Int.J.Curr.Microbiol.App.Sci (2020) *9*(3): 2336-2341

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 3 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.903.266

Factors Affecting Conception Rate in Holstein Friesian Crossbreed Cattle in Maharashtra State, India

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Keywords

Reproduction performance, Field animals, Conception rate

Article Info

Accepted:
15 February 2020
Available Online:
10 March 2020

A B S T R A C T

Data on 57000 Artificial Inseminations (A.I.) performed at field level during 5 years (from January 2010 to December 2014) on 30998 animals owned by 8063 farmers of Beed district and 6903 farmers of Jalgaon district of Maharashtra state were considered for study. Overall mean conception rate as 47.33±0.32 per cent. The conception rate was significantly affected by area, year of A.I., heat stage, body condition, AI sequence number. However, season of A.I., lactation number and economic condition of farmer did not significantly influence the conception rate.

Introduction

Maharashtra is believed to have the second largest livestock population state in India. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country. The total cattle population for the state is estimated to be about 16.2 million. Out of this the indigenous cattle constitute about 13.1 million and the remaining 3.1 million are crossbred cattle and80.86 per cent of the total cattle in the state are local breeds and remaining are crossbred and exotic breeds that accounted for about 19.13 per cent ,respectively (Anonymous, 2015).As per 19th Livestock Census-2012, bovine population in Maharashtra has declined by about 5 per cent to 2.1 crore as against 2.2 crore in 2007. While crossbreds cattle increased by 19 per cent, local cows and buffaloes have shown 8-9 per cent decline. However, the indigenous cattle and buffalo milch population declined by 5-7 per cent between 2007 and 2012, while there has been an impressive growth of26 percent in crossbred milch animals.

Crossbreeding provides an important tool for improving the production potential of non-descript cattle by crossing with high milk producing exotic dairy breeds. Conception rate is directly associated with the production attribute and responsible for monitoring lifetime productivity of the individual animal. 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. On the contrary, there are many genetic and non-genetic factors, viz. genotypes of dam and bull , age and parity of cow, semen quality, season etc., have direct influence on increasing conception rate. Considering these, the present study was planned with the aim to evaluate the effects of genetic, environmental and their interactions affecting conception rate in HFX cattle.

Materials and Methods

The data of 57000 Artificial Inseminations pertaining to 30998 HFX cattle from 8063 farmers of Beed district and 6903 farmers of Jalgaon district of Maharashtra state were considered for study.AI centers from June 2010 to May 2015. The available data was classified on the basis of Area, parity, AI sequence number, body condition, Economic condition of farmer, AI year and season. The lactation sequence ranged from heifer to fifth. Body condition score (BCS) were categorized from 1 to 4, where BCS-1 being physically poor and BCS-4 being over-condition. Conception rates (CR) were estimated from the proportion of pregnancies confirmed by the rectal palpation of the genital tract between 90 to 120 days of post-insemination among the total number of animals inseminated artificially with frozen semen in a specified period of time. The conception rate was estimated by using the following formula

Conception rate = number of cow pregnant/number of cow inseminated X100

Insemination data was recorded using the electronic data loggers and stored in SQL server. For each animal, the conception rate (CR) was defined as pregnant or not. Data was analyzed using open source R software version 3.6.1.

Results and Discussion

Conception rate recorded in present study was (47.33±0.32%) similar results were observed by Razi *et al.,* 2010 and Gokhale and Bhagat 2015.Nordin *et al.,* 2004 and Bhagat *et al.,* 2008, Bhagat *et al.,* 2009 also observed higher conception rate in their study.

Analysis of Variance

In this present study total conception rate and the variation in relation to area, different parity, year of insemination, season of AI, AI sequence number , economic condition of farmer and body score condition are shown in Table 1 and 2. The conception rate was significantly affected by area, year of A.I., heat stage, body condition, AI sequence number. However, season of A.I.,lactation number and economic condition of farmer did not significantly influence the conception rate.

District Wise Conception Rate

Two districts namely Jalgaon and Beed were undertaken under study and it was noticed that district differences in conception rate were not important however marginal significance (P<0.05%) was noted. In Jalgaon district conception rate (46.8 ± 0.61%) was recorded while in Beed district (47.8 ± 0.67%) conception rate was recorded.

Year of A.I wise conception rate

Year to year variations were noticed important and significantly affected conception rate the conception rate was lower (45.5 ± 1.54) in 2010 compared to other years of inseminations while highest conception rate was observed in year 2011 (49.4 ± 0.88).

Ricord *et al.,*. (2004) noticed that number of inseminations performed, and conception rate are negatively correlated. however, the difference was statistically in-significant.

Lactation number wise conception rate

Lactation had no significant effect on conception rate in HFX cattle. These results are in agreement with the observations made by Woldu *et al.,* (2011) in Ethiopian cattle who did not notice any parity effect on conception rate. Highest conception rate (48.1 ± 1.68%) was recorded for animals of 2rd lactation and lowest (46.9 ± 5.68%) for 5th and above lactation.

These results are in agreement with Miah *et al.,* (2004) who also observed significantly lowest conception rate in 5th lactation. In heifers (47.6 ± 0.68%) conceptions was recorded.

A.I. season wise conception rate

Effect of season was important since it might be due to changes innutrition, environmental temperature, over-all climate effect and photo period. In the present investigation, conception rate in rainy season was (47.5 ± 0.65 %) while in summer it was (47.5 ± 0.64%) while in winter season it was (47.1 ± 0.66%) respectively. The A.I. season had non significant effect on conception rate.

A.I. sequence wise conception rate

Sequence of A.I. had significant effect on conception rate. It was observed that highest conception rate (49.7 ± 0.57%) was recorded in first attempt in second attempt it was (48.8 ± 0.70%) while conception rate was (43.6 ± 0.82%) in third attempt.

Heat stage wise conception rate

There was significant difference effect due to heat stage of animal over conception rate. In heat stage wise study highest conception rate was observed in early heat stage (49.0 ± 0.97%)while in mid heat stage it was (47.8 ± 0.44%) and lowest was in late heat stage (45.2 ± 1.14%). Potdar *et al.,* 2016 observed same results in their study.

Table.1 Analysis of variance for conception rate in HFX cattle

Source of variation	Degree of freedom	Means Square
Area	1	14505*
Lactation Number	5	1685.2
AI Sequence Number	2	15838.6***
Body Condition	3	8956***
Heat Status	2	1067.5*
AI Year	5	61328.67***
AI Season	2	102598
Economic Condition	1	1863

Sign. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1; Confidence level used: 0.95

Table.2 Different factors associated with conception rate of holstein friesian crossbreed cattle in Maharashtra

Category	Particulars	Confirm Pregnant	Total AI	Conception Rate with Standard Error
	Total AI	28168	57002	47.33±0.32
Lactation No	Heifer	7525	15012	47.6 ± 0.68
	1	3842	7633	48.1 ± 1.68
	2	4893	9926	47.3 ± 2.68
	3	5727	11729	47.2 ± 3.68
	4	3508	7230	46.9 ± 4.68
	5	2673	5472	46.9 ± 5.68
Area*	Beed	16568	32943	47.8 ± 0.67
	Jalgaon	11600	24059	46.8 ± 0.61
Heat Stage*	Early	1552	3091	49.0 ± 0.97
	Late	963	2065	45.2 ± 1.14
	Mid	25653	51846	47.8 ± 0.44
Season	Rainy	9471	19141	47.5 ± 0.65
	Summer	9199	18513	47.5 ± 0.64
	Winter	9498	19348	47.1 ± 0.66
Body Condition***	No ribs exposed	2159	4378	46.9 ± 0.91
	one rib exposed	5477	10451	50.1 ± 0.74
	three ribs exposed	6254	13657	44.4 ± 0.71
	two ribs exposed	14278	28516	47.9 ± 0.63
AI number***	1	19711	39116	49.7 ± 0.57
	2	5616	11412	48.8 ± 0.70
	3	2841	6474	43.6 ± 0.82
Economic Condition	APL	23564	47748	47.10 ± 0.59
	BPL	4604	9254	47.60 ± 0.72
Year of A.I.***	2010	563	1202	45.5 ± 1.54
	2011	2533	4943	49.4 ± 0.88
	2012	5593	11275	47.6 ± 0.70
	2013	6370	13186	46.7 ± 0.69
	2014	5746	11950	46.1 ± 0.68
	2015	7363	14446	48.8 ± 0.66

Economic condition of farmer wise conception rate

The economic status of farmers' significantly ($P<0.05$) affect conception rate. The animals owned by below poverty line (BPL) group of farmers recorded significantly higher conception rate (47.60 ± 0.72%) compared to above poverty line (APL) category of farmers (47.10 ± 0.59%). Bhagat and Gokhale (2016) and Pandey *et al.*, (2016) also noticed higher conception rate in animals owned by BPL category farmers.

Body score conditionwise conception rate

The variation in conception rate among cows of different Body Score Condition was highly significant ($p<0.05$). Animals with three visible ribs were having lowest conception rate (44.4 ± 0.71 %) while highest conception rate was observed in animals with one rib exposed (50.1 ± 0.74%) .Animal with two rib and no rib visible were having (47.9 ± 0.63%) and(46.9 ± 0.91%) conception rate respectively. Potdar *et al.*, 2016 who reported highest conception rate in animal with one rib exposed (44.90%)

It was concluded that the conception rate was significantly affected by area, year of A.I., heat stage, body condition, AI sequence number. However, season of A.I. ,lactation number and economic condition of farmer did not significantly influence the conception rate needed to be considered for conception rate improvement.

Acknowledgements

The authors are thankful to BAIF Management and all stakeholders in study area those who participated and cooperated during study

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How to cite this article:

Potdar, V. V., Y. S. Gaundare, J. R. Khadse, Sachin Joshi and Marimuthu Swaminathan. 2020. Factors Affecting Conception Rate in Holstein Friesian Crossbreed Cattle in Maharashtra State. *Int.J.Curr.Microbiol.App.Sci.* 9(03): 2336-2341. doi: https://doi.org/10.20546/ijcmas.2020.903.266