THE OPTIMUM TIME FOR ARTIFICIAL INSEMINATION OF COWS IN TWO CLIMATIC ZONES OF VENEZUELA

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Cows and heifers from a Holstein herd in Maracay (height 450-450 m above sea level and mean temperature 24.8ºC) and from a Holstein Jersey and Native herd in Merida (height 1960 m above sea level and mean temperature 15.4ºC). Heat was detected twice daily and each animal was then allocated to one of two treatments:
1) insemination at detection of heat or 2) insemination approximately 12 h after detection of heat. The data were analysed for each farm by least squares, using data from the cows or heifers which remained pregnant after one, two or three services. The number of observations and the percentage conception in Maracay was: 0 h (65, 62.5%) and 12 h (60, 68.32). In Merida the results were: 0 h (91, 58.27.) and 12 h (105, 85.1%). The difference was not significant in Maracay, but in Merida insemination at 12 h gave better conception ($P < .05$) than at 0 h. The results suggest that it is more Important to wait 12 h before insemination in temperate climates and not in hot climates.

Key words: Artificial insemination, dairy cattle

The best time for artificial insemination occurs in the last part of heat. It is therefore recommended that cows observed to be on heat in the morning are inseminated in the afternoon and cows detected on heat in the afternoon be inseminated on the morning of the following day. There are two reasons for the reevaluation of the recommendations for European cows in the tropics. Firstly, to follow these recommendations requires an inseminator and a deposit of semen to be available on each farm because in many tropical regions, travelling inseminators pass each farm only once per day. Secondly, Fenton et al (1976) and Hall et al (1959) have found that the duration of heat is less in hot climates than in temperate regions and therefore suggest that the optimum time for insemination is reduced in hot climates.

The present study was undertaken to compare the optimum time of insem- ination in a temperate climate (Merida) with that in a hot climate (Maracay) and to determine the effect on conception of having inseminators in attendance twice per day(inseminating all cows in the last part of the heat) or only once per day (inseminating one group of cows in the first part of heat and the rest in the last part).

Materials and Methods

The cows used were 145 cows and heifers from the Holstein herd of the Instituto de Producción Animal, Facultad de Agronomia, Universidad Central de Venezuela, located in Maracay (height 450 meters and median temperature 24.8ºC) and 196 cows from the Holstein, Jersey and native nerd from the experimental station El Joque, Programa de Alturas de Leche, located in Merida (height 1960 meters and median

temperature 15.4°C). The management of the herd was described by Fenton et al (1976) and Martinez (1976). Heat was detected twice daily and animals were randomly allocated to one of the following two treatments: 1) insemination when heat was detected for the first time or 2) insemination approximately twelve hours after detection of heat. The treatments were balanced in each farm by inseminator.

Only the results of inseminations where the cows remained pregnant after two or three services were used. This information was studied for each farm by least squares analysis. The dependent variable was percentage conception and the discreet variables were: time of insemination (0 or 12 hours), parity of animal inseminated (heifer or calved cow), type of semen (imported or local), hour of insemination (am or pm) and the interaction of the first variable with each of the three.

Results and Discussion

Insemination after twelve hours was significantly ($P< 0.05$) better than 0 hour in Merida while there was no significant difference in Maracay (Tables 1 and 2). This observation indicates that there was a difference between the two farms in the optimum time for insemination and suggests that the optimum time in temperate climates occurs later than in hot climates.

Table 1:
Analysis of variance for conception rate

Source of variation	Maracay		Merida	
	df	Mean squares	df	Mean squares.
Time of insemination	1	0.1126	1	1.0360*
Type of semen	1	0.9450*	1	0.7489
Parity	1	0.0914	1	0.4637
Hour of day inseminated	1	0.0697	1	0.4224
Interaction				
Time x semen	1	0.3967	1	0.0030
Time x parity	1	0.0825	1	1.1755*
Time x hour	1	0.4102	1	1.6296**
Residual	137	0.2282	188	0.2179

* ($P < .05$)
** ($P < .01$)

These results agree with those of Hall et al (1959) who found that in subtropical climates conception between 7 and 12 hours after commencement of heat was better than between 13 and 18 hours, the time normally recommended for temperate climates. Broadway et al (1975) showed that insemination early in heat gave better results during the hot season in Texas. They found a high embryonic mortality ($P< 0.05$) when animals were inseminated after 12 hours. This was not the case in the hot climate of Maracay, where there was no difference in distribution of intervals between insemination and next heat (Table 3).

Table 2:
Adjusted means of conception rate

Source of variation	No. of data	Maracay	No. of data	Merida
Time of insemination				
0 hours	65	62.5	91	58.2
12 hours	80	68.3	105	85.1
Type of semen				
Local	83	57.1	18	82.5
Imported	62	73.7	178	60.8
Interaction Time x hour of day				
0 h, am	36	59.2	51	62.8
0 h, pm	29	65.8	40	53.6
12 h, am	39	76.2	44	71.1
12 h, pm	41	60.4	61	99.2
Overall mean	145	65.4	196	71.7

Table 3:
Distribution of intervals between insemination and next heat in cows which did not conceive

Interval	Maracay		Merida	
	0 hours	12 hours	0 hours	12 hours
Number of intervals	25	27	41	33
< 18 days, %	0	3.7	4.9	3 0
18-25 days, %	76.0	70.3	31.7	36.4
26-35 days, %	4.0	3.7	9.8	3.0
36-50 days, %	8.0	14.8	26.8	21.2
>50 days %	12.0	7.4	26.8	36.4

This table also shows that there was a difference between Merida and Maracay in the percentage of intervals in the normal range (18-25 days). This suggests that the detection of heat was better in Maracay than in Merida or that there were differences in management and the results cannot therefore be attributed only to the difference in climate.

Macmillan and Watson (1975) reported that insemination early in heat gave a worse conception, when the semen was not of good quality. This conclusion cannot be commented on for the present work since, although the local semen gave poorer conception, in Maracay there was no significant interaction between time of insemination and type of semen used.

The interaction between time of insemination and parity was significant in Merida with the differences in conception between 0 or 12 hours being greater in heifers than in cows. All the heifers (15 animals) inseminated at 12 hours conceived. The interaction between time of insemination and hour of the day was also significant in

Merida when insemination at 0 hours was better in the morning and at 12 hours was better in the afternoon. It is possible that this interaction was due to the fact that there were more hours between the detection of heat pm and am than between detection am to pm. Therefore cows detected in heat in the morning had already more hours on heat than cows detected in the afternoon.

From the data in Table 2, the effect of having the inseminator available once or twice daily can be seen. With two visits daily the conception rate would be close to that at 12 hours, but with one visit daily the conception rate would be between that at 0 and that at 12 hours. At least in Maracay the inseminators could work only once a day without markedly decreasing conception (68.3 vs 62.5%), whilst in Merida the difference between the two tune periods differed significantly (85.1 vs 58.2%).

Conclusions

The results of this work show there was a difference between the two farms in the optimum time for insemination. It is possible that this was caused by the difference in climate, but there were also differences in management, quality of semen and insemination.

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