucose values of C_1, C_2, C_3 and C_4 and above were 53.23 ± 1.51 mg/100 ml, 53.44 ± 1.43 mg/100 ml, 51.85 ± 1.83 mg/100 ml, 51.25 ± 4.09 mg/100 ml respectively. On analysis the difference in the blood glucose level was not significant among groups (Table 6 and Fig. 5).

Based on the age, the animals were grouped into three viz: upto 4 years, 5 to 6 years and 7 years and above. The respective conception rates of the three groups were 37.08 per cent, 64.44 per cent and 61.54 per cent. Analysis of the data showed a positive association between age and

fertility. Highly significant difference ($P < 0.01$) was obtained in the conception rates of animals in age groups of upto 4 years and 5 to 6 years. The blood glucose level of animals in the age groups of upto 4 years, 5 to 6 years and 7 years and above were found to be 53.31 ± 0.88 mg/100 ml, 53.14 ± 1.27 mg/100 ml and 50.63 ± 2.21 mg/100 ml respectively. Statistical analysis revealed that the difference in the level of blood glucose between the groups was not significant (Table 7 and Fig. 6).

The data on treatment animals were grouped into four on the basis of period in months from last calving to treatment. The conception rates of 27.27 per cent, 58.70 per cent, 42.86 per cent and 56.52 per cent were obtained in groups 3 to 5 months, 6 to 8 months, 9 to 11 months and 12 and more months respectively. Maximum percentage of conception was observed in the group of 6-8 months. Next in order was the group of 12 and more months after calving. The lowest conception rate was observed in the group 3 to 5 months after calving (Table 8 and Fig.7). A positive association between months after calving and fertility was observed ($\chi^2 = 4.3644$; $C = 0.5941$). Mean blood glucose levels of 52.97 ± 3.16 mg/100 ml, 54.40 ± 1.59 mg/100 ml, 51.16 ± 2.61 mg/100 ml and 50.78 ± 1.75mg/100 ml were recorded for animals in groups 3-5 months, 6-8 months, 9-11 months and 12 and more months after last calving.

However, the difference in the levels of glucose between groups was not significant (Table 8 and Fig. 7).

All the treated animals in the study were grouped into five on the basis of number of unsuccessful insemination during the post-partum period. The conception rates of treated animals that had upto 3 (group1); 4 to 5 (group 2); 6 to 7 (group 3); 8 to 9 (group 4) and 10 and above (group 5) unsuccessful inseminations were 41.38 per cent, 52.78 per cent, 46.15 per cent, 71.43 per cent and 100 per cent respectively. Statistical analysis revealed significant difference in the conception rates between group 1 and group 2. The mean blood glucose of animals in the groups 1 to 5 were 54.65 $\pm$ 0.77 mg/100 ml, 50.97 $\pm$ 1.67 mg/100 ml, 48.16 $\pm$ 2.65 mg/100 ml, 51.13 $\pm$ 3.82 mg/100 ml and 45.16 $\pm$ 2.78 mg/100 ml respectively (Table 9 and Fig. 8). Statistical analysis of the data showed that the difference in blood glucose levels between groups was not significant.

The data on fertility using different types of semen were classified into three viz., Egg Yolk Citrate (EYC) semen, Coconut Milk Extender (CME) semen and frozen semen (Table 10). Highest fertility rate of 59.38 per cent was recorded in animals inseminated with frozen semen followed by 49.28 per cent with EYC semen and 36.96 per cent with CME semen. On analysis it was observed that the difference

in conception rate between the animals that received CME semen and frozen semen was significant ($P < 0.05$). The mean blood glucose levels of the animals that received the EYC semen, CME semen and frozen semen were 51.91 ± 1.07 mg/100 ml, 53.08 ± 1.20 mg/100 ml and 55.34 ± 1.25 mg/100 ml respectively (Table 10 and Fig. 9).

Out of the 77 animals in which the intra-uterine administration of dextrose was not successful, 34 were selected at random for the second treatment with a combination of dextrose and antibiotics, out of these 17 conceived giving a conception rate of 50 per cent as against 10.00 per cent only in the control animals (Table 11). The difference in conception rate between the two groups was statistically significant ($P < 0.05$).

TABLES

Table 1. Conception rates and blood glucose levels in repeaters in treatment and control groups

Sl No	Groups	Total animals	Number conceived	Conception rate (%)	Blood glucose mg/100 ml Range	Mean
1	Treatment (Post-insemination dextrose)	147	70	47.62	30.55 to 67.86	53.02 ± 0.69
2	Control (Post-insemination Normal Saline)	13	2	15.38	30.33 to 61.54	54.13 ± 0.85
	Total	160	72	45.00	30.33 to 67.86	53.11 ± 0.65

Conception rate between groups was highly significant ($P < 0.01$).

Blood glucose level between groups was not significant.

Table 2. Conception rate at different levels of blood glucose in repeaters treated with dextrose

Sl No	Blood glucose mg/100 ml	Number of animals	Number conceived	Conception rate (%)
1	Upto 45	27	18	66.67
2	46 to 55	41	19	46.34
3	56 and above	79	33	41.77
	Total	147	70	47.62

$\chi^2 = 21.6488$ ($P < 0.01$).

Conception rate between groups 1 and 3 was significant ($P < 0.05$).

Table 3. Blood glucose level in repeaters settled and not settled to post-insemination dextrose treatment and in controls

Sl No	Group	Number of animals	Blood glucose mg/100 ml Range	Mean
1	Settled	70	31.11 to 66.67	51.92±1.09
2	Not settled	77	30.55 to 67.86	54.03±0.86
3	Controls	13	33.33 to 61.54	54.13±2.12
	Total	160	30.55 to 67.86	53.11±0.65

Blood glucose level between groups was not significant.

Table 4. Blood glucose level in normal fertile and experimental repeaters during oestrum

Sl No	Group	Number of animals	Blood glucose mg/100 ml	
			Range	Mean
1	Normal fertile	15	50.00 to 71.40	59.79 ± 1.63
2	Experimental repeaters	147	30.55 to 67.86	53.02 ± 0.69
	Total	162	30.55 to 71.40	53.65 ± 0.66

Blood glucose level between groups was highly significant ($P < 0.01$).

Table 5. Conception rate and blood glucose level in repeater heifers and cows treated with dextrose

Sl No	Group	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100 ml	
					Range	Mean
1	Heifers	53	21	39.62	35.22-66.67	53.33±1.11
2	Cows	94	49	52.13	3055-67.86	52.85±0.88
	Total	147	70	47.62	30.55-67.86	53.02±0.69

Conception rate between groups was not significant.

Blood glucose level between groups was not significant.

Table 6. Parity, conception rate and blood glucose level of repeaters treated with dextrose

Sl No	Group	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100ml	
					Range	Mean
1	H	53	21	39.62	35.22-66.67	53.33±1.11
2	C_1	32	17	53.13	30.55-65.38	53.23±1.51
3	C_2	34	13	38.24	36.88-66.67	53.44±1.43
4	C_3	21	15	71.43	31.11-67.86	51.85±1.83
5	C_4 and above	7	4	57.14	33.33-60.24	51.25±4.09
	Total	147	70	47.62	30.55-67.86	53.02±0.69

Conception rate between H and C_3 was significant ($P < 0.05$).

Conception rate between C_2 and C_3 was significant ($P < 0.05$).

Blood glucose level between groups was not significant.

Degree of association between parity and fertility : 0.7119.

Table 7. Age, conception rate and blood glucose level of repeaters treated with dextrose

Sl No	Age (years)	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100 ml	
					Range	Mean
1	Upto 4	89	33	37.08	30.55-66.67	53.31±0.88
2	5 to 6	45	29	64.44	31.11-67.86	53.14±1.27
3	7 and above	13	8	61.54	33.33-60.24	50.63±2.21
	Total	147	70	47.62	30.55-67.86	53.02±0.69

Conception rate between 1 and 2 was highly significant ($P < 0.01$).

Conception rate between 1 and 3 was highly significant ($P < 0.01$).

Table 8. Duration after calving, conception rate and blood glucose level of repeaters treated with dextrose

Sl No	Duration after last calving (months)	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100ml	
					Range	Mean
1	3 to 5	11	3	27.27	31.11-67.86	52.97±3.16
2	6 to 8	46	27	58.70	33.33-66.67	54.40±1.59
3	9 to 11	14	6	42.86	30.55-64.29	51.16±2.61
4	12 and above	23	13	56.52	36.46-60.71	50.78±1.75
	Total	94	49	52.13	30.55-67.86	52.85±0.88

$\chi^2 = 4.3644$.

Blood glucose level between groups was not significant.

Table 9. Number of unsuccessful inseminations during post-partum period, conception rate and blood glucose level in repeaters treated with dextrose

Sl No	Number of unsucceful inseminations	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100ml	
					Range	Mean
1	Upto 3	87	36	41.38	31.11-67.86	54.65±0.77
2	4 to 5	36	19	52.78	30.55-66.67	50.97±1.67
3	6 to 7	13	6	46.15	35.22-66.67	48.16±2.65
4	8 to 9	7	5	71.43	39.60-64.29	51.13±3.82
5	10 and above	4	4	100.00	40.26-51.43	45.16±2.78
	Total	147	70	47.62	30.55-67.86	53.02±0.69

Conception rate between groups 1 and 2 was significant ($P < 0.05$).

Table 10. Type of semen used, conception rate and blood glucose level in repeaters treated with dextrose

Sl No	Type of semen	Number of animals	Number conceived	Conception rate (%)	Blood glucose mg/100ml Range	Blood glucose mg/100ml Mean
1	EYC	69	34	49.28	30.55-65.38	51.91±1.07
2	CME	46	17	36.96	33.33-67.86	53.08±1.20
3	Frozen	32	19	59.38	40.26-66.67	55.34±1.25
	Total	147	70	47.62	30.55-67.86	53.02±0.69

Conception rate between 2 and 3 was significant ($P < 0.05$).

Table 11. Conception rate in repeaters treated with a combination of dextrose and antibiotics

Sl No	Group	Number of animals	Number conceived	Conception rate (%)
1	Treatment	34	17	50.00
2	Control	10	1	10.00
	Total	44	18	40.91

Conception rate between 1 and 2 was significant ($P < 0.05$).

ILLUSTRATIONS

Fig.1. Conception rates & Blood glucose levels of repeaters in treatment and control groups

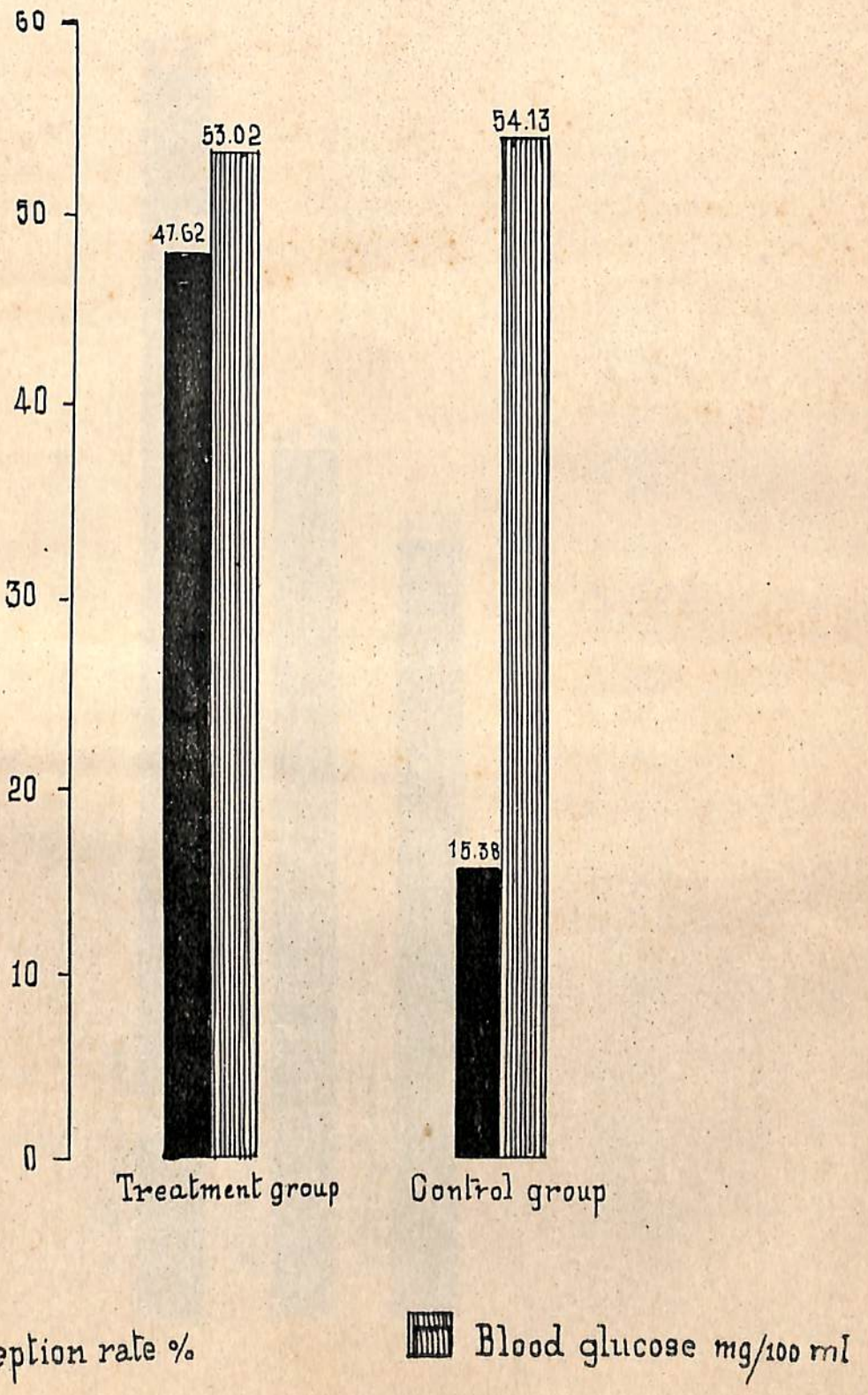

Fig.2. Conception rate of repeaters treated with Dextrose, in different blood glucose levels

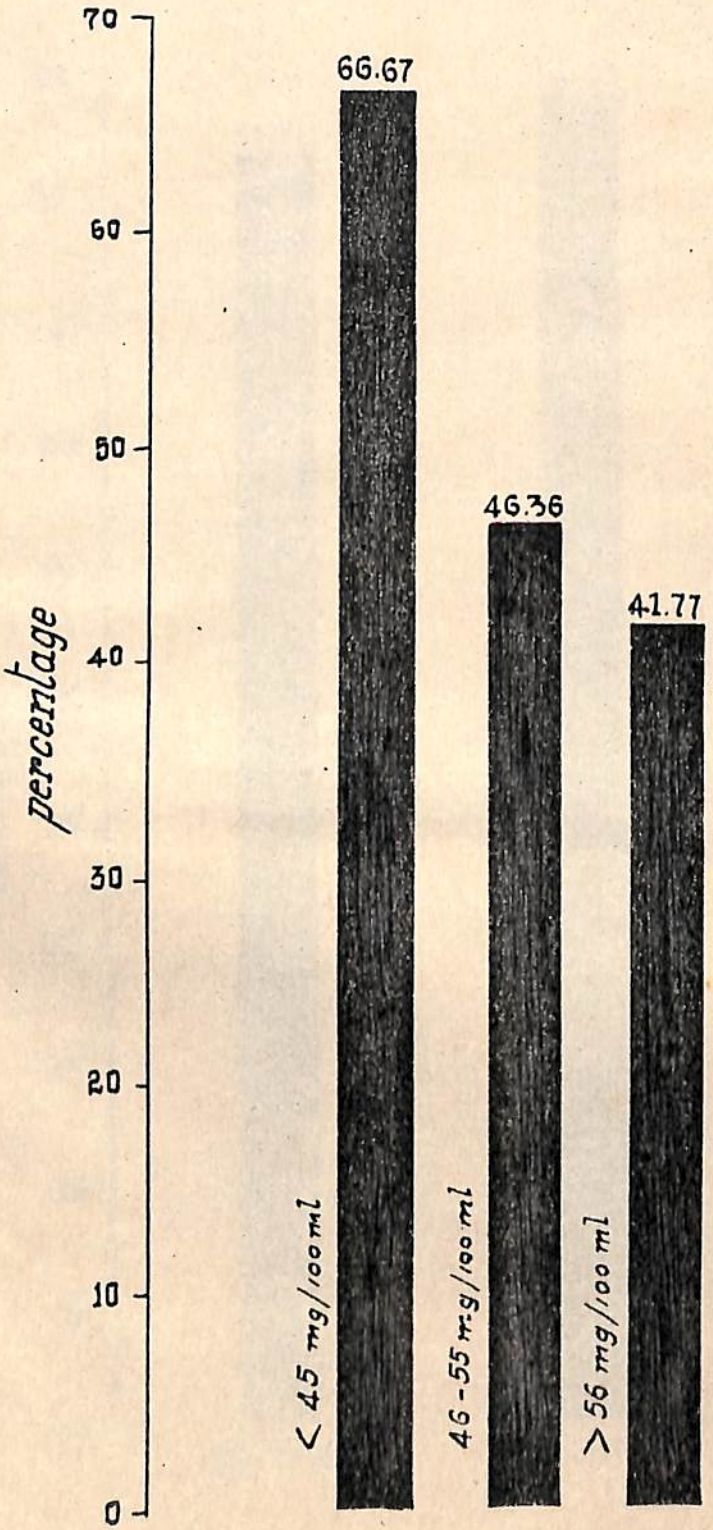

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Fig.3. Blood glucose levels in repeaters settled and not settled to post-insemination

Dextrose treatment & Controls

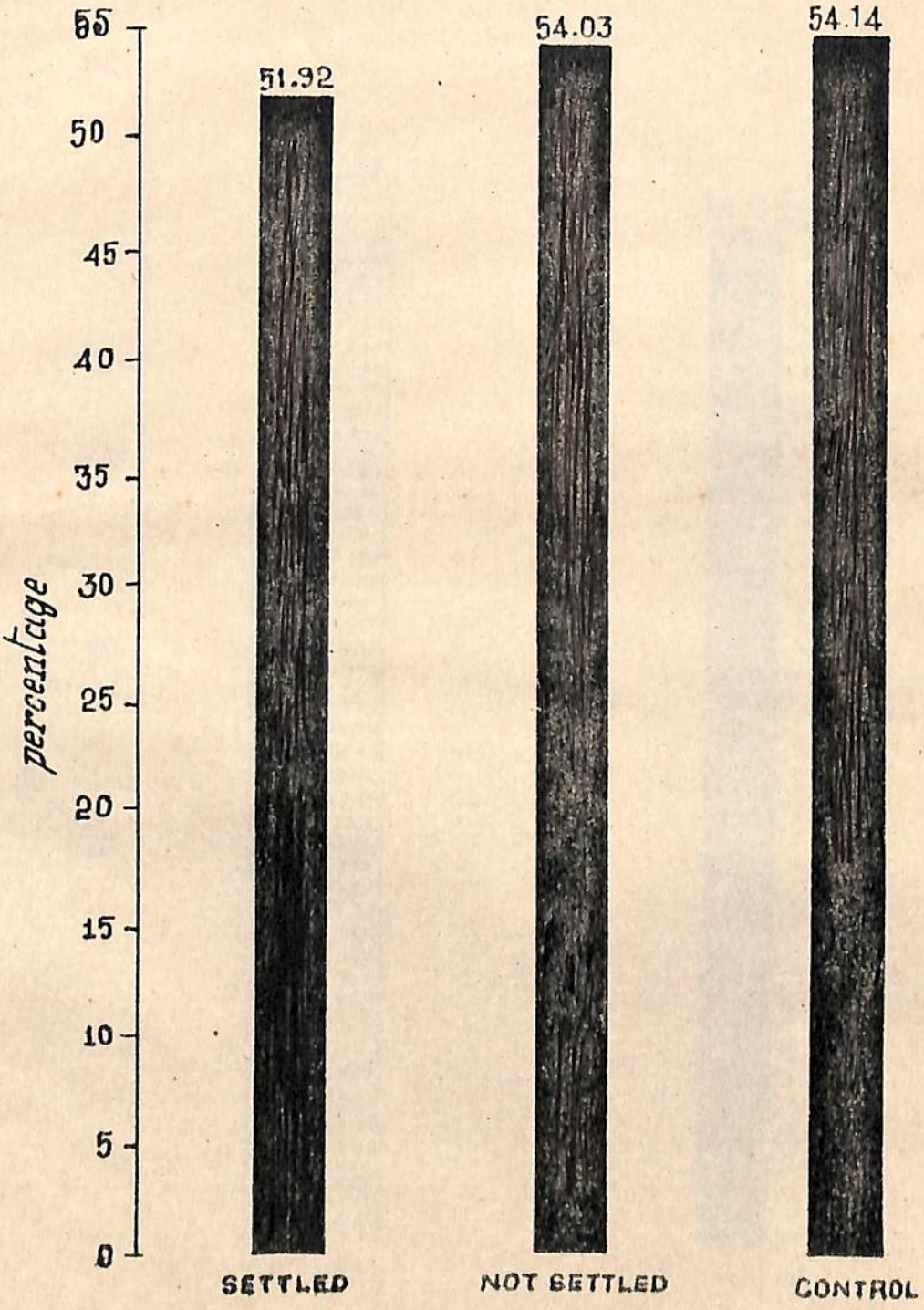

Fig. 4. Conception rates and blood glucose levels in Heifers and Cows treated with Dextrose

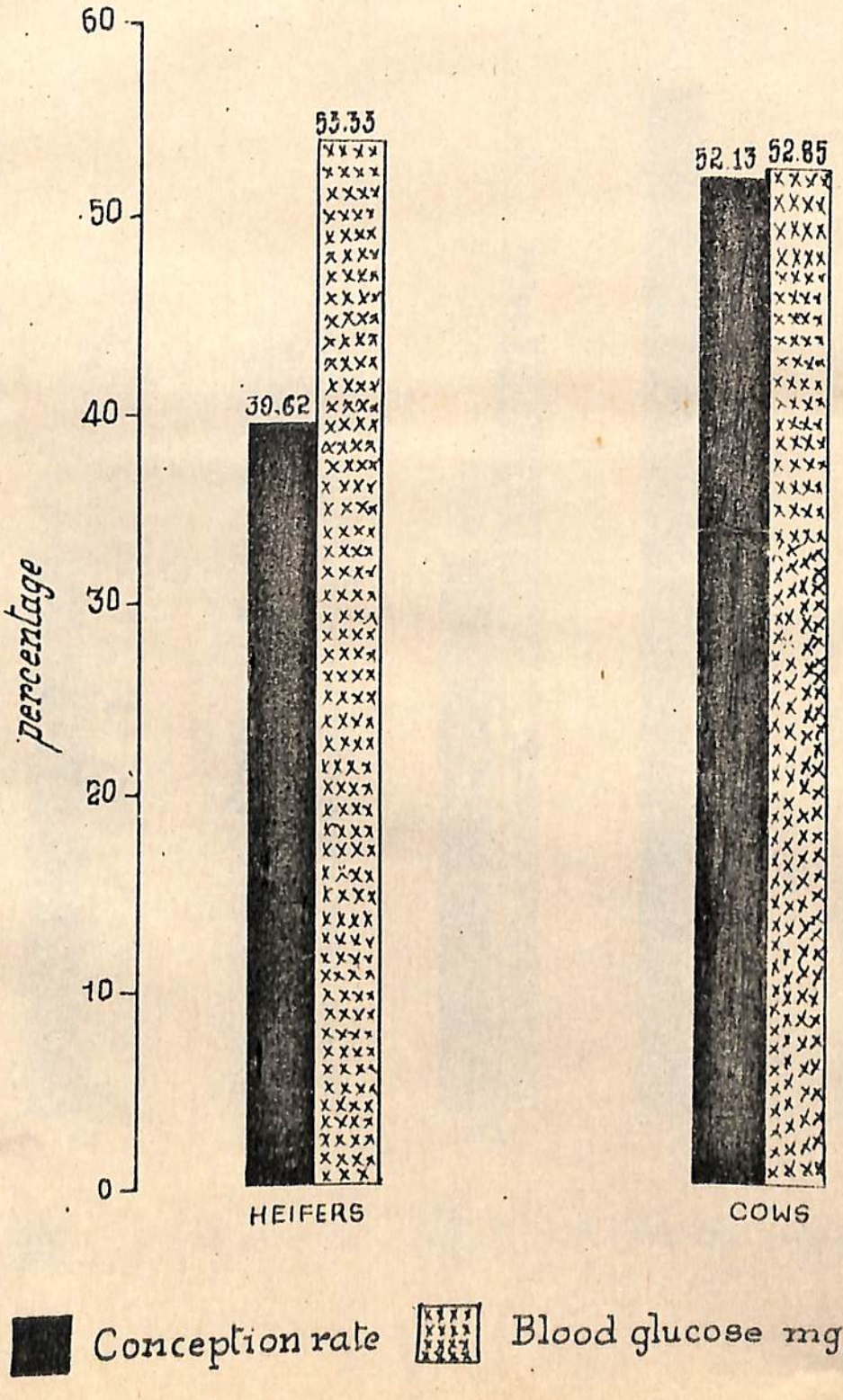

Fig.5. Parity, conception rates and blood glucose level in repeaters treated with Dextrose

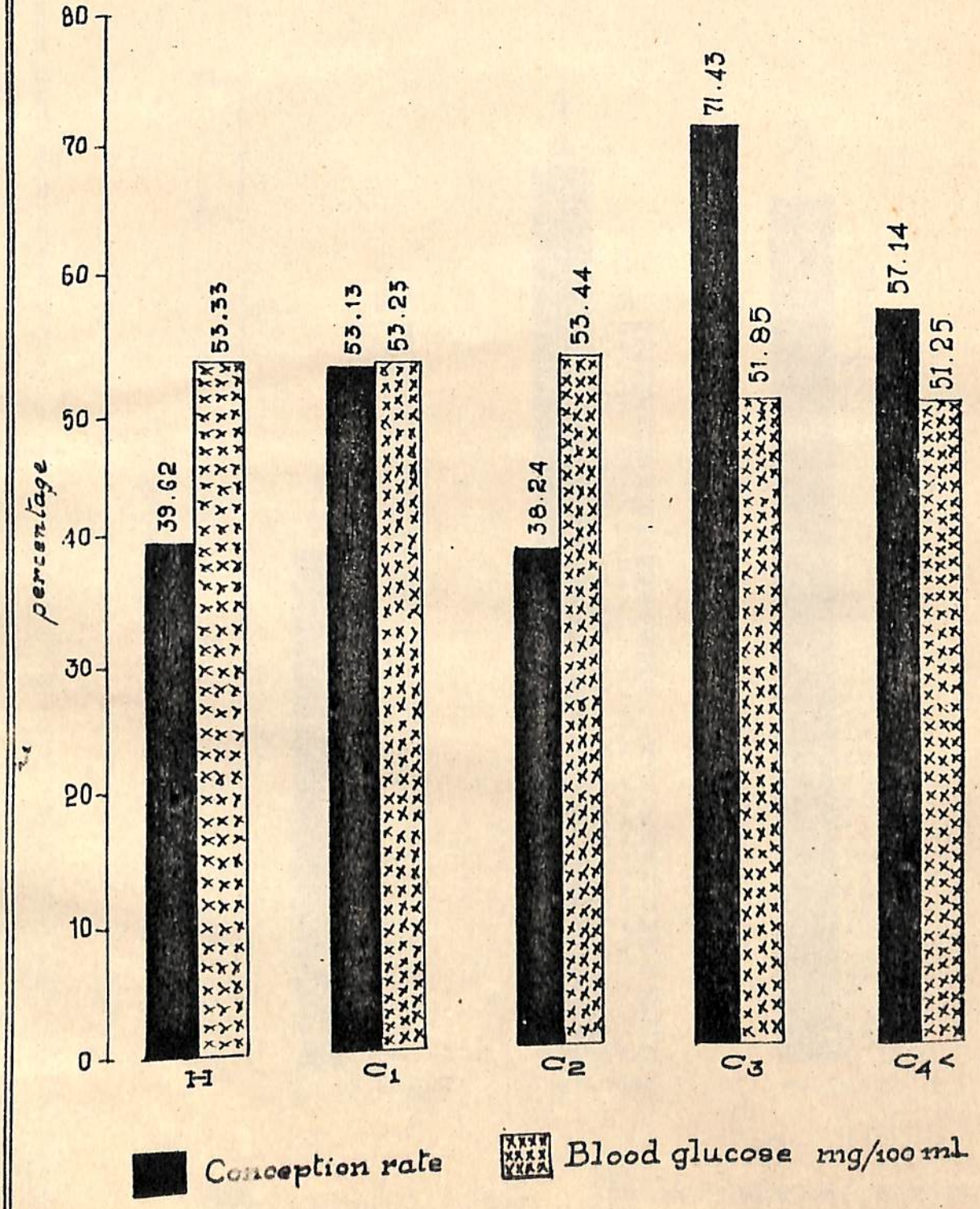

Fig.6. Age, conception rate and blood glucose levels in repeaters treated with Dextrose

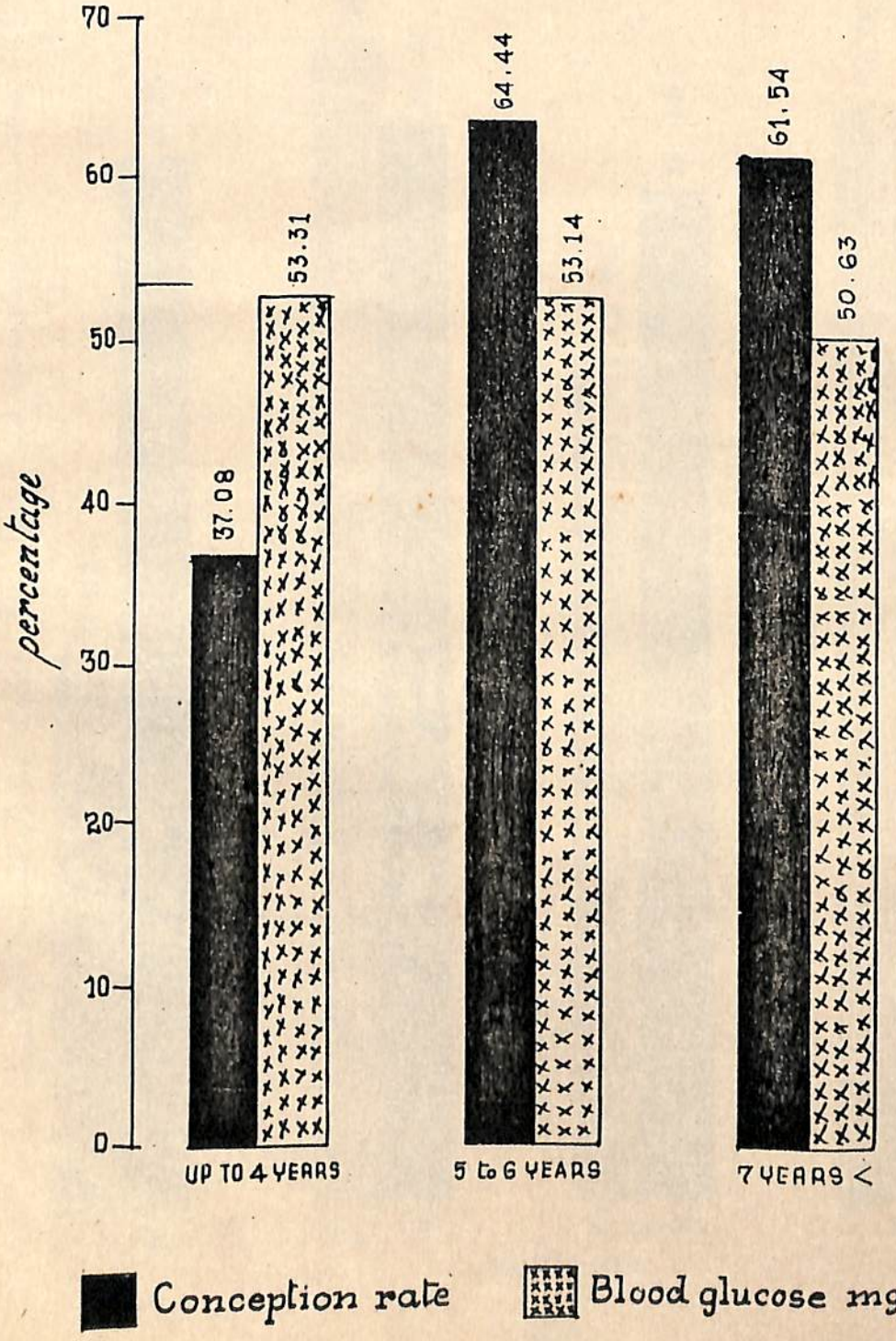

Fig.7. Months after last calving, conception rates and blood glucose of repeaters treated with Dextrose

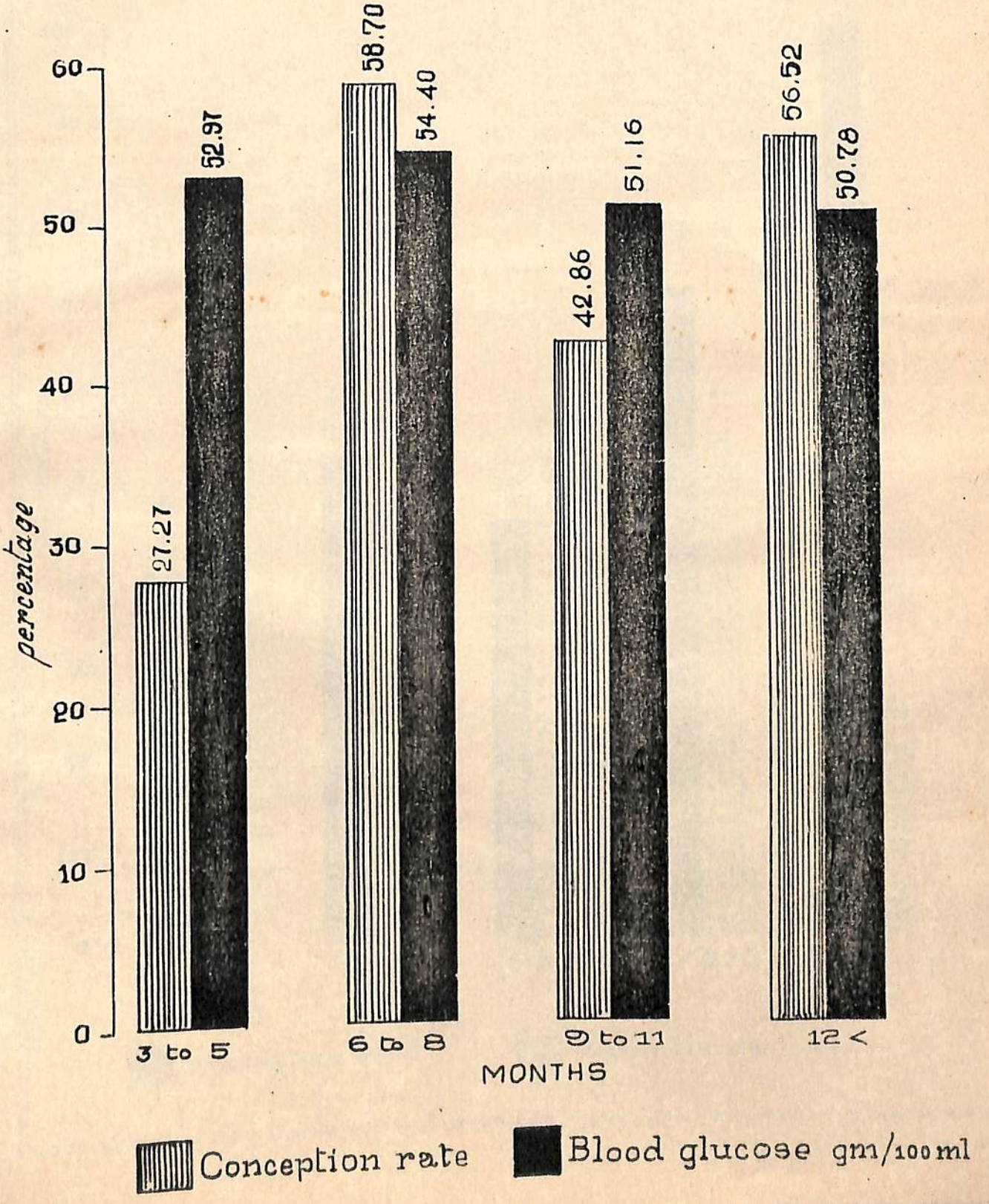

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Fig.8. Number of previous infertile inseminations during post-partum period, conception rate & blood glucose levels of repeaters treated with Dextrose

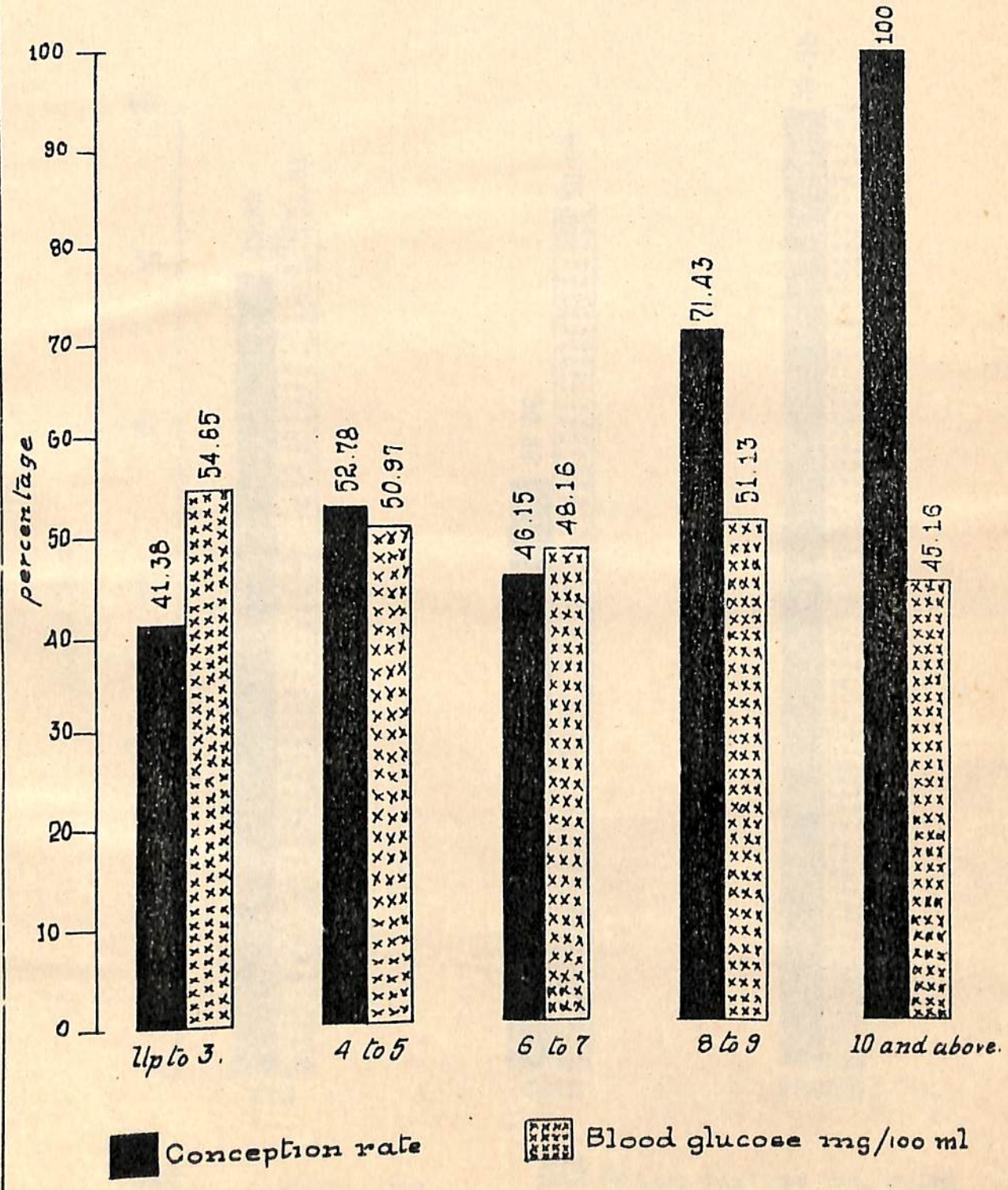
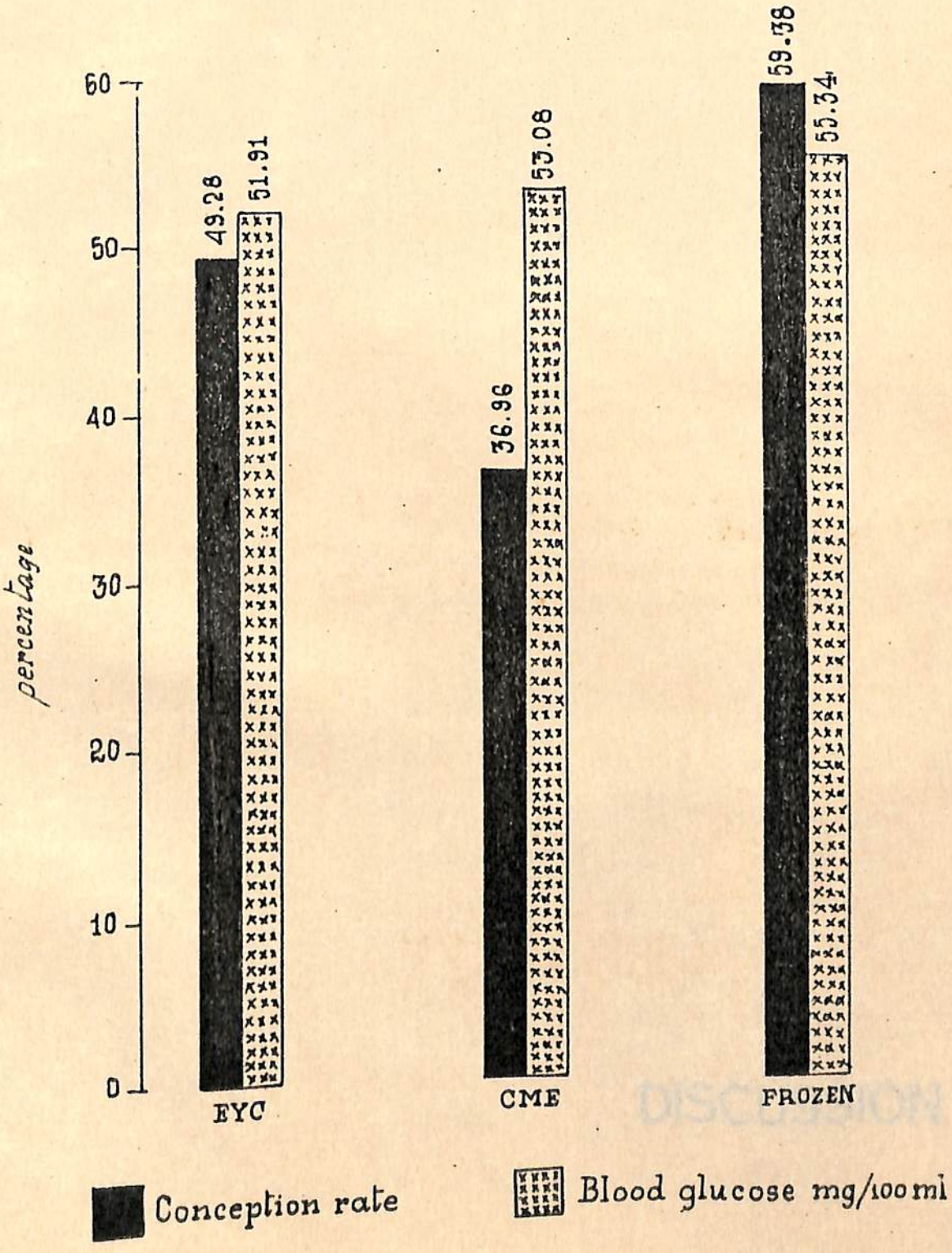


Fig. 9. Type of semen used, conception rate and blood glucose level in repeaters treated with Dextrose



DISCUSSION

DISCUSSION

Conception rate of animals treated with dextrose intrauterine after insemination was found to be 47.62 per cent whereas in the controls it was only 15.38 per cent (Table 1 and Fig. 1). There is highly significant difference in the conception rates of animals in the treated and the control groups ($P < 0.01$). The blood glucose level prior to treatment observed in the treated and control groups was 53.02 $\pm$ 0.69 mg/100 ml and 54.13 $\pm$ 0.85 mg/100 ml respectively. The difference in blood glucose levels of the treatment and controls was statistically not significant. The significant enhancement of conception rate is considered as the beneficial effect of administration of dextrose in the treated animals. Several reports have appeared correlating the glucose level of luminal fluid to fertility. A higher level of glucose in the uterine fluid favoured conception rate, whereas low level of glucose was seen in animals with reduced fertility rate (Gupta *et al*. 1962; Goel and Rao, 1972; Thangaraj, 1976; Khullur *et al*. 1978; Enkhia *et al*. 1982).

Glucose has a vital role to play in the nutrition and metabolism of the fertilized ova. Mouse and rabbit embryos were shown to utilize glucose as energy substrate and mucopolysaccharides present in the luminal fluids were considered as

an important factor in the nutrition of blastocyst during the pre-implantation period (Heap and Lamming, 1962; Anderson, 1971; Brinster, 1973). Roberts (1971) suggested that hypoglycemia at oestrus or shortly after service might exert harmful effects on conception by lowering of the glucose and glycogen levels in the mucosa of the genital tract, which reduced the energy available to the fertilised ova. In the present study administration of dextrose has enhanced fertility. The beneficial effect of treatment can be attributed to be due to the increase in glucose content in the luminal fluid and uterine mucosa. Similar beneficial effects in conception rate in repeat breeder cows have been reported by irrigation of uterus and cervix with sugar solution prior to insemination (Gorohv, 1962). Mathew et al. (1980) have recorded 65 per cent conception rate in repeaters by administration of dextrose with antibiotics after insemination.

The conception rate of 66.67 per cent was noted in treated animals having comparatively low blood glucose level of upto 45 mg/100 ml (Table 2 and Fig. 2). The conception rate was found to decrease with an increase in the level of blood glucose in the repeaters selected for the study. The observed association between the conception rate and blood glucose level was statistically significant. In animals with lowest blood glucose level before dextrose administration,

higher conception rate was observed. This may be attributed to the beneficial effect of dextrose that was infused intra-uterine after insemination. It is presumed that the dextrose therapy might have increased the level of glucose in the luminal fluid so that nourishment and life of fertilised ova in the uterus before implantation is improved, increasing, the conception rate. The fact that improvement of fertility on dextrose administration was more pronouced in repeater animals with low level of glucose (45 mg/100 ml), points out that there might be other factors involved in repeat breeding in the treatment group. The relative role of these factors in the three groups might be variable in that, it might be more significant in the group with higher blood glucose level than in those with low blood glucose level. As otherwise glucose supplementation should have the same beneficial effect in all the three groups.

The blood glucose level in animals that settled to inseminations followed by glucose treatment was found to be 51.92$\pm$ 1.09 mg/100 ml and for animals not settled was 54.03 $\pm$ 0.86 mg/100 ml. For the control animals it was 54.13 $\pm$ 2.12 mg/100 ml (Table 3 and Fig. 3). The analysis of the data revealed no significant difference in the blood glucose levels of these three groups. However, in settled animals the blood glucose level was found to be comparatively lower than that in animals not settled and that in controls. Animals with lower blood

glucose level was seen to respond more favourably to treatment by enhanced level of glucose in the luminal fluid and mucosa favouring fertility. Various workers have indicated profound influence of blood glucose on fertility. Optimum value of blood glucose is required for normal reproductive function. Low blood glucose levels in animals is always reported to result in low reproductive efficiency (McClure, 1968a; Downie and Gelman, 1976; Konstantinov and Radoslavo, 1977; Velhankar, 1978). Reduction in blood glucose level induced by insulin injections to cows around oestrum, reduced conception rate to 38 per cent as against 75 per cent in controls (McClure, 1968b). This effect of lowered fertility is attributed to be due to the lowering of glucose level in the blood and uterine mucosa reducing energy to fertilized ova and resultant mortality. Downie and Gelman (1976) observed that plasma glucose level was significantly high in cows that subsequently conceived, than in animals that did not conceive.

The blood glucose levels of 15 normal fertile cows in heat and 147 repeaters of treatment group were found to be 59.79 ± 1.63 mg/100 ml and 53.02 ± 0.69 mg/100 ml (Table 4). The difference in glucose level between these groups was highly significant ($P < 0.01$). McClure (1965a) observed 77 per cent fertility rate in animals having a blood glucose level of 48 mg/100 ml and a conception rate of zero in animals

having a blood glucose level of 25 mg or less per 100 ml. Downie and Gelman (1976) reported higher blood glucose values of 65.60mg/100 ml in fertile cows and 50.70 mg/100 ml in infertile cows during oestrus. Hunter (1977) and Deshpande *et al*. (1978) reported that raising blood glucose level at mating favours conception. In accordance with the observations of McClure (1965a); Downie and Gelman (1976); Hunter (1977) and Deshpande *et al*. (1978) the blood glucose level in repeaters was found to be significantly lower than that of normal cows in the present study.

The conception rates of repeater heifers and cows in the treatment group were found to be 39.62 per cent and 52.13 per cent respectively after glucose treatment. There is significant difference in conception rates between these groups. The glucose levels in heifers and cows were 53.33 $\pm$ 1.11 mg/100 ml and 52.85 $\pm$ 0.88 mg/100 ml respectively (Table 5 and Fig. 4). Higher conception rate after treatment has been observed in cows having slightly lower blood glucose level eventhough the difference in the blood glucose level was not statistically significant between the groups. The higher conception rate in cows having lower blood glucose level indicated that intra-uterine infusion of glucose is more effective in cows.

Maximum conception rate of 71.43 per cent after treatment

is recorded in the animals in group C_3 with a blood glucose concentration of 51.85 ± 1.83 mg/100 ml. Next in order is C_4 and above with a conception rate of 57.14 per cent and a blood glucose level of 51.25 ± 4.09 mg/100 ml. Lowest conception rate of 38.24 per cent after treatment is observed in C_2 having a mean blood glucose level of 53.44 ± 1.43 mg/100 ml. As the parity status of the animal increased conception rate after treatment showed an upward trend. Even-though the difference in blood glucose level before treatment of animals in various parity groups has not shown any statistical significance, apparently the conception rate after treatment increased with a decrease in blood glucose levels in cows prior to treatment. In other words post-insemination dextrose therapy was found to be more effective in animals with low blood glucose levels.

The maximum fertility of 64.44 per cent was observed in animals in the age group of 5 to 6 years (Table 7 and Fig. 6). Next in order was the conception rate of 61.54 per cent in the age group of seven years and more and least was 37.08 per cent among animals below four years of age. Statistical analysis revealed highly significant difference in the conception rate between the animals of different age groups. The difference in the blood glucose levels between the groups were not significant. However, slight decline in the blood glucose level and

considerable increase in the fertility rate were observed in repeaters as the age advanced. The apparent increase in the conception rate after treatment in animals of higher age group with comparatively low blood glucose level may be an indication of better influence of intra-uterine dextrose therapy in these animals.

The conception rate in animals of 3 to 5 months after calving was only 27.27 per cent. In other groups with longer post-partum interval higher conception rate was obtained. A statistical correlation was observed between post-partum interval and fertility. The blood glucose level of repeater cows treated 3 to 5 months after calving was 52.97 $\pm$ 3.16 mg/100 ml. The value increased to 54.40 $\pm$ 1.59 mg/100 ml in animals treated 6 to 8 months after calving. The blood glucose concentration decreased to 50.78 $\pm$ 1.75 mg/100 ml in animals treated at 12 months or more after calving. However, there was no significant difference in blood glucose level between the groups. McClure (1968a) reported that blood glucose level and conception rate of cows in the early months of lactation is low. He further observed spontaneous improvement in the blood glucose level and conception rate as the post-partum interval increased. In the present study also the conception rate showed an increasing trend as the post-partum period increased but the rise in blood glucose level was observed only upto eight months of post-partum period. An increase in

the conception rate after treatment and decrease in the blood glucose level prior to treatment were observed in the animals beyond eight months of post-partum period. The higher conception rates in these groups of animals is due to the beneficial effect of intra-uterine glucose therapy.

In the present study, the conception rate in animals which received upto three inseminations was 41.38 per cent as against 52.78 per cent in animals that had 4 to 5 previous inseminations. On analysis the difference in conception rate between the two groups was found to be significant (Table 9 and Fig. 8). Maximum blood glucose concentration of 54.65 $\pm$ 0.77 mg/100 ml was observed in animals of group 1 and the minimum blood glucose concentration of 45.16 $\pm$ 2.78 mg/100 ml in animals of group 5. The glucose level of animals in group 2 was 50.97 $\pm$ 1.67 mg/100 ml. The animals in groups 2 to 5 had higher conception rate than that of animals in group 1 which had higher blood glucose value. This also indicate that lower blood glucose value could be enhanced by dextrose administration resulting in higher conception rate.

The conception rate after treatment in repeaters settled to insemination using frozen semen was 59.38 per cent (Table 10 and Fig. 9). Conception rates of 49.28 per cent and 36.96 per cent were recorded in animals that settled to insemination using EYC semen and CME semen respectively. On statistical analysis there was significant difference in the conception rate of animals after treatment that received CME

and frozen semen. However, there was no significant difference in the blood glucose level of animals prior to treatment in these groups.

Sub-clinical infection of the uterus and nutritional deficiencies have been attributed as causes for embryonic mortality. Extensive use of antibiotics in the field has not brought about the desired effect of settling repeaters to insemination. In the present study post-insemination infusion of dextrose with antibiotics in 34 repeater animals that did not respond to post-insemination intra-uterine dextrose therapy recorded 50 per cent fertility rate as against 10.00 per cent in ten controls. There is significant difference ($P < 0.05$) in conception rate in animals of treatment and control groups. The present observation of improved fertility confirms that there are factors like sub-clinical endometritis, other than blood glucose, causing repeat breeding. The beneficial effect of antibiotics along with dextrose on conception could be attributed to the elimination of factors like sub-clinical endometritis. Similar observations have been made by Mathew *et al*. (1980).

SUMMARY

SUMMARY

The effect of post-insemination intra-uterine administration of glucose after insemination to improve the breeding efficiency of repeat breeders was studied.

Repeaters brought at the Cross Breeding Scheme, Chalakudy, University Livestock Farm, Mannuthy and Artificial Insemination Centre, Kokkalai, Trichur, which had not settled with two or more inseminations were utilised for the present study. Among these 160 repeaters free from genital infections as evidenced by detailed gynaeco-clinical examination selected for the study, 147 were included in the treatment group and 13 in the control group at random. The animals in the treatment group were inseminated using semen of cross-bred bulls. Six hours after insemination 5 ml of blood from each animal was collected and glucose estimated. Blood glucose level of normal cows in heat that settled with one or two inseminations was estimated for comparison. Immediately after the collection of blood, 50 ml of 15 per cent dextrose solution was administered intra-uterine to each cow in the treatment group and 50 ml of normal saline solution intra-uterine to animals in the control group. Pregnancy was confirmed 45 to 60 days after insemination. The data were classified according to blood glucose level, conception, parity, age, number of previous infertile inseminations and type of semen used for inseminations.

Among the 147 animals in the treatment group that received intra-uterine dextrose therapy following insemination, 70 (47.62 per cent) conceived while among the 13 controls, two (15.38 per cent) settled giving an overall conception rate of 45.00 per cent. The variation in conception rate between the treatment and control groups was statistically significant ($P < 0.01$). The blood glucose levels of the two groups were 53.02 ± 0.69 mg/100 ml and 54.13 ± 0.85 mg/100 ml respectively. There was significant enhancement in the conception rate due to glucose treatment. The highest conception rate (66.67 per cent) was obtained in the group of animals which had the lowest blood glucose level (upto 45 mg/100 ml) and the lowest conception rate 41.77 per cent was in the group which had the highest blood glucose level (56 mg and more/100 ml). Statistical analysis revealed a significant association ($P < 0.01$) between conception rate and blood glucose level.

The mean blood glucose of animals which settled to insemination followed by intra-uterine glucose therapy was only 51.92 ± 1.09 mg/100 ml, whereas the value for those which did not conceive was 54.03 ± 0.86 mg/100 ml. In control animals, the blood glucose level was 54.13 ± 2.12 mg/100 ml. Animals with low blood glucose responded more favourably to the treatment. The blood glucose level of normal cows which settled with one or two inseminations was significantly higher (59.79 ± 1.63 mg/100 ml) than that of the repeaters (53.02 ± 0.69 mg/100 ml).

The conception rate in cows (52.13 per cent) was higher than that of heifers (39.62 per cent). The blood glucose levels of cows and heifers were 52.85 ± 0.88 mg/100 ml and 53.33 ± 1.11 mg/100 ml respectively. The conception rates in cows grouped according to parity were 53.13 per cent, 38.24 per cent, 71.43 per cent and 57.14 per cent respectively for those calved once, twice, thrice and four times and more. Statistical analysis showed a positive association between parity and fertility. The blood glucose levels in the respective groups were 53.23 ± 1.51 mg/100 ml, 53.44 ± 1.43 mg/100 ml, 51.85 ± 1.83 mg/100 ml and 51.25 ± 4.09 mg/100 ml. The conception rate of cows in the age group upto four years, five to six years and seven years and above were 37.08 per cent, 64.44 per cent and 61.54 per cent respectively, revealing a positive association between age and fertility. The blood glucose levels of the corresponding groups were 53.31 ± 0.88 mg/100 ml, 53.14 ± 1.27 mg/100 ml and 50.63 ± 2.21 mg/100 ml. The conception rates of the repeaters treated three to five months, six to eight months, nine to eleven months and twelve months and more after calving were 27.27 per cent, 58.70 per cent, 42.86 per cent and 56.52 per cent respectively, the variation being statistically significant ($P < 0.01$). The mean blood glucose levels of the respective groups were 52.97 ± 3.16 mg/100 ml, 54.40 ± 1.59 mg/100 ml, 51.16 ± 2.61 mg/100 ml and 50.78 ± 1.75 mg/100 ml. The blood glucose level did not

show any significant variation between the groups. The conception rates of the treated animals that had upto 3, 4 to 5, 6 to 7, 8 to 9 and 10 and above unsuccessful insemination were 41.38 per cent, 52.78 per cent, 46.15 per cent, 71.43 per cent and 100 per cent respectively. Analysis of the data revealed a significant difference in the conception rates between groups one and two ($P < 0.05$). Fertility rates of 59.38 per cent was observed in animals inseminated with frozen semen, 49.28 per cent with EYC semen and 36.96 per cent with CME semen. The variation between groups inseminated with CME semen and frozen semen was statistically significant($P < 0.05$).

Thirty-four repeaters of the treatment group which did not conceive were administered a combination of dextrose and antibiotics six hours after insemination. Out of these 50 per cent conceived compared to only 10 per cent in the control group. The difference in the conception rate in the treatment and control groups was statistically significant ($P < 0.05$). The present observation of improved conception in treated animals confirmed that, there are factors in addition to blood glucose level causing repeat breeding. This could be attributed to the beneficial effect of antibiotics on elimination of sub-clinical endometritis.

It is concluded that post-insemination intra-uterine administration of dextrose was effective in improving the conception rate in repeat breeding cows.

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INFLUENCE OF DEXTROSE ON FERTILITY OF REPEAT BREEDING COWS

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ABSTRACT OF A THESIS

Submitted in partial fulfilment of
the requirement for the degree

Master of Veterinary Science

Faculty of Veterinary and Animal Sciences
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Mannuthy - Trichur

1983

ABSTRACT

A study was conducted to assess the efficacy of intra-uterine administration of dextrose after insemination in improving the breeding efficiency of repeaters. Post-insemination intra-uterine administration of 50 ml of 15 per cent dextrose to 147 repeat breeders resulted in a conception rate of 47.62 per cent as against 15.38 per cent in 13 controls. The difference in the conception rate of animals in the treatment and control group was highly significant ($P < 0.01$).

For analysis, the data on the treatment and control animals were grouped on the basis of blood glucose level, parity, age, post-partum interval in months, number of previous unsuccessful inseminations and type of semen used for insemination. The conception rate of 66.67 per cent was obtained in animals having low blood glucose level (upto 45 mg/100 ml) as against 41.77 per cent in those which had high blood glucose level (56 mg/100 ml and more). Significant statistical association between the conception rate and blood glucose level was observed. The blood glucose level of normal cows (59.79 $\pm$ 1.63 mg/100 ml) which settled to one or two inseminations was significantly higher than that of repeaters (53.02 $\pm$ 0.69 mg/100 ml). The conception rate was higher in cows (52.13 per cent) than in heifers (39.62 per cent) though,

the blood glucose levels did not show significant variations between the two groups. The parity did not influence the blood glucose level significantly, however, a positive association was observed with parity and fertility. A positive correlation was observed between the age and fertility also. However, blood glucose level did not show a significant variation between age group. Highest fertility rate (59.38 per cent) was obtained in animals inseminated with frozen semen and lowest (36.96 per cent) in those animals inseminated with CME semen. However, there was no significant difference in blood glucose levels. Administration of a combination of dextrose and antibiotics after insemination was found to increase the conception rate in repeaters which failed to conceive to post-insemination dextrose therapy.

Post-insemination intra-uterine administration of dextrose alone or dextrose with antibiotics increased conception rate in repeat breeders.