RESEARCH ARTICLE

Factors Affecting Conception Rate in AI Bred Cattle under Field Conditions of Maharashtra

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Abstract

Data on 98336 artificial inseminations (AI) performed during 6 years (January 2010 to November 2015) on 56037 field animals owned by 29097 farmers' from 44 cattle development centres spread across two districts of Maharashtra state were collected and analyzed. Whole data set was classified according to districts (Beed, Jalgaon), economic status of farmers (APL, BPL), animal breed (HF cross, Indigenous, Jersey cross, Non-descript), parity of animal (heifer, first, second, third, fourth, fifth calvers), animal body condition score (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), bull breed used for AI (HF, HF crossbreed, Jersey, Jersey crossbreed, Indigenous), AI sequence number (1,2,3) and AI Year (2010 to 2015). Least square analysis was used to compute conception rate. The results revealed overall mean conception rate as 46.2 ± 0.51% and it was significantly ($p<0.01$) higher in Beed district, Jersey crossbreed animals, animals having fourth parity, animals exhibiting one rib exposed, early heat and animals inseminated with Indigenous breed bulls semen, first AI sequence number and during the year 2015 compared with respective groups of parameters under study. However, effect of season of AI and economic condition of farmers did not affect conception rate in animals under field conditions of Maharashtra.

Key words: Artificial insemination, Maharashtra, Economic condition, Conception rate, Cattle, Least square means.

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Introduction

Getting cows pregnant in a timely manner is important in maintaining a profitable dairy business. Artificial insemination (AI) was introduced as an effective breeding program in the beginning of 1960s with the objective of upgrading indigenous local cows. AI program always demands to keep records of non-return rate, conception rate, service per conception and calving rate in order to properly evaluate the reproductive efficiency of cows, skillness of the inseminators, fertility and semen quality of bulls. However, an effective reproductive recording system must provide the cattle owner with the key information required to make reproductive management decision. Conception rate is directly associated with the production attribute and responsible for monitoring life time productivity of the individual animal. Conception is the first pre-requisite of an animal entering into the productive life. Conception rate determines directly to the total profitability of farm enterprises. Thus, to achieve the maximum profitability, it is very important to increase the conception rate up to maximum level. An attempt was made to study the factors affecting conception rate as an indicator of fertility in animals under field conditions of Maharashtra.

Materials and Methids

In Maharashtra state, a total of 98336 artificial inseminations performed on 56037 animals during January 2010 to November 2015 maintained by 29097 farmers' from 44 cattle development centres spread across 2 districts of the Maharashtra 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 AIs were received through data logger device on windows based platform 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 (Jalgaon and Beed), economic status of farmers (APL, BPL), animal breed (HF cross, Indigenous, Jersey cross, Nondescript), parity of animal (heifer, first, second, third,

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fourth, fifth and above calvers), animal body condition score (no ribs 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 (Indigenous, HF, HF crossbreed, Jersey, Jersey crossbreed), AI sequence number (1,2,3), and AI Year (2010 to 2015) were compiled to study the effect on conception rate. Least Square Means analysis of the data was done using 'R' software (version 3.5.1).

Results and Discussion

The ANOVA shows district, parity of animal, artificial insemination sequence number, body condition of animal, heat stage during insemination, and year of AI had significant effect over conception rate (Table 1).

The overall mean conception rate was recorded as 46.2 ± 0.51% which was remarkably higher than that reported in 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 ($p<0.05$) affected the conception rate. Conception rate of Jalgaon district was 45.8 ± 0.46% while that of Beed district was 46.6 ± 0.56%. Management of animals at different agroclimatic condition with different locations have major role in differentiating conception rate (Table 2).

The economic status of farmers' did not affect significantly ($p>0.05$) the conception rate. The animals owned by below poverty line (BPL) group of farmers however recorded apparently higher conception rate (46.5 ± 0.54%) compared to above poverty line (APL) category of farmers (46.1 ± 0.49%; Table 3). Bhagat and Gokhale (2016) and Pandey *et al.* (2016) also noticed higher conception rate in animals owned by BPL category farmers. More caring of animals at BPL families and lesser number of animals may be major factor for higher conception rate. Higher coverage of AI and lower conceptions are negatively correlated (Ricord *et al.,* 2004).

Animal breed significantly ($p<0.001$) affected conception rate. The conception rate in HF cross and indigenous animals was 44.6 ± 0.56 % and 45.1 ± 0.75 %, respectively. In JYX it was 48.2 ± 0.63 % and in Non-descript cattle 47.01 ± 0.60 % (Table 4). 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.

Animal parity also significantly ($p<0.001$) affected the conception rate as has been reported by Shindey *et al.* (2014), Bhagat and Gokhale (2016) and Potdar *et al.* (2016). The highest conception rate of 47.5 ± 0.61% was observed in animals of 1st parity, while the lowest conception rate was observed in heifers (45.20 ± 0.53%, Table 5). This might be due to greater attention by the farmers towards productive

Table 1: Analysis of variance for conception rate in dairy cattle of Maharashtra

Source of variation	*Degree of freedom*	*Means Square*
District	1	4.1963*
Animal Breed	3	12.833***
Parity Number	5	4.2621***
Heat Status	2	15.743***
Bull Breed	4	33.109***
Body Score Condition	3	21.878***
Year of AI	5	9.086***
AI Sequence Number	2	124.494***
Economic Condition of Farmer	1	1.409
AI Season	2	2.082

***p<0.001, **p<0.01 and *p<0.05.

Table 2: District wise conception rate through AI in cattle (Mean ± SE)

*District**	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
Beed	20286	40295	46.6 ± 0.56
Jalgaon	29322	58041	45.8 ± 0.46

Table 3: Economic status of farmer vis-a-vis conception rate through AI in cattle (Mean ± SE)

Economic Status of farmers	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
APL	38333	76208	46.1 ± 0.49
BPL	11275	22128	46.5 ± 0.54

Table 4: Animal Breed wise conception rate through AI in cattle (Mean ± SE)

*Breed****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
HF cross	28449	57628	44.6 ± 0.56
Indigenous cattle	4603	8739	45.1 ± 0.75
Jersey cross	5743	11492	48.2 ± 0.63
Non-descript cattle	10813	20477	47.01 ± 0.60

Table 5: Animal Parity wise conception rate through AI in cattle (Mean ± SE)

*Animal Parity****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
Heifer	13057	26246	45.20 ± 0.53
1	7271	13963	47.5 ± 0.61
2	8940	17788	45.9 ± 0.58
3	9379	18573	46.5 ± 0.58
4	5835	11540	46.6 ± 0.65
5	5126	10226	45.8 ± 0.66

Table 6: Body Condition score of animal vis-a-vis conception rate through AI in cattle (Mean ± SE)

*Body Condition****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
No ribs exposed	4591	9349	44.8 ± 0.66
One rib exposed	10356	19499	48.6 ± 0.58
Three ribs exposed	10920	22657	45.01 ± 0.57
Two ribs exposed	23741	46831	46.6 ± 0.50

Table 7: Heat stage of animal vis-a-vis conception rate through AI in cattle (Mean ± SE)

*Heat Stage****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
Early	3098	6041	48.01 ± 0.73
Mid	44850	88632	47.7 ± 0.37
Late	1660	3663	43.0 ± 0.88

Table 8: Season of insemination vis-a-vis conception rate through AI in cattle (Mean ± SE)

Season	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
Rainy	16784	33184	46.6 ± 0.52
Summer	16030	31580	46.3 ± 0.54
Winter	16794	33572	45.8 ± 0.52

animals which are in milking. 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. Other parity wise detail of conception rate is given in Table 5.

Body condition score of animal shows how it is managed and fed, an important tool to judge condition of animal. All animals under study were divided into 4 subgroups as per appearance of ribs to study its effect on conception rate. Significantly ($p<0.001$) higher pregnancies (48.6 ± 0.58%) was recorded in animals showing one rib exposed and lowest in no rib exposed (44.8 ± 0.66%, Table 6). The results obtained differed with report of Bhave *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. Potdar *et al.* (2016) indicated insignificantly highest conception rate in field animals having no rib exposed. Balanced diet feeding, vitamin and minerals can overcome these issues of infertility (Balakrishnan, 2003).

Heat stage of animal, during which AI is done, is one of the most important factors that contribute to conception rate in dairy animals. It has significant ($p<0.001$) effect on conception rate. In present study, animals having early heat stage showed the highest conception rate (48.01 ± 0.73%) followed by mid heat (47.7 ± 0.37%) and lowest in late heat stage (43.0 ± 0.88%, Table 7). Gunasekaran *et al.* (2008), Pandey *et al.* (2016) and Potdar *et al.* (2016) noticed higher conceptions in animals exhibiting early heat.

Season of artificial insemination had no significant ($p>0l.05$) effect over conception rate. yet highest conception was recorded in rainy season (46.6 ± 0.52%) followed by summer season (46.3 ± 0.54%) and lowest in winter season (45.8 ± 0.52%, Table 8). Bhagat and Gokhale (2013, 2016) reported highest conception rate in winter season, while Shindey *et al.* (2014), Pandey *et al.* (2016) and Potdar *et al.* (2016) noticed animals inseminated during summer season had higher conception rate.

Since the present analysis of AI work is for year 2010 to 2015, it showed significant ($p<0.001$) effect of year over conception rate. The highest conception rate was noted in year 2011 (47.5 ± 0.64%), while the lowest conception rate was observed in year 2010 (43.0 ± 0.90%). Other year wise details of conception rate are given below in Table 9.

Bull breed whose semen is used for AI work had significant ($p<0.001$) influence on conception rate as has been reported by Bhagat and Gokhale (2016), Pandey *et al.* (2016) and Potdar *et al.* (2016). Highest conception rate was observed in sire of Indigenous origin (51.1 ± 0.61%) followed by HF cross (47.1 ± 0.56%), HF pure (46.80 ± 0.55%), Jersey

Table 9: Year of insemination and conception rate in cattle (Mean ± SE)

*Year of AI****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
2010	2043	4254	43.0 ± 0.90
2011	6125	11809	47.5 ± 0.64
2012	10634	20893	47.1 ± 0.56
2013	10682	21665	45.8 ± 0.55
2014	8867	17884	46.1 ± 0.57
2015	11257	21831	45.8 ± 0.52

Table 10: Bull Breed used for insemination and conception rate in cattle (Mean ± SE)

*Sire Breed****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
HF pure	11324	22485	46.80 ± 0.55
HF cross	23526	47396	47.1 ± 0.56
Indigenous breed	8611	15558	51.1 ± 0.61
Jersey pure	4826	10146	42.6 ± 0.67
Jersey cross	1321	2751	43.5 ± 1.09

Table 11: Artificial insemination sequence number and conception rate in cattle (Mean ± SE)

*AI No****	*Confirm Pregnant*	*Total AI*	*Conception rate (%)*
1	36414	70342	49.7 ± 0.45
2	9104	18402	47.8 ± 0.56
3	4090	9592	41.2 ± 0.67

crossbred (43.5 ± 1.09%,) and Jersey pure bulls (42.6 ± 0.67%, Table 10). The results contradicted 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. However, Miah *et al.* (2004) reported that genotype of bulls used for AI did not affect the conception rate.

Artificial insemination sequence number had significant ($p<0.001$) effect over conception rate, the highest conception rate was observed with first AI (49.7 ± 0.45%) followed by second AI (47.8 ± 0.56%) and lowest in third AI sequence number (41.2 ± 0.67%, Table 11). Potdar *et al.* (2016) and Bhagat and Gokhale (2016) also reported the same results.

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