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Factors Affecting Pregnancy Rate in A. I. Bred Cattle under Field Conditions of Karnataka State

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Abstract

The objective of this study was to investigate the potential factors affecting pregnancy rate in Artificially Inseminated (AI) animals under field conditions of Karnataka state. The data used in this experiment was collected from 390 villages in the jurisdiction of 10 Cattle Development Centres (CDC) in 4 tehsils of Mysuru and Hassan districts. Total 11,549 AI's were performed on 10,744 animals owned by 7,533 farmers during the year of 2015 and 2016. The effect of factors such as farmer economic status, CDC in-charges education, animal breed, season of AI and lactation order on pregnancy rate was determined and male to female ratio assessed. Logistic regression analysis was used to compute the odds ratio and probability of pregnancy rate. The results revealed that overall mean pregnancy rate was 53.36±0.46 per cent and it was noticed significantly higher in animals having 3rd lactation (58.94±0.85%), in Jersey crossbred animals (54.25±0.68%) and inseminators having 11th level of education (55.50±0.57%). Statistical analysis of data shown that, in-charge education, animals breed and lactation order had significant effect on pregnancy rate and farmer economic status and season of AI had non-significant effect. The male to female ratio was observed as 53:47.

Keywords: Artificial Insemination, Field Conditions, Karnataka State, Logistic Regression, Pregnancy Rate

Introduction

The genetic potential and environmental combinations including nutrition, health and overall management adopted by farmers are mainly governing elements for fertility of farm animals and to assess the same per cent pregnancy rate is the accepted indicator. Low pregnancy rate either due to non-expression of heat, reproductive problems or increased number of services per pregnancy, increased age at first calving, service period, calving interval etc. ultimately results into depressing, overall lifetime productivity of animals. Lower heritability of the trait is indicative of greater environment and management influence suggesting scope for improvement in management of animals by farmers. Available literature in relation of cattle development Center (CDC), CDC in-charge education, economic status of farmers, animal breed, season of breeding, animal lactation order etc. with pregnancy of animals bred with artificial inseminations (A.I.) is inadequate to explain the role of these factors for deciding fertility strategy at village level. An attempt in the present investigation was made to study these factors affecting pregnancy rate as an indicator of fertility and sex ratio in animals under field conditions of Mysuru and Hassan districts of Karnataka state.

Materials and Methods

The artificial insemination (A.I.) program being operated under ITC in Mysuru and Hassan districts in Karnataka state for breeding field animals and BAIF is performing role of service provider. During the year 2015 and 2016, total 11,549 AI's were performed on 10,744 animals owned by 7,533 farmers spread over 390 villages in the jurisdiction of 10 CDC's in 4 tehsils. All animals were maintained and reared by the farmers' individually. The housing ranged from open to permanent constructed sheds. Animals were stall fed with dry and green fodder along with concentrate. The calls for AI 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. The pregnancy rate calculated by formula as suggested Qureshi *et al* (2008).

The information on CDC in-charges education (10^{th}, 11^{th}, Graduate), farmers economic status (APL, BPL), animal breed (HF cross, Jersey cross, Hallikar, ND), season of AI (Rainy-June to September, Winter-October to January, Summer-February to May), lactation order of animal (heifer, first, second, third, fourth, fifth & above) was compiled for studying the effect on pregnancy rate.

Logistic Regression

Logistic regressions work with odds rather than proportions. The odds are simply the ratio of the proportions for the two possible mutually exclusive outcomes. If p is the proportion for one outcome, then (1-p) is the proportion for the second mutually exclusive outcome;

$$ODDS=p/(1-p)$$

The logistic regression model relates the log of the odds to the explanatory variable in the form of a linear function. In case of multiple logistic regression, more than one continuous/discrete explanatory variable can be incorporated in the model to study their simultaneous effect on the categorical response variable. The Akaike Information Criterion (AIC) was used to assess the fitness of the model (Manoj *et. al.*, 2015). The data was analyzed using R project for statistical computing software (version 3.6.1).

Results and Discussion

The mean pregnancy rate was recorded as 53.36±0.46 per cent which was remarkably higher than finding of Anzar *et. al.* (2003) in Pakistan (29.00%), Nordin *et al* (2004) in Malaysia (35.50%), Bhagat *et al* (2008 & 2009) in field crossbred cattle (45.16±0.46 & 43.58±0.40%) in Maharashtra state, Woldu *et al* (2011) in Ethiopian cattle (48.30%), Shinde *et al* (2014) in animals from Wardha district of Maharashtra state (46.40±0.19%), Razi *et al* (2010) in Bangladeshi cattle and Bansal *et al* (2019) under field conditions of Bihar state (52.16%), however lower to that of reported by Gokhale and Bhagat (2015) under field conditions of Maharashtra state (55.96±0.31%). The present pregnancy rate is influenced by following factors:

Farmer Economic Status

The economic status of farmer did not affected the pregnancy rate (Table-1). More than half of inseminations (53.74%) were performed in the group of farmers belonging to above poverty line (APL) and recorded higher pregnancy rate (53.34±0.63%) compared to those from below poverty line (BPL) group of farmers (53.37±0.68%). The highest coverage of A.I. as well as pregnancy rate in APL group of society indicated affluent condition of farmers and their better management practices followed for the animals. Gokhale and Bhagat (2015) recorded highest percentage of APL farmers in Punjab state. The present results were in-agreement with the findings of Anzar *et.al.* (2003) in Punjab province of Pakistan which was apparently attributed to availability of green fodder, supply of adequate ration and effluent condition of farmers resulting overall better management of animals along with commercial view of rearing the dairy animals.

Table 1: Animal breed affecting pregnancy rate in AI bred cattle

Economic status of farmer (NS)	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
APL	6207	53.74	53.34	0.63	1.00	0.50	53.34
BPL	5342	46.26	53.37	0.68	0.99	0.50	53.07

Note: NS Non-significant

CDC In-Charge Education

Education of inseminator significantly affected the pregnancy rate (Table-2). The results observed in present investigation were in agreement with Anzar *et al.* (2003) in Pakistan, who also noticed significant effect of inseminator's education level on the pregnancy rate in field animals. Almost two third (65.28%) inseminations were performed by inseminators having 11th pass and recorded highest pregnancy rate (55.50±0.57%) compared to other education groups of inseminators, this might be due to their work experience and skill in this field. The percentage coverage of inseminations performed by graduate and 10th pass inseminators was at par and pregnancy rate was recorded as 49.85±1.12 and 48.82±1.11 percent, respectively. The results of Gokhale and Bhagat (2015) supported the findings who observed that higher educated inseminators recorded lesser pregnancy rate.

Table 2: CDC in-charge education status affecting pregnancy rate in AI bred cattle

Education status**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
Graduate	1980	17.14	49.85	1.12	1.00	0.50	49.85
11th pass	7539	65.28	55.50	0.57	1.27	0.56	55.73
10th Pass	2030	17.58	48.82	1.11	1.00	0.50	49.84

*Note: ** ($p<0.01$)*

Animal Breed

The percent coverage of animals as well as significant higher pregnancy rate was recorded in Jersey crossbred animals (45.80% & 54.25±0.68% respectively). The pregnancy rate of HF crossbred and local breed of Karnataka state (Hallikar) recorded pregnancy rate at par, however, pregnancy rate in non-descript (ND) animals was lowest (46.65±2.64%) and coverage of animals was only 3.10 per cent (Table-3). The results of Miah *et al* (2004) in Bangladeshi crossbred cows, Potdar *et al* (2016) in field animals from Maharashtra and Bansal *et al* (2019) in Bihar state field animals supported present findings who noticed significant effect of animal breed on pregnancy rate. Highest chances of getting pregnancies was noticed in Jersey cross animals (55.49%) followed by native breed Hallikar (53.89%), HF crosses (52.96%) and lowest in ND animals (48.20%). The findings of Bhagat *et al* (2009), Anzar *et al* (2003), Razi *et al* (2010), Pandey *et al* (2016) and Bhagat *et al* (2019) in field animals disagreed with present results who noticed non-significant higher pregnancy rate in local animals and ND crosses, however Qureshi *et al* (2008) reported higher pregnancy rate in Holstein crosses in Jammu region.

Table 3: Animal breed affecting pregnancy rate in AI bred cattle

Animal breed*	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
HF cross	4477	38.77	52.96	0.74	1.00	0.50	52.96
Hallikar	1424	12.33	52.95	1.32	1.04	0.51	53.89
Jersey cross	5290	45.80	54.25	0.68	1.10	0.52	55.49
ND	358	3.10	46.65	2.64	0.83	0.46	48.20

*Note: * ($p<0.05$)*

Season of AI

From table-4, it was revealed that in rainy season 34.17%, winter season 33.05% and summer season 32.78% inseminations were performed. Bansal *et al* (2019) recorded maximum AI in summer (34.96%) season compared with rainy (34.85%) and winter season (30.19%). Although higher pregnancies were recorded in rainy season (54.08±0.79%) followed by summer season (53.57±0.81%) and winter season (52.40±0.80%) the season had non-significant effect on pregnancy rate. These results are contradicted to the findings of Shinde *et al* (2014), Pandey *et al* (2016), Potdar *et al* (2016) and Bhagat *et al* (2019) who noticed animals inseminated during summer season had higher pregnancy rate. However, Bhagat and Gokhale (2013, 2016) and Bansal *et al* (2019) reported higher pregnancies in animals bred during winter season. Higher pregnancies in rainy season might be attributed to better effect of overall animal health and green fodder availability.

Table 4: Season of AI affecting pregnancy rate in AI bred cattle

Season of AI (NS)	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
Rainy	3946	34.17	54.08	0.79	1.00	0.50	54.08
Winter	3817	33.05	52.40	0.80	0.94	0.48	52.27
Summer	3786	32.78	53.57	0.81	0.95	0.49	52.80

Lactation Order

Animal lactation order significantly affected pregnancy rate (Table-5). Shinde *et al* (2014), Bhagat and Gokhale (2016), Potdar *et al* (2016) and Bansal *et al* (2019) also recorded similar results, however Bhagat and Gokhale (2013) and Pandey *et al* (2016) recorded non-significant effect of parity on pregnancy rate. Compared with multiparous animals, lowest pregnancy rate was observed in heifers (40.69±0.91%). These results agreed with findings of Gunasekaran *et al* (2008), Razi *et al* (2010), Bhagat and Gokhale (2016), Pandey *et al* (2016) Bansal *et al* (2019) and Bhagat *et al* (2019) however, disagreed with the results of Potdar *et al* (2016) who noticed higher pregnancy rate in heifers. The lower pregnancy in heifers might be due to more attention of farmers to animals under production. In multiparous animals, the likelihood of getting more pregnancies increased with progress of lactation order and reached highest in third lactation (55.08%) and decreased in fourth lactation and again increased in animals having fifth and more lactation. The results of present investigation corroborated with the findings of Bansal *et al* (2019).

Table 5: Lactation order affecting pregnancy rate in AI bred cattle

Lactation order**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
Heifer	2856	24.73	40.69	0.91	1.00	0.50	40.69
First	1291	11.18	55.62	1.38	1.82	0.65	52.53
Second	2328	20.16	58.33	1.02	2.02	0.67	54.42
Third	3312	28.68	58.94	0.85	2.09	0.68	55.08
Fourth	1169	10.12	55.09	1.45	1.81	0.64	52.44
Firth & more	593	5.13	55.31	2.04	1.92	0.66	53.56

*Note: ** ($p<0.01$)*

Sex Ratio

Sex ratio is the most vital aspect of dairy farming, because it is more economical to produce more number of female calves for the herd replacement for culling old and low producing animals from the herd. The theory indicates that the ratio of male to female offspring at birth should be 50:50 in respect of evolutionary equilibrium but in present investigation, the male to female ratio was observed as 53:47.

Conclusion

The study indicated that pregnancy rate significantly affected due to in-charge education status, animal breed and lactation order and these factors need to be emphasized for having better pregnancy rate in AI bred cattle under field conditions in Karnataka state.

Conflict of Interests

There is no conflict of interest.

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