



Factors affecting conception rate in AI bred cattle under field conditions of Bihar

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Fertility in farm animals are the expression of results from 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. Low conception rate either due to non-expression of heat, reproductive problems or increased number of services per conception leads to increased age at first calving, service period, calving interval and ultimately lowering overall lifetime productivity of animals since reproduction performance principally accounts for production efficiency. Lower heritability of the trait is indicative of greater environment and management influence suggesting scope for improvement in management of animals by farmers. An attempt was made to study the factors affecting conception rate as an indicator of fertility in animals under field conditions of Bihar. Due to the joint animal efforts between Department of Animal Husbandry and Fisheries, Bihar and Bhartiya Agro Industries Foundation (BAIF), a total of 1,28,075 artificial inseminations performed on 1,02,386 animals during January 2010 to November 2015 maintained by 55,685 farmers' from 69 cattle development centres spread across 4 districts of the state were collected and analyzed. The animals were individually maintained and reared by the farmers. The housing ranged from open to permanent constructed sheds. Animals were stall fed with dry and green fodder along with concentrate. The calls for artificial insemination were received through mobile phones and animals were inseminated with frozen semen at doorstep of farmers. Cows not repeated within 60 to 70 days post insemination were examined for pregnancy confirmation by rectal palpation and conception rate was calculated as per the formula given by Qureshi *et al.* (2008). The information on factors like districts (Chhapra, Samastipur, Siwan, Vaishali), economic status of farmers (APL, BPL),

animal breed (HF cross, Indigenous, Jersey cross, Non-descript), lactation order/parity of animal (heifer, first, second, third, fourth, fifth, sixth and above), animal body condition score (all ribs exposed, no rib exposed, one rib exposed, two ribs exposed, three ribs exposed), heat stage (early, mid, late), season of AI (rainy-June to September, winter-October to January, summer-February to May) and sire used for AI (Gir, HF purebred, HF crossbred, Jersey purebred, Jersey crossbred, Sahiwal) were compiled for studying effect on conception rate. Logistic regression was considered the best model as conception rate is categorical response variable and the data was analyzed using 'R' software (version 3.4.1).

The overall mean conception rate was recorded as 52.16% which was remarkably higher than tropical condition animals in Pakistan (Anzar *et al.* 2003), Malaysia (Nordin *et al.* 2004), crossbred animals in Maharashtra (Bhagat *et al.* 2008, Bhagat *et al.* 2009), Ethiopian cattle (Woldu *et al.* 2011) and warm weather animals in Wardha district of Maharashtra (Shindey *et al.* 2014), and lower to that of animals from Bangladesh (Razi *et al.* 2010) and Maharashtra (Gokhale and Bhagat 2015).

District significantly affected the conception rate; however, Pandey *et al.* (2016) reported non-significant effect of districts on conception rate under Jharkhand conditions. Highest percentage of animals covered under AI was recorded from Chhapra district (62.34%) and lowest from Vaishali district (10.19%). The coverage of AI from other two districts was at par (13.90 and 13.57%). The probability of getting highest animals pregnant was noticed in Chhapra district (54.25%) and lowest in Vaishali district (41.02%) compared to Samastipur (52.41%) and Siwan (52.18%) districts which were at par. The individual farmers' management and agro-climatic conditions of respective district might be attributed to significant differences in conception rate of animals.

The economic status of farmers' significantly ($P < 0.05$) affected conception rate. The animals owned by below poverty line (BPL) group of farmers recorded significantly higher conception rate (53.14%) compared to above poverty line (APL) category of farmers (51.88%). Bhagat and Gokhale (2016) and Pandey *et al.* (2016) also noticed higher conception rate in animals owned by BPL category farmers.

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The significantly higher conception rate in BPL section of society reveals that being major livelihood source besides small animal holding and maintain of non-descript or local animals results in caring of animals in spite of less resources compared with APL group of farmers but coverage of animals under AI from BPL farmers' was less (46.04%) compared to APL group of farmers (53.96%). Higher coverage of AI and lower conceptions are negatively correlated (Ricord *et al.* 2004).

Although more than half (51.34%) portion of cattle population comprised non-descript (ND) besides major share (41.14%) from Holstein Friesian cross animals, a small fraction of indigenous (2.33%) and Jersey cross (5.20%) population was also recorded under study. Significantly higher chances of getting pregnant were noticed in Jersey cross (51.92%) and ND (51.02%) animals. The conception rate in HF cross and indigenous animals was at par (49.57% and 49.12%, resp.). Similar findings of significantly higher conception rate in local animals and Jersey crosses were also reported by Bhagat *et al.* (2009), Anzar *et al.* (2003), Razi *et al.* (2010), Pandey *et al.* (2016) and Potdar *et al.* (2016) in field animals. However, Qureshi *et al.* (2008) reported higher conception rate in Holstein crosses in hilly region of Jammu. Animal breed significantly affected conception rate, however Miah *et al.* (2004) reported insignificant effect of breed on conception rate in Bangladeshi crossbred cows.

Animal lactation order/parity significantly affected conception rate as also reported by Shindey *et al.* (2014), Bhagat and Gokhale (2016) and Potdar *et al.* (2016). However, Bhagat and Gokhale (2013) and Pandey *et al.* (2016) recorded non-significant effect of parity on conception rate. In multiparous animals, the likelihood of getting pregnancies increased with progress of lactation order and reached highest in third lactation (52.93%) and decreased thereafter and noted lowest (51.24%) in animals having sixth and above lactations. Under tropical climate of Bangladesh, Razi *et al.* (2010) recorded similar results but Mufti *et al.* (2010) recorded highest conception rate in first lactation in same animals. Qureshi *et al.* (2008) recorded highest conception rate in first lactation hilly animals of Jammu and Kashmir. Conception rate in heifers was noticed to be lowest (50.33%) among other multiparous animals which might be due to the fact that farmers paid more attention to the instant productive animals. The findings of Gunasekaran *et al.* (2008), Razi *et al.* (2010), Bhagat and Gokhale (2016) and Pandey *et al.* (2016) supported the present investigation as they also noticed lowest conception rate in heifers whereas Potdar *et al.* (2016) reported highest conception rate in heifers.

The overall animal management adopted by farmers' reflects on body condition score of animals and it provide an objective evaluation of amount of fat cover disregarding animal frame size but having involved more technicalities for judging at field level it requires skill and experience (Anitha *et al.* 2005). To overcome this problem, a simple method of visualization of exposure of ribs was applied

and all animals under study were divided into 5 subgroups as no rib exposed, one rib exposed, two ribs exposed, three ribs exposed and all ribs exposed for studying its effect on conception rate. The possibility of achieving significantly higher pregnancies (55.67%) was recorded in animals showing three ribs exposed, however coverage of AI was 18.31% followed by animals with ribs exposed (52.71%) and AI coverage was 45.06% which was highest compared with other groups. The results obtained were in agreement with report of Bhagat *et al.* (2016) who noticed highest conception rate in field buffaloes having three ribs exposed, whereas Bhagat *et al.* (2009) noticed highest conception rate in field animals having no rib exposed. It was further noticed that likelihood of getting animals pregnant declined steadily with increment in exposure of ribs and reached lowest (50.14%) in animals having all ribs exposed. Potdar *et al.* (2016) indicated insignificant highest conception rate in field animals having no rib exposed.

The deficiencies of various trace minerals, inadequate vitamin intakes, energy/protein imbalances and excessive protein intake could lead to infertility and poor reproductive performance reflecting through poor expression of oestrus symptoms (Balakrishnan 2003). The nature and variation in expression of oestrus behaviour therefore has significant effect on conception rate. In present study, 85.20% of inseminations were performed in animals having mid heat and recorded significantly highest conception rate (54.12%) followed by late heat animals (54.03%) and AI coverage was 11.98%. Lowest conception rate (50.72%) was recorded in restless animals having early heat. These results agreed with those reported by Bhagat *et al.* (2009) but differed with the results of Gunasekaran *et al.* (2008), Pandey *et al.* (2016) and Potdar *et al.* (2016) who noticed higher conceptions in animals exhibiting early heat.

The distribution of percent AI's performed was equivalent (rainy 34.85%, winter 30.19% and summer 34.96%). Although highest conception was recorded in winter (52.44%) followed by rainy (52.10%) and summer (51.78%), the difference failed to reach statistical significance level (5%). Bhagat and Gokhale (2013, 2016) also reported similar findings but Shindey *et al.* (2014), Pandey *et al.* (2016) and Potdar *et al.* (2016) noticed animals inseminated during summer season had higher conception rate.

Sire (whose semen is used for AI) breed had significant influence on conception rate as also reported by Bhagat and Gokhale (2016), Pandey *et al.* (2016) and Potdar *et al.* (2016). However, Miah *et al.* (2004) reported that genotype of bulls used for AI did not affect the conception rate. The results indicated that more than two-third (68.89%) of inseminations were performed by using HF bulls (pure and crossbreed) semen, while 16.06% AI's by Jersey bulls (pure and crossbreed) semen and remaining 15.05% AI's performed with semen of indigenous milch breeds (Gir and Sahiwal). Among these groups, probability of attaining highest conception rate (54.57%) was recorded in animals inseminated with HF purebred bulls' semen, followed by Sahiwal (53.72%), HF crossbreed (52.99%), Jersey

purebred (52.95%), Gir (52.66%) and lowest in Jersey crossbred (50.50%). The results contradicts the findings of Bhagat and Gokhale (2016), Pandey *et al.* (2016) and Potdar *et al.* (2016) who noticed highest conception rate in indigenous breeds used for inseminating the field animals.

SUMMARY

Data on 1,28,075 artificial inseminations (AI) performed during 6 years (January 2010 to November 2015) on 1,02,386 field animals owned by 55,685 farmers' from 69 cattle development centres spread across four districts of Bihar were collected and analyzed. Whole data set was classified according to districts (Chhapra, Samastipur, Siwan, Vaishali), economic status of farmers (APL, BPL), animal breed (HF cross, Indigenous, Jersey cross, Non-descript), lactation order/parity of animal (heifer, first, second, third, fourth, fifth, sixth and above), animal body condition score (all ribs exposed, no rib exposed, one rib exposed, two ribs exposed, three ribs exposed), heat stage (early, mid, late), season of AI (rainy-June to September, winter-October to January, summer-February to May) and sire used for AI (Gir, HF purebred, HF crossbreed, Jersey purebred, Jersey crossbreed, Sahiwal). Logistic regression analysis was used to compute the odds ratio and probability of conception rate. The results revealed that overall mean conception rate as 52.16% and it was noticed significantly higher in Chhapra district, BPL group of farmers, Jersey crossbreed animals, animals having third lactation, animals exhibiting three ribs exposed, mid heat and animals inseminated with HF purebred semen compared with respective groups of parameters under study. However, effect of season of AI did not affect conception rate in rural animals under field conditions of Bihar.

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