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Assessment of factors affecting conception rate in cross bred cows following artificial insemination under field conditions

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ABSTRACT

Studies were conducted to identify the factors affecting fertility in cross bred cows following artificial insemination (AI) under field conditions. A field survey was carried out on 446 crossbred cows of 89 farmers inseminated by 34 AI technicians. The data was analyzed by Artificial Insemination Database Application (AIDA) a software provided by FAO/IAEA Vienna, Austria. The 1st service conception rate (FSCR) and the overall conception rate (OCR) were 29.4% and 38%, respectively. The OCR was better (48.8%) in cows inseminated 18-23 hours after the onset of estrus. Inseminations done by professional degree holders yielded better conception rate (48.7%) as compared to those done by diploma holders (20.4%) or by progressive dairy farmers (30.2%). The OCR was significantly (P<0.05) higher (51.6%) when inseminations were done during "standing estrus". It is concluded that the quality of estrus, semen, management and expertise of AI technician have a strong bearing on the success of AI in cross bred cows.

Key Words: Artificial insemination, AIDA, Cross bred cows, Conception rate.

An efficient artificial insemination (AI) programme is a prerequisite to accomplish high producing cross bred cows in India. Unfortunately, however, the conception rate (CR) following AI under Indian field conditions is much lower (30%) (Ulamale *et al.*, 2003) as compared to 65% reported in developed countries (Gwazdauskos *et al.*, 1981). This had direct economic implications on Indian dairy industry. Success of AI could be marred by either/or a combination of several factors, e.g. related to the cow, the bull, the management and/or nutritional (Ayalon, 1984, Bruyas *et al.*, 1993). Achievement of acceptable fertility following AI requires identification of specific factors involved and application of appropriate intervention. The precise etiology of this ever-increasing failure of AI, however, is unknown. Haphazard application of various remedial measures has been of only limited success (Maurya 2000). It is, therefore, warranted to define specific interventions based on specific etiological factors. The present study was, therefore, undertaken to investigate into the various managemental factors responsible for the failure of AI success under field conditions.

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A field survey was conducted at several places in Punjab, with the help of a questionnaire prepared in accordance with the "Artificial Insemination Database Application" (AIDA) software of the FAO/IAEA. The information collected from 568 AIs done on 446 cross bred cows belonging to 89 farmers subjected to 34 AI technicians was analyzed. Statistical analysis of data was done using Z-test for comparison of proportions. Factors related to Cow, Farm management, Semen, AI technique and Technicians were recorded on each inseminated cow.

Of the 568 AIs done on 446 cows, 218 were fertile resulting into 38.4% overall conception rate (OCR). The CR recorded in the present study is similar to earlier observations in India (Ulamale *et al.*, 2003). However, it is much lower than Norwegian (71%, Refsdal, 1998) and 68% in Vietnam (Dzung *et al*, 1999)

Analysis of factors affecting fertility:

a) Cow related factors:

i. Effect of quality of estrus:

Cows inseminated during standing estrus had significantly higher (P<0.05) FSCR (43.3%) and OCR (51.6%) as compared to 24% and 32%, respectively, in the cows inseminated at the other times of estrus period(Table 1). Dzung *et al.* (1999) also reported that conception rate in cows inseminated in standing

estrus were higher (80%) than in cows depicting restlessness (23.3%) or mounting behaviour (22.2%). However, Mongiardino et al (1999) observed no statistical differences in conception rates following inseminations during standing heat or during secondary heat signs. 'Standing to be mounted' has been recorded as the most reliable period for AI (Glencross et al 1981, Sprecher et al 1995). Untimely AI in the present study might have contributed to poor conception rate.

ii. Effect of vulvar swelling:

FSCR and OCR were significantly ($P<0.05$) higher in cows with marked vulvar swelling (41.9% and 46.1%, respectively) as compared to the cows with slight (21.7% and 33.1%, respectively) or no appreciable vulvar swelling (18.2% and 22.6%, respectively) at the time of AI (Table 1). Results of the present study are in agreement with Shamuddin *et al.* (1999). However, Than *et al.* (1999) observed no significant effect of vulvar swelling with fertility in cows.

iii. Effect of type of estrual discharge:

FSCR and OCR in cows with clear mucus discharge were 31.0% and 39.7%, respectively (Table 1). Only one out of 16 AIs done in cows with turbid mucus conceived. Normal uterine secretions and cervico vaginal discharges are important for viability and transportation of sperm and embryo in genital tract (Rowson *et al*, 1972, Sreenan and Beehan, 1974). Turbidity in uterine secretions is indicative of uterine pathology (Raghwan *et al*. 1971, Ott, 1986). It was thus apparent that clear mucus discharge is a pre-requisite for conception following AI.

iv. Effect of calving type:

Poor FSCR (15.8 %) in cows with abnormal calving as compared to normal calving cows (32.9 %) was recorded (Table 1). However, OCR did not differ significantly. Bhosrekar (1973) and Stefan *et al.* (1984) reported persistent endometritis and repeat breeding in dystocia affected cows.

v. Effect of uterine tone:

The cows inseminated with marked uterine tone had significantly ($P<0.05$) higher FSCR (32.2 %) and OCR (43.0 %) as compared to 22.6 % and 22.3 %, respectively, in the cows with slight uterine tone (Table 1). Dzung *et al.* (1999) and Than *et al.* (1999) reported similar findings. Mongiardino *et al.* (1999), however, reported that uterine tone alone was not enough an indicator of standing estrus in itself.

b) Factors related to farm management:

i. Effect of method of heat detection:

The FSCR and OCR were similar in cows detected in heat through either visual observations or by the teaser (32.0% vs 27.4%) and (39.5% v/s 37.4%), respectively, (Table 1). The cows in the present study were under better vigilance and individual attention of the farmers. In large farms, estrus detection with a teaser becomes a necessity, as the visual observation on each animal is not possible. For best results, however, teaser should be used in combination with visual observation for better breeding performance of cows (Rajamahendran *et al.* 1989).

ii. Effect of interval between emergence of first heat sign and AI :

The OCR was highest (48.8 %) in the cows inseminated 18-23 hr. after the first observation of estrus signs (Table 1) which is in accordance with the findings of Ulamale *et al.* (2003), Dzung *et al.* (1999) and Sepulveda *et al.* (1999). It is therefore important to go for insemination on the basis of start of estrus.

iii. Effect of housing system:

Type of housing systems appeared to have no significant bearing on CR. However, Toleng *et al.*(1999) observed significantly higher CR in cows kept in paddocks than those kept in other housing systems.

c) Factors related to semen:

i. Effect of semen quality:

The OCR in cows inseminated with semen of known good quality (50.7%) was significantly higher ($P<0.05$) than with the semen of unknown and, therefore, uncertain quality (Table 1). Ensured good quality of semen is important for better conception rate (Hafez, 1993). It appeared that unexamined semen had significant role in the genesis of conception failure through AI at field level. 78

ii. Effect of method of thawing of semen on CR:

Table 1: Conception rate in inseminated cows with relation to some physiological and procedural variables

Variables/Factors studied			First service			Overall			
			Services	Conceptions	CR	Services	Conceptions	CR	Serv/ Conception
a) Related to cow	Heat signs	Standing heat	60	26	43.3*	182	94	51.6*	1.9
		Other heat signs	154	37	24	386	129	32	3.1
	Vulvar swelling	Marked	86	36	41.9*	256	118	46.1*	2.2
		Slight	106	23	21.7	281	93	33.1	3.0
		None	22	4	18.2	31	7	22.6	4.4
	Vaginal discharge	Clear	203	63	31	547	217	39.7*	2.5
		Turbid	7	0	0	16	1	6.25	3
		None	2	0	0	5	0	0	-
	Calving type	Normal	155	51	32.9*	410	161	39.3	2.5
		Abnormal	19	3	15.8	75	27	36	2.8
	Degree of uterine tone	Marked	152	49	32.2*	442	190	43*	2.3
		Slight	62	14	22.6	126	28	22.3	4.5
b) related to Farm management	Method of heat detection	Teaser	117	32	27.4	297	111	37.4	2.7
		Visual	97	31	32	271	107	39.5	2.5
	Interval between onset of heat & AI (hours)	< 12	24	3	12.5	44	7	15.9	6.3
		12-17	106	34	32.1	270	104	38.5	2.6
		18-23	45	17	37.8*	129	63	48.8*	2.0
		24-29	27	8	29.6	89	32	36	2.8
		30-35	9	1	11.1	22	7	31.8	3.1
		36-42	1	0	0	5	3	60	1.7
		> 43	2	0	0	7	2	33.3	3.5
	Housing system	Loose barn	122	33	27	319	112	35.1	2.8
		Tie Stall	92	30	32.6	249	106	42.6	2.3
c) Related to semen	Semen quality	Good	30	11	36.7	75	38	50.7	2
		Unknown	184	57	29	493	193	37.1	2.7
	Method of thawing	Water37°C	162	53	32.7*	431	188	43.6*	2.3
		Cold water	45	6	13.3	120	22	18.3	5.5
		Air	7	4	57.1	17	8	47.1	2.1
d) Related to AI Techniq ue & technicia n	Passage of AI gun	Easy	193	62	32.1*	522	210	40.2*	2.5
		Difficult	21	1	4.8	46	8	17.4	5.8
	Education level	Professional degree	106	38	35.8*	306	149	48.7*	2.1
		Diploma	39	8	20.5	103	21	20.4	4.9
		School certificate	69	17	24.6	159	48	30.2	3.3

The values with (*) are significantly higher (P<0.05) than the corresponding values within the variable

Thawing of semen in warm water or in air yielded significantly (p<0.05) higher CR than in cold water (Table 1). Thawing of semen in warm water is of utmost importance and is well documented (Chandler *et al.* 1986).

d) Factors related to AI technique and technician:

i. Relationship between passage of AI gun and CR:

The OCR was significantly higher (40.2% v/s 17.4%) and number of services per conception was lesser (2.5 v/s 5.8) in cows with easy passage of AI gun through cervix than those with difficult passage (Table 1). Difficult entry into the cervix could be an indicative of some pathological

condition, improper estrus, infentile genetalia or kinked cervix. It may also reflect on the expertise of an inseminator.

ii. Education level of AI technician:

FSCR and OCR (35.8% and 48.7%, respectively) were significantly higher ($p<0.05$) in cows inseminated by professional degree holders compared with the diploma holders (20.5% and 20.4%) and trained progressive dairy farmers i. e. high school certificate holders (24.6% and 30.2%). Services per conception were lesser (2.1) in cows inseminated by professionals than by diploma holders (4.9) or high school certificate holders (3.3) (Table 1). The level of professional education and technical training appeared to have direct bearing on conception rate. Education level of AI technician had a great bearing on the success of AI in other studies too (Toleng *et al.*, 1999).

It is concluded that the stage of estrus at AI, semen quality, management and expertise of AI technician have a strong bearing on the success of AI in cross bred cows. Poor conception rate found in this study is indicative of serious drawbacks in the AI programme operational in the field. It is, therefore, warranted to define specific interventions based on specific etiological factors for improving conception at field level under Artificial insemination programme.

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