



## Studies on factors influencing conception rate in rural cattle

R L BHAGAT<sup>1</sup> and S B GOKHALE<sup>2</sup>

BAIF Development Research Foundation, Central Research Station, Urulikanchan, Pune, Maharashtra 412 202 India

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Fertility levels in farm animals express effects of genetic potential and environmental combination including nutrition, health, overall management etc. and per cent conception rate is the accepted indicator to assess the same. Study of factors affecting conception rate in cattle is necessary for planning breeding strategies. Available literature on inseminator and farmer related aspects affecting conception rates is inadequate to explain the role of these factors in different agro climatic conditions across the country at village level for drawing generalized strategy. An attempt in the present investigation was made to study the role of inseminator and farmer and related factors like breed of animal, parity, AI sequence, season of breeding etc. in relation to conception rate as an indicator of fertility in Indian animals under field conditions across six different states of the country.

Data on 24,282 artificial inseminations (AI) performed during April 2012 to March 2013 on 20,085 rural dairy cattle owned by 14,937 farmers spread over 30 Cattle Development Centres (CDC) of 29 tahsils in 15 districts of six Indian states (Maharashtra, Bihar, Uttar Pradesh, Odisha, Jharkhand and Punjab) were compiled for present investigation. The animals were individually maintained and reared by the respective farmers. The housing ranged from open to permanent constructed sheds. Animals were stall fed with dry and green fodder along with concentrate as per availability in individual state. The calls for artificial insemination were received through mobile phones and animals were inseminated with frozen semen at the doorstep of farmers. Cows not repeated within 60 to 70 days post insemination were rectal palpated for pregnancy confirmation. The conception rate was calculated by following formula (Qureshi *et al.* 2008)

$$\text{Conception rate \%} = \frac{\text{Number of cows detected pregnant}}{\text{Number of cows tested for pregnancy}} \times 100$$

The information on different factors like education level of CDC in-charge, (High school (8<sup>th</sup>–10<sup>th</sup>), Intermediate (11<sup>th</sup> and 12<sup>th</sup>), Diploma, Graduate, Post graduate),

Present address: <sup>1</sup>Research Officer (dr.bhagat@live.com, <sup>2</sup>Director Research (suresh.gokhale45@gmail.com).

economic status of farmer (above poverty line-APL, below poverty line-BPL, weaker), animal breed (Dangi, Gir, Khillar, Sahiwal, Non-descript, HF crossbreed, Jersey crossbreed), parity of animal (heifer, 1,2,3,4 and above), AI sequence (1, 2, 3,4 and above), season of AI (rainy, winter, summer) and sire breed used for AI (HF pure, Jersey Pure, HF crossbreed, Jersey crossbreed, Sahiwal, Dangi, Khillar, Gir) were compiled for studying effect of these factors on conception rate. The data were analyzed using statistical methods suggested by Snedecor and Cochran (1967) and significance within subgroups was tested by Duncan's multiple range test as modified by Kramer (1957).

The overall mean conception rate was recorded as 55.96±0.31 %. The figures reported in present investigation were much higher than those reported by Bhagat *et al.* (2008, 2009) in field crossbred cattle (45.16±0.46 and 43.58±0.40%), Shindey *et al.* (2014) in field animals from Wardha district in Maharashtra state (46.40±0.19%), Anzar *et al.* (2003) in Pakistan (29.00%), Nordin *et al.* (2004) in Malaysia (35.50%) and Woldu *et al.* (2011) in Ethiopian cattle (48.30%). Individual state wise conception rate recorded was Bihar 51.08±0.73%, Jharkhand 62.03±0.63%, Maharashtra 56.64±0.74%, Odisha 59.24±0.91%, Punjab 47.11±1.03% and Uttar Pradesh 54.70±0.77%. Scrutiny of state wise conception rate revealed that it differs significantly (P<0.01) between the states.

*Education level of center in-charge:* Educational level of inseminators significantly affected the conception rate. High school level inseminators covered 5.54% of total AI's and recorded highest conception rate of 63.94±1.31% compared to other education groups of inseminators, their long working experience and skill in this field could be the reason. Intermediate level inseminators, although performed nearly half the total inseminations (50.69%), conception rate achieved was 56.09±0.44%, less compared to high school education level group of inseminators. Lowest conception rate of 47.43±1.35% was recorded in the post graduate group; although their AI coverage was at par with that of high school level inseminators. It was noticed that in general, conception rate decreased with increase in inseminator's education level. Ricord *et al.* (2004) found negative correlation between inseminations performed and conception rate. Among six states under study, except

Maharashtra state all other states had inseminators of intermediate level. In Bihar, Odisha, Punjab and Uttar Pradesh states, graduate level inseminators were available while in Punjab and Uttar Pradesh states only, post graduate level inseminators were working. The inseminators' education level affecting conception rate significantly noticed in present investigation was in agreement with findings of Anzar *et al.* (2003) in Pakistan, who, also noticed education level affecting conception rate in field animals.

**Farmer economic status:** The economic status of farmer significantly affected conception rate. Nearly 92% inseminations (91.87%) were performed in below poverty line (BPL) and weaker category group of farmers and recorded significantly higher conception rate ( $58.33 \pm 0.59$  and  $55.92 \pm 0.39\%$ ) compared to above poverty line (APL) group of farmers ( $48.13 \pm 1.12\%$ ). The highest coverage of AI and significantly higher conception rate in BPL and weaker section of society reveals their major livelihood dependence on animals resulting in caring of animals in spite of less resources compared with APL group of farmers. Anzar *et al.* (2003) reported from Punjab province of Pakistan higher reproductive performance which apparently was attributed to availability of green fodder, supply of adequate ration and condition of farmers resulting overall better management of dairy animals with commercial view. It was noticed that BPL farmers were highest in all states except Punjab state where all farmers were in APL group.

**Animal breed:** Although the major fraction of cattle population under study in all six states comprised Holstein Friesian (HF), Jersey cross animals and Non-descript (ND) animals, small pockets of populations of Dangi, Khillar and Gir in Maharashtra and Sahiwal animals in Bihar, Jharkhand and Uttar Pradesh were also recorded under the study. The proportion of inseminations from HF crosses were highest (40.85), followed by non-descript (41.37), Jersey cross (13.68) and indigenous animals (4.1). The conception rate among breeds differed significantly and it was highest in draught breeds like Dangi ( $64.87 \pm 2.42\%$ ) and Khillar ( $63.48 \pm 3.61\%$ ) followed by ND animals ( $59.78 \pm 0.48\%$ ). The conception rate in indigenous milch breeds (Gir and Sahiwal) and crossbreds (Holstein and Jersey breed) was noticed to be at par ranging from  $50.00 \pm 6.74$  for Gir to  $55.95 \pm 0.86\%$  for Jersey crosses. Similar findings of higher conception rate in Jersey crosses and local animals were also reported by Bhagat and Gokhale (1999), Bhagat *et al.* (2009) and Anzar *et al.* (2003) in field animals however, Qureshi *et al.* (2008) reported higher conception rate in Holstein crosses in Jammu region. The breed of animal affected conception rate significantly, however, Miah *et al.* (2004) in Bangladeshi crossbred cows recorded insignificant effect of breed of animal on conception rate. Among states, although highest AI coverage of HF crossbred animals were from Bihar (3279), the conception rate was highest in animals from Jharkhand state ( $58.22 \pm 1.22\%$ ), in Uttar Pradesh highest AI coverage (3321) was from Jersey cross animals but conception rate was highest in animals from Jharkhand ( $60.81 \pm 2.09\%$ ). State

wise variation observed in conception rate could be the result of the factors like extent of dependency on livestock, agro-geology, animal feeding and social variations, etc.

**Animal parity:** Animal parity significantly affected conception rate, Shindey *et al.* (2014) also recorded similar results in animals from Vidharbha region of Maharashtra state, however Bhagat and Gokhale (2013) recorded non-significant effect of parity on conception rate. Highest ( $59.41 \pm 0.80\%$ ) conception rate was noticed in third lactation animals followed by second ( $57.73 \pm 0.66\%$ ), fourth and above ( $56.54 \pm 1.26\%$ ) and lowest ( $55.96 \pm 0.70\%$ ) was recorded in first lactation animals, however, Qureshi *et al.* (2008) recorded highest conception rate in first lactation in animals of Jammu and Kashmir state. Conception rate in heifers ( $53.25 \pm 0.53\%$ ) was noticed lowest among other parity of animals, this might be due to farmers paying more attention to the instant productive animals. The findings of Gunasekaran *et al.* (2008) and Bhagat and Gokhale (1999) supported the present investigation as they also noticed lowest conception rate in NDRI crossbred heifers and field crossbred heifers, respectively. State-wise results indicated that conception rate in heifers was low compared to lactating animals except in Maharashtra state wherein heifers highest conception rate ( $58.51 \pm 1.31\%$ ) was recorded.

**AI sequence:** Out of 24,282 inseminations 82.72% inseminations were performed in first attempt followed by second (13.80%), third (2.38%) and very few in fourth and above attempt (1.11%). The conceptions recorded in first attempt were significantly highest ( $56.49 \pm 0.35\%$ ) compared to inseminations performed in remaining attempts, these results corroborated with the findings of Shindey *et al.* (2014) who recorded significantly highest conception rate in first attempt. State-wise results revealed that animals from Punjab state conceived in two attempts, animals from Bihar and Maharashtra state required more than four attempts while animals from Jharkhand, Odisha and Uttar Pradesh required three attempts.

**AI season:** In general, season-wise number of inseminations distributed in all states studied were almost equal. The distribution of percent inseminations performed was 33.13 in rainy season (June to September), 32.84% in winter (October to January) and 34.04% in summer (February to May). Although highest conceptions were recorded in rainy season ( $56.48 \pm 0.55\%$ ) followed by summer ( $55.98 \pm 0.54\%$ ) and winter ( $55.42 \pm 0.55\%$ ), the differences were not important. Bhagat and Gokhale (1999), (2013) and Shindey *et al.* (2014) also reported similar findings although the later worker noticed that animals inseminated during summer season registered significantly higher conception rate.

**Service sire breed:** Sire (used for inseminating the animals) breed had significant influence on conception rate however, Miah *et al.* (2004) from Bangladesh reported that genotype of bulls used for AI did not affect the conception rate. The results across states studied indicated that more than half of the inseminations (55.68%) were performed by using HF purebred and HF crossbred bulls while 24.08

% by Jersey purebred and Jersey crossbred bulls; among these groups, highest conception rate ( $55.03 \pm 0.61\%$ ) was recorded in animals inseminated with HF purebred semen, followed by Jersey cross ( $54.80 \pm 1.20\%$ ), Jersey purebred ( $54.64 \pm 0.77\%$ ) and HF cross ( $52.94 \pm 0.59\%$ ). The conception rate in animals inseminated with semen of indigenous breeds like Dangi ( $67.21 \pm 1.99\%$ ), Gir ( $63.87 \pm 1.32\%$ ), Khillar ( $64.81 \pm 2.40\%$ ) and Sahiwal ( $61.48 \pm 0.94\%$ ) was highest compared with animals inseminated with pure and crossbred bulls from exotic HF and Jersey breeds, however coverage of inseminations was 2.29, 5.39, 1.63 and 10.93, respectively.

#### SUMMARY

The data of 14,937 farmers spread over 29 tehsils in 15 districts of six Indian states revealed mean conception rate as  $55.96 \pm 0.31\%$ . State wise conception rate recorded in Bihar was  $51.08 \pm 0.73\%$ ; Jharkhand;  $62.03 \pm 0.63\%$ ; Maharashtra,  $56.64 \pm 0.74\%$ ; Odisha,  $59.24 \pm 0.91\%$ ; Punjab,  $47.11 \pm 1.03\%$ ; Uttar Pradesh,  $54.70 \pm 0.77\%$  respectively, which was highly significant between the states. The education level of center in-charge, economic status of farmers, animal breed, animal parity, AI sequence and sire breed had significant effect on conception rate while effect of AI season did not significantly affect conception rate in rural animals across the states studied. It was recommended that due consideration need be given to consider effect of significant factors affecting conception rates while planning for improving conception rate in rural animals.

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