ISSN 1819-1878

Asian Journal of Animal Sciences

http://knowledgiascientific.com

Knowledgia SCIENTIFIC
A Place to Publish Outstanding Research

Asian Journal of Animal Sciences 4 (2): 56-63, 2010
ISSN 1819-1878

Fertility Status of Artificially Inseminated Crossbred Cows of Kashmir Valley

[1]H.K. Bhattacharyya, [1]M.R. Fazili, [2]I. Khan and [3]F.A. Bhat
[1]Teaching Veterinary Clinical Complex,
Faculty of Veterinary Sciences and Animal Husbandry,
Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir,
Shuhama-Alusteng, Srinagar-190 006, Jammu and Kashmir, India
[2]Faculty of Fisheries, SKUAST-K, Shuhama-Alusteng, Srinagar,
Jammu and Kashmir, India
[3]Department of Animal Reproduction, Gynaecology and Obstetrics,
Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-K,
Shuhama-Alusteng, Srinagar-190 006, Jammu and Kashmir, India

Abstract: The present study was conducted on 472 cattle (cows 370 and heifers 102) reared in a rural tract comprising of 6 villages in and around the veterinary faculty of the university. Artificial insemination was carried out to all the animals with frozen thawed semen having at least 50% post-thaw motility. Conception Rate (CR) and number of services per conception (NSC) were evaluated. Effect of breed, parity, season, estrus intensity and time of insemination in CR was also determined. Overall CR and NSC recorded were 69.09 and 1.72%, respectively. The CR of the cows was significantly ($p<0.05$) affected by estrus intensity; being highest in good (75.00%) and lower (60.87%) and lowest (57.89%) in moderate and weak estrus, respectively. No significant variation in CR was observed with respect to breed, parity, season and time of insemination. However, highest values were obtained in crossbred Jersey (70.16%), 3rd parity (74.00%), Summer season (73.91%) and insemination at 16±2 (73.81%) hours following onset of behavioral estrus. Sex ratio (male: female) of the calves born from conceived animals was 1:1.53. From this study it is concluded that under agro-climatic conditions of Kashmir to achieve maximum CR cows should be inseminated during 16-22 h following onset of behavioral estrus.

Key words: Conception rate, artificial insemination, crossbred cows, Kashmir

INTRODUCTION

The term fertility is a qualitative term denoting ability of an animal to produce young one (Sane *et al*., 1982). Fertility of a herd is depended primarily on conception rate and number of services per conception. Conception Rate (CR) is influenced by various factors including breed (Rao *et al*., 1992), parity (Biochard and Manfredi, 1994; Fengxum, 1997), season (Alam and Ghosh, 1988; Gordon, 1996), stage and/or intensity of estrus (Gunasekaran *et al*.,

Corresponding Author: M.R. Fazili, 78 H.I.G. Colony, (Lane 6, Green Park)
Near Telephone Exchange, Bemina, Srinagar 190018,
Jammu and Kashmir State, India Tel: +91-09419095830

2008) and time of insemination (Miah *et al*., 2004). Fertility of today's animals is lower than the ones that existed one or few decades earlier. Gordon (2005) reported that calving rates to first service is declining significantly by 0.7-0.9% per year. The most significant factors explaining such decline are believed to be the genetic changes associated with new strains of breeds, increased herd size and possibly increase use of do-it-yourself insemination. In Ireland first service CR has decreased to 48% in 2003 from 60-69% in 1980 (Mee, 2003; Gordon, 2005).

Artificial insemination has been widely adopted in upgrading the low yielding non-descript cattle population using quality semen of Jersey and Holstein Frisian breeds during last three decades in the temperate Kashmir valley. In some areas of Kashmir valley upto 93% cattle are already upgraded and are mostly medium milk producers (Bhattacharyya *et al*., 2009). However, detailed basic information related to conception rate is not available. This study was therefore undertaken to assess CR of cows reared in a rural tract (comprising of 6 villages around veterinary faculty of SKUAST-K) that were presented for artificial insemination at the Teaching Veterinary Clinical Complex.

MATERIALS AND METHODS

A total of 472 cattle (cows 370 and heifers 102) brought for insemination to the clinics of the faculty during the period from 1st May, 2005 to 30th April, 2007 constituted the material of present investigation. Insemination with frozen thawed semen having at least 50% post-thaw motility was carried out by a single gynaecologist. The animals that did not conceive upto 3rd insemination were considered repeat breeders (Roberts, 1971). All the animals were free from any gross abnormality of reproductive tract. At the end of the study period overall CR and number of services per conception (NSC) were determined. Factors like breed, parity, estrus intensity, time of insemination and season of the year were also recorded. Seasons comprised of Winter (16 Nov-15 March), Spring (16 March-May), Summer (June-Aug) and Autumn (Sep-15 Nov). The most important and appreciable signs of estrus were assigned scores from 1 to 3 (Table 1) in ascending order. Every animal was given a total score of 5-15 determined after adding individual values of the various estrus signs. Depending upon the individual total scores, estrus was categorized as good, moderate and weak with a total score of 13-15, 8-12 and 5-7 for, respective category. To assess the effect of time of insemination on CR, animals were inseminated at 10±2, 16±2, 22±2 and 28±2 h following the onset of behavioral estrus. Sex ratio of the calves born from the conceived animals was also ascertained. Statistical analysis was done by using Pearson chi-square test (Snedecor and Cochran, 1994).

Table 1: Estrus category

	Scores		
Estrus signs	3	2	1
A. Behavioural estrus			
1. Bellowing	Continuous	Intermittent	Absent
2. Restlessness/ aggressiveness	More	Some	Absent
3. Mounting and/or allowing mounting by other animals attempt to mount milkers as well	Mounting and/or allowing mounting by other animals with by other animals	Mounting and/or allowing mounting	Absent
B. Physical estrus			
1. Tonicity of uterus	Pronounced	Moderate	Mild
2. Relaxation of os-cervix	Completely dilated	Partially dilated	Un-dilated
Maximum total score	15	10	5

RESULTS AND DISCUSSION

Conception Rate (CR) and No. of Services per Conception (NSC)

The first service CR was recorded as 33.90%. This value is similar to the value reported earlier in Holstein Frisian (HF) crossbred cattle of Bangladesh (Miah *et al*., 2004). Dohoo (1983) recorded 19-54% first service CR in Holstein cows. He also reported lower first service CR and higher NSC in cows bred before 50 days post-partum compared with cows bred after 50 days post-partum. In our study, overall CR recorded was 69.09%. This value was higher than one reported in indigenous breeds (Kumar and Singh, 2009). However, overall CR as high as 82-91% was also reported earlier in Holstein cows in Canada (Dohoo, 1983). The cows included in our study belonged to uneducated rural farmers maintaining one or two cows per family. Consequently, the high CR reported from organized farm is not expected here.

In this study, average NSC was 1.72 (561/ 326). Similar values were reported by several earlier workers (Azage *et al.,* 1981; Purbey and Sane, 1981; Kumar and Singh, 2009). However, higher NSC ranging from 2.1 to 2.8 have also been reported (Kumar and Bhat, 1979; Swensson *et al*., 1981; Choudhuri *et al.,* 1984). The value of NSC greater than 2 is regarded as poor (Cook, 2009). According to Upham (1991) this value should always be less than 2.25 and should never exceed 3 (Pennington *et al*., 1985). However, NSC of as high as 3.6 is also reported in hill cattle of India (Qureshi, 1979). In our study, 33.90, 20.55 and 14.62% animals conceived at 1st, 2nd and 3rd insemination, respectively. Conception rate gradually decreased from first to third insemination.

Percentage of repeat breeding was 30.93% and this value was similar to the finding recorded earlier in this locality (Bhattacharyya and Buchoo, 2008). Butani *et al*. (2008) recorded very high incidence of repeat breeding (49%) in crossbred cows from rural tracts of Gujarat. Very low values of less than 5% are also reported in pure HF (Francos, 1974) and HF crosses (Narladkar *et al*., 1994). The variation in reported percentage of repeat breeding could be due to variation in breed, age, parity, breeding practices, semen quality, technical know-how of inseminator, season, nutrition, agro-climatic condition of the area and modalities of analyzing data (Abhilas *et al*., 2008).

Effect of Breed on CR

Conception rate varied non-significantly between crossbred Jersey and crossbred HF cows. Non-significant difference in CR among different genotypes of cows was also reported earlier (Gwazdauskas *et al*., 1975; Ghosh, 1995; Miah *et al*., 2004). Rao *et al*. (1992) observed higher CR in indigenous cows than other genotypic groups. In fact, it is difficult to find out the effect of cow's genotype on their fertility. Instead environmental and managerial conditions might have more influence on fertility (Miah *et al*., 2004).

Effect of Parity on CR

In this study, CR of heifers and cows in their 1st to 3rd parity is approximately the same i.e., 70-74% (Table 2, Fig. 1). However, CR reduced although non-significantly beyond 3rd parity. Fengxum (1997) also observed higher CR in 1st, 2nd and 3rd than in later parities. Biochard and Manfredi (1994) reported higher (54%) CR in 1st parity cows and lowest (38%) in 7th parity. Gunasekaran *et al*. (2008) recorded non-significant association between parity and conception upto 4th parity. From these findings it can be concluded that CR from zero (heifer) to 3rd parity are usually constantly higher and decreased subsequently (Smith, 1982; Miah *et al*., 2004). In the present study, incidence of repeat breeding increased with

Table 2: Influence of breed, parity, season, estrus intensity and time of insemination on conception rate in crossbred cows

Parameters	No. of animals (n)	1st insemination CR (n)	Overall CR (n)	Repeat breeder in % (n)	Chi-square value	p-value
Breed						
CB/J	372	34.95 (130)	70.16 (261)	29.84 (111)		
CB/HF	100	30.00 (30)	65.00 (65)	35.00 (35)	1.249	0.536
Overall	472	33.90 (160)	69.09 (326)	30.93 (146)		
Parity						
Heifer	68	35.29 (240	70.59 (48)	29.41 (20)		
1st	132	36.86 (48)	71.21 (94)	28.79 (38)		
2nd	104	38.42 (40)	73.08 (76)	26.92 (28)	16.955	0.151
3rd	100	31.00 (31)	74.00 (74)	26.00 (26)		
4th	34	26.47 (90	47.05 (160	52.94 (18)		
5th	16	25.00 94)	50.00 (8)	50.00 (8)		
≥6th	18	22.22 (4)	55.56 (10)	44.44 (8)		
Season						
Winter	86	25.58 (22)	60.47 (52)	39.53 (34)		
Spring	98	36.73 (36)	73.47 (72)	26.53 (26)	6.522	0.367
Summer	138	37.68 (52)	73.91 (102)	26.09 (36)		
Autumn	106	32.08 (34)	67.92 (72)	32.08 (34)		
Estrus intensity						
Good	272	34.33 (95)	75.00 (204)	25.00 (68)	12.24	0.016
Moderate	92	35.87 (33)	60.87 (56)	39.13 (36)		
Weak	38	31.58 (12)	57.89 (22)	42.11 (16)		
Time of insemination						
10±2	140	32.14 (45)	69.28 (97)	30.71 (43)		
16±2	126	38.10 (48)	73.81 (93)	26.19 (33)	5.045	0.538
22±2	81	33.33 (27)	70.37 (57)	29.63 (24)		
28±2	71	25.35 (18)	60.56 (43)	39.44 (28)		

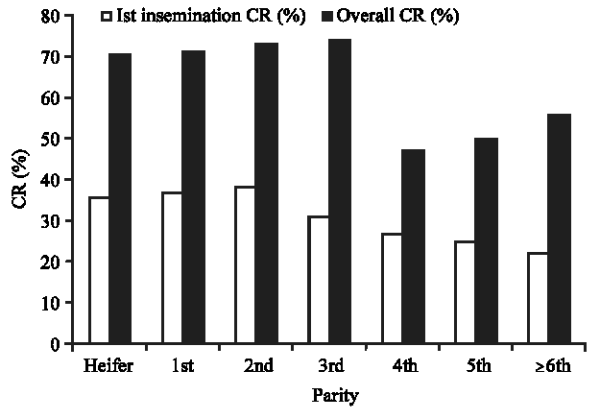

Fig. 1: Effect of parity on CR

advancement of lactation. The high incidence of repeat breeding among older cows may be due to metritis and other diseases which lead to reduction in fertility rate (Gunasekaran *et al.*, 2008).

Effete of Season on CR

Conception rate was found highest in Spring and Summer followed by Autumn (Table 2, Fig. 2). Naidu *et al.* (2000) also recorded non-significantly higher CR in Summer (58.4%). Our study supports earlier finding of Gordon (1996), who recorded higher fertility rate in Zebu cattle during Summer in countries nearer to equator. Alam and Ghosh (1988)

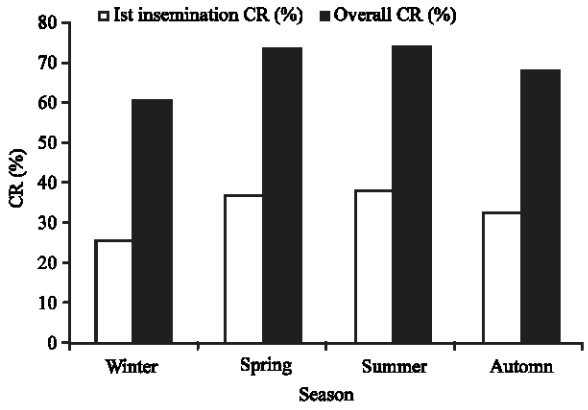

Fig. 2: Effect of season on CR

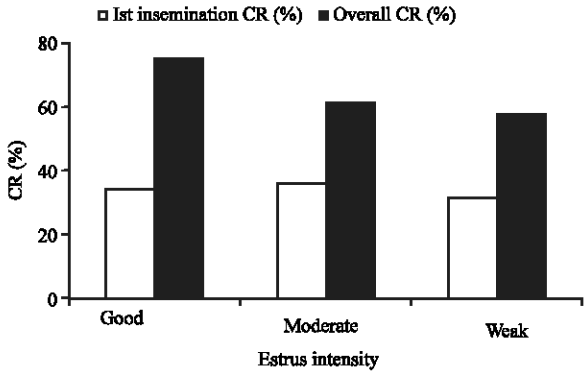

Fig. 3: Effect of estrus intensity on CR

reported that CR of cows significantly differed in different seasons. This variation might be due to changes in nutrition, environmental temperature, climate, photoperiod and many other factors including influence of bulls (Saxena and Tripathi, 1986). In the present study, low CR was recorded in Winter months. Under Kashmir agro-climatic condition cattle are stall fed during Winter and there is no supply of green fodder in this period leading to reduced intake of vitamins and minerals. These factors could lead to conception failure including repeat breeding. Moreover extreme cold (Gordon, 2005) and extreme hot (Zakari *et al*., 1981) weather can directly influence CR.

Effect of Estrus Intensity on CR

Significantly higher CR (P: 0.016) was observed in animals showing good estrus (Table 2, Fig. 3). Low CR was found in animals showing both moderate and weak estrus. Uterine tonicity and relaxation of os-cervix are two important physical indicators for measuring intensity of estrus (Das *et al*., 2009). Restlessness, bellowing and mounting and/or allowing mounting other animals are most frequently observed behavioral signs of estrus (Keown and Kononoff, 2007). Gunasekaran *et al*. (2008) recorded 0, 14.74 and 42.42% CR in animals showing weak, moderate and intense uterine tone, respectively. In the current study, at the time of presentation of the animals for insemination 67.66, 22.89 and 9.48% animals

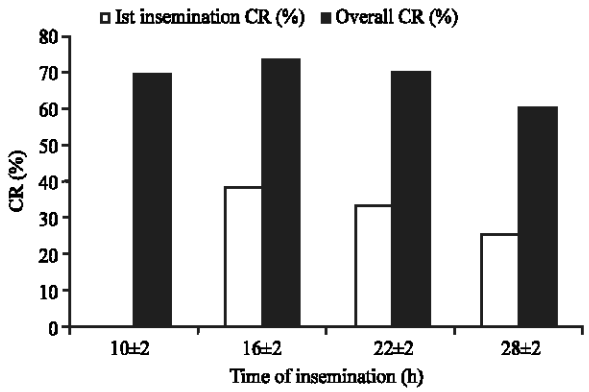

Fig. 4: Effect of time of insemination on CR

were in good, moderate and weak estrus, respectively. These findings reflect adequate literacy rate among the villagers regarding estrus detection.

Effect of Time of Insemination on CR

No significant difference was observed when insemination was carried out either at 10±2, 16±2, 22±2 or 28±2 h following onset of behavioral estrus; however, maximum conception was achieved when insemination was conducted at 16±2 h (Table 2, Fig. 4). This period of insemination is about 2-8 h longer than the period covered under routine am-pm rule of insemination. For the last 3 decades ovulation in cows was considered to occur 25-33 h after onset of estrus (Chenault *et al*., 1975; Beenard *et al*., 1983; Rajamahendran *et al*., 1989). However, in a recent report of Saumande and Humblot (2005) delayed ovulation time (38.5 h) in present day animals has been recorded in HF cows. Consequently CR will obviously be lower when insemination would be carried out by routine am-pm rule. Due to synchrony of insemination with ovulation, high CR was recorded in our study.

Miah *et al*. (2004) found highest CR (60.26%) when insemination was done between 11-14 h of estrus and lowest CR (27.47%) when insemination was done at later than 22 h. Das *et al*. (1990) observed significant variation in CR; 58.82, 69.69 and 33.70% when cows were inseminated in early, middle and late estrus respectively. Our study supports the finding that insemination in mid or mid-late estrus period is more preferable than either early or late estrus. It is more important to inseminate a cow on the basis of duration of estrus; however, this period varies from breed to breed and even from animal to animal. It can thus be concluded that nowadays insemination few hours (2-8) later than the time followed earlier is more beneficial for achieving optimum CR in crossbred cattle as estrus duration and ovulation time from onset of estrus is also longer in these animals.

Sex of Calves

In the present study more female (276) calves were born than male (180) and the ratio recorded was 1: 1.53. Ahmed *et al*. (2005) recorded 1:1.16 sex ratio in swamp buffalo. Bhuyan (1997) also recorded more female calves than male calves in his study.

From the study it can be concluded that breed, parity, season and time of insemination did not influence CR; while, stage of estrus significantly affected CR in crossbred cows reared under agro-climatic condition of Kashmir.

REFERENCES

Abhilas, R.S., A.S. Rao, K.M. Krishna and K.V. Naidu, 2008. Trace minerals profile and incidence of repeat breeding crossbred cows. Indian Vet. J., 85: 1166-1167.

Ahmed, K., D.K. Bhattacharyya and T.K. Amonge, 2005. Seasonal and diurnal variation in parturition of Swamp buffaloes. Indian Vet. J., 82: 1000-1001.

Alam, M.G.S. and A. Ghosh, 1988. Reproductive performance in cows: Its relation to parity and season. Bangladesh Vet. J., 22: 51-61.

Azage, T., E.S.E. Gala and B. Kebebe, 1981. A study on the reproduction of local zebu and F_1 crossbred (European x Zebu) cows. 1: Number of services per conception, gestation length and days open till conception. Ethiopian J. Agric. Sci., 3: 1-14.

Beenard, C., J.P. Valet, R. Beland and R.D. Lambert, 1983. Prediction of bovine ovulation by a rapid radio-immunoassay for plasma LH. J. Reprod. Fert., 68: 425-430.

Bhattacharyya, H.K. and B.A. Buchoo, 2008. Incidence of reproductive disorders of cattle in Kashmir valley. Indian J. Dairy Sci., 61: 1-2.

Bhattacharyya, H.K., M.R. Fazili and A. Hafiz, 2009. Farm animal in rural Kashmir-some observations. J. Dairying Foods Home Sci., 28: 127-129.

Bhuyan, D., 1997. Studies on certain aspects of reproduction in Swamp buffaloes of Assam. Ph.D. Thesis, Submitted to Assam Agricultural University, Guwahati – 22.

Biochard, D. and E. Manfredi, 1994. Genetic analysis of conception rate in french holstein cattle. Acta Agric. Scandinavica Anim. Sci., 44: 138-145.

Butani, M.G., R. Kumar, A.J. Dhami, F.S. Kavani and A. Killedar, 2008. Incidence of major infertility problems in crossbred cows a nd buffaloes under field conditions. Indian J. Field Vet., 4: 1-4.

Chenault, J.R., W.W. Thatcher, P.S. Kalra, R.M. Abrams and C.J. Wilcox, 1975. Transitory changes in plasma progestins, estradiol and luteinizing hormone approaching ovulation in the bovine. J. Dairy Sci., 58: 709-717.

Choudhuri, G., G.C. Banerjee and H. Guha, 1984. Studies on the breeding efficiency traits and some of the factors affecting them in the Hariana-type cows. Indian Vet. J., 61: 585-590.

Cook, J., 2009. Understanding conception rates in dairy herds. Practice, 31: 262-266.

Das, S.C., J.U. Ahmed and M.G.S. Alam, 1990. Conception rate in zebu cows frozen Shahiwal semen. Bangladesh Vet. J., 24: 90-93.

Das, P.K., K.C. Deka, R.K Biswas, J. Goswami and S. Deori, 2009. A comparative study on Oestrus oestrous cycle and reproductive organs of repeat breeding cows. Indian Vet. J., 86: 580-581.

Dohoo, I.R., 1983. The effects of calving to first service interval on reproductive performance in normal cows and cows with postpartal disease. Can. Vet. J., 24: 343-346.

Fengxum, X., 1997. Conception rate of cows and analysis of its correlations. China Dairy Cattle, 4: 30-31.

Francos, G., 1974. Observation of frequency of reproductive disorders in dairy herd in Israel. Dentsche Tieraztliche Wachenschrift, 81: 135-135.

Ghosh, D.K., 1995. Economic traits of crossbred cattle in the small dairy enterprises of Gazipur District. M.Sc. Thesis, Dept. of Physiology, Bangladesh Agricultural University, Mymensingh.

Gordon, I., 1996. Controlled Reproduction in Cattle and Buffaloes. CABI Publishing, Wallingford, Oxon, UK., ISBN-10: 0851991149, pp: 492.

Gordon, I., 2005. Reproductive Technologies in Farm Animals. CABI Publishing, London, ISBN-10: 0851998623, pp: 346.

Gunasekaran, M., C. Singh and A.K. Gupta, 2008. Effect of estrus behavior on fertility in crossbred cattle. Indian Vet. J., 85: 159-163.

Gwazdauskas, F.C., C.J. Wilcox and W.W. Thatcher, 1975. Environmental and managemental factors affecting conception rate in a sub-tropic climate. J. Dairy Sci., 58: 88-92.

Keown, J.F. and P.J. Kononoff, 2007. Estrus (heat) detection guidelines. IANR Neb Guide, Department of Extension, University of Nebraska-Lincoln Extenion, Institute of Agriculture and Natural Resources, USA. http://elkhorn.unl.edu/epublic/pages/publicationD.jsp?publicationId=717.

Kumar, S. and P.N. Bhat, 1979. Reproductive performance of Hariana cattle. Indian J. Anim. Sci., 49: 1001-1008.

Kumar, A. and U. Singh, 2009. Fertiltiy status of Hariana cows. Indian Vet. J., 86: 807-809.

Mee, J.F., 2003. Trends in reproductive performance in high yielding dairy cow herds. Reprod. Domestic Anim., 38: 362-362.

Miah, A.G., U. Salma and M.M. Hossain, 2004. Factors influencing conception rate of local and crossbred cows in Bangladesh. Int. J. Agric. Biol., 6: 797-801.

Naidu, V.G., K.B. Rao, V.V.V.S. Rao and K.K. Reddy, 2000. A note on effect of season on Oestrus and conception in Ongole cows. Indian J. Anim. Reprod., 21: 66-66.

Narladkar, B.W., S.A. Bakshi, D.R. Paragaonkar and S.U. Digraskar, 1994. Incidence of various reproductive disorders in Deoni cows and their crossbreds. Livestock Adviser, 19: 28-28.

Pennington, J.A., D.L. Hill, C.J Callahan, C.M. Brown and M.D. Brown, 1985. Effect of preinsemination injection of gonadotropin-releasing hormone on reproductive performance of dairy cattle. Bovine Practitioner, 20: 14-16.

Purbey, L.N. and C.R. Sane, 1981. Studies on conception rate by natural service in a Dangi herd. Indian J. Anim. Reprod., 1: 80-80.

Qureshi, S.H., 1979. A study on the conception rate in Kumaon hill cattle inseminated by deep frozen semen of Brown Swiss bulls. Indian Vet. J., 56: 37-40.

Rajamahendran, R., J. Robinson, S. Desbottes and J.S. Walton, 1989. Temporal relationships among estrus, body temperature, milk yield, progesterone and luteinizing hormone levels and ovulation in dairy cows. Theriogenology, 31: 1173-1181.

Rao, A.V.M., M.S. Naidu and Y.N. Murthy, 1992. Effects of breed type of season on conception rates in cows. World. Rev. Anim. Prod., 27: 23-25.

Roberts, S.J., 1971. Veterinary Obstetrics and Genital Diseases. 2nd Edn., CBS Publication and Distributors, India, pp: 496-506.

Sane, C.R., S.N. Luktuke, B.R. Deshpande, A.S. Kaikini and D.P. Velhankar *et al*., 1982. Reproduction in Farm Animals (Theriogenology). Varghese Publishing House, Bombay, India, pp: 103.

Saumande, J. and P. Humblot, 2005. The variability in the interval between estrus and ovulation in cattle and its determinants. Anim. Reprod. Sci., 85: 171-182.

Saxena, V.B. and S.S. Tripathi, 1986. Seasonal variation in semen characteristics and preservability in Red Dane bulls. Indian Vet. J., 63: 76-77.

Smith, R.D., 1982. Factors affecting conception rate. Proceedings of National Invitational Dairy Cattle Reproduction Workshop, Cornell University. http://www.wvu.edu/~Agexten/forglvst/Dairy/dirm10.pdf.

Snedecor, G.W. and W.M. Cochran, 1994. Statistical Methods. 8th Edn., Iowa State University Press, Iowa, USA., pp: 560.

Swensson, C., J. Schaar, E. Brannang and L.B. Meskel, 1981. Breeding activities of the Ethio-Swedish integrated rural development project. III: Reproductive performance of Zebu and crossbred cattle. World Anim. Rev., 38: 31-36.

Upham, G.L., 1991. M easuring dairy herd reproductive performance. Bovine Practitioner, 26: 49-56.

Zakari, A.Y., E.C. Molonkwu and D.I. Ossori, 1981. Effect of season on the estrus cycle of cows (*Bos indicus*) indigenous to Northern Nigeria. Vet. Record, 109: 213-215.