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REPRODUCTIVE AND PRODUCTIVE PERFORMANCE OF A HOLSTEIN HERD IN MARACAY, VENEZUELA

N Martínez, S Galindo de Ramirez & J Combellas

Instituto de Producción Animal, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela.

Production and reproduction parameters were studied during the periods 1968-1976 and 1970-1977 respectively in a Holstein herd under a system of zero grazing fed with freshly cut forage and concentrates. Average body weight and total milk production was 606 kg and 4731 kg, and 5[illegible] kg and 4213 [illegible], for the cows of the foundation herd imported from the USA and for those born in Maracay respectively. The reproductive efficiency was lowest in those animals which gave birth at the beginning of the year and were served during the rainy season. Liveweight and milk production rose with the number of lactations, there being no effect on reproductive characteristics. Calving problems decreased reproductive efficiency without affecting the milk production of the cows.

Key words: Holstein, milk production, reproductive efficiency

The introduction of European breeds into tropical countries has been one of the alternatives used to increase milk production. The extent to which these animals express their production potential depends on the system of exploitation (Wilkins et al 1979), their production being limited both by economic factors and by the availability of concentrates and specialized work force.

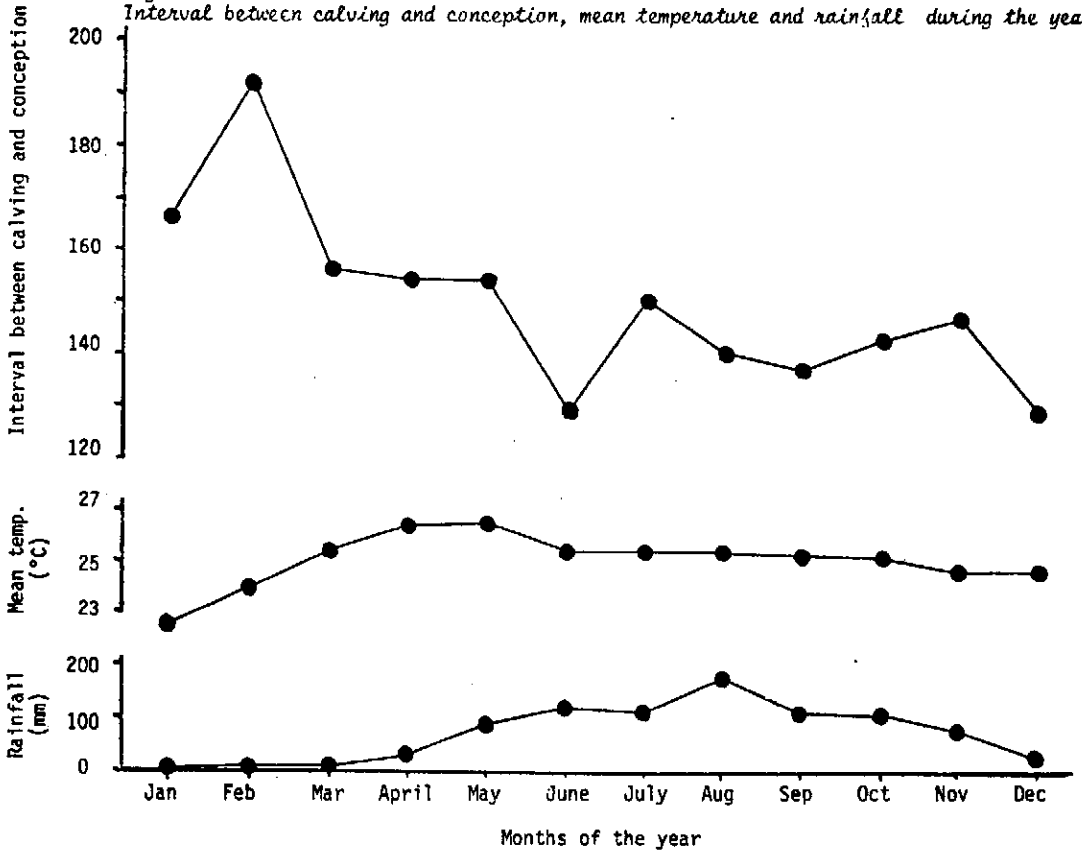
The purpose of this work is to present some results obtained on the productive and reproductive aspects of a Holstein herd maintained in a system of semi-confinement in Maracay . A detailed report on the reproductive performance of the herd in the period 1970-1974 was previously published by Fenton et al (1976).

Materials and Methods

The records of the Holstein herd of the Institute of Animal Production in Maracay were used in the analysis, excluding animals that had not completed their lactation by the end of the respective periods. Milk production records were analysed for cows which calved down between the years 1968 and 1976. The period for which reproductive parameters were analysed was 1970 - 1977. The herd is formed by a group of heifers imported from the USA in 1967,a group of cows acquired within the country and the descendants of those two groups.

The institute is at a height of 452 m above sea level and experiences two very different seasons, the rainy season from May to October and the dry season from November to April. Monthly averages for temperature and rainfall are shown in Figure 1.

Figure 1:
Interval between calving and conception, mean temperature and rainfall during the year



The relative humidity follows the same tendency as the rainfall varying between 65 and 80%.

The animals were kept in shaded yards during the day and in uncovered corrals at night. They were milked twice a day at 12 hour intervals. The basal ration consisted of cut elephant grass (*Pennisetum purpureum*) and occassionally fresh alfalfa was fed (*Medicago sativa*). The forage offered was restricted in some periods and the quality was variable. 6 to 8 kg/d of a concentrate of approximately 18% crude protein was offered.

Milk production was measured daily and the animals were weighed monthly. Details of the reproductive management of the herd were reported by Fenton et al (1976). It should be noted that cows were served during the first oestrus observed 60 days after calving and insemination was carried out approximately 12 hours after the detection of heat. Those cows which retained the placenta for more than 12 hours or showed purulent discharges from the genital tract after calving were considered abnormal calvings.

The production parameters studied were total milk production per lactation, lactation length and 305-day milk production. The reproductive parameters analysed were the interval between calving and first heat, the interval between calving and conception and the number of services per

conception. The independant variables considered were: year of calving, month of calving, number of lactation (1,2,3 and 4), type of calving (normal vs abnormal) and the origin of the animals (imported from the USA vs born in Maracay). The anlysis was carried out by the least squares method.

Results

The origin of the animals significantly affected their production (Table 1). This comparison only includes the cows imported from North America and those born in Maracay. The imported cows produced more milk and weighed more than those born locally. The intervals between calving and first oestrus,and calving and conception did not differ between the two groups. However the cows born in Maracay required more services per conception than the imported cows.

Table 1:
Productive and reproductive parameters of imported animals and those born in Maracay

	Imported cows	Cows born in Maracay
Productive parameters		
No. of records	181	412
Total milk production	4731 ± 96	4213 ± 120 **
305 day milk production	4564 ± 73	4041 ± 91 **
Length of lactation	323 ± 5	326 ± 7 NS
Liveweight (kg)	606 ± 6	517 ± 6 **
Reproductive parameters		
No. of records	72	473
First post partum oestrus(d)	69 ± 5	63 ± 3 NS
Interval between calving and conception (d)	151 ± 10	157 ± 6 NS
Services/conception	2.32± 0.28	3.10± 0.17 **

[1] In this table and those following the adjusted means and standard errors are presented

* P < 0.05
** P < 0.01

Milk production and duration of lactation of the herd increased until 1969-1971 and then diminished (Table 2). The appearance of first oestrus is delayed in the last years analysed, however the number of services per conception decreases in the same years and the interval between calving and conception also decreases. The month of calving had a significant but erratic effect on milk production (Table 3). The interval between calving and conception and the number of services required was, in general, higher

in the first 5 months of the year. The differences in months with respect to the appearance of first oestrus were lower.

Milk production increased with the number of lactations, but this variable had little effect on the reproductive parameters (Table 4). The problems of calving that were considered did not affect milk production but had a negative effect both on the appearance of first oestrus and on the interval between birth and conception (Table 5).

Table 2:
Productive and reproductive parameters during the years analyzed

	Year									
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Productive parameters										
No. of records	96	27	64	82	80	80	89	85	89	
Total milk production (kg)	4085 ±183	4402 ±237	4953 ±155	4394 ±136	4023 ±120	4402 ±120	4254 ±115	3875 ±122	4228 ±122	**
305 d milk production	4068 ±139	4169 ±180	4612 ±118	4216 ± 96	3849 ± 91	4050 ± 91	4190 ± 88	3838 ± 93	4126 ± 93	**
Duration of lactation (d)	307 ±10	326 ±13	345 ± 9	329 ± 7	331 ± 7	346 ± 7	314 ± 6	306 ± 7	311 ± 7	**
Reproductive parameters										
No. of records			60	82	58	79	82	85	83	87
First post-partum oestrus (d)			66 ±6	51 ±5	51 ±5	54 ±5	63 ±5	76 ±5	81 ±5	82 ** ±5
Interval between calving and conception (d)			185 ±11	143 ± 9	198 ±10	148 ± 9	124 ± 9	128 ± 9	134 ± 9	145 ** ± 9
Services/conception			3.62 ±.31	2.90 ±.25	4.08 ±.28	3.00 ±.24	1.92 ±.24	1.88 ±.25	2.14 ±.26	1.84 ** ±.26

Table 3:
Influence of the month of calving on productive and reproductive parameters

	Month of the year											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Productive parameters												
No. of records	53	46	42	47	52	73	80	54	43	79	63	60
Total milk production (kg)	4478 ±150	4632 ±160	4188 ±167	4383 ±159	4054 ±148	4193 ±132	4417 ±126	4226 ±146	3948 ±163	4523 ±124	4340 ±133	4105 ** ±137
305 d milk production (kg)	4215 ±113	4370 ±122	4056 ±127	4216 ±121	3875 ±112	4094 ±100	4201 ± 96	4085 ±111	3829 ±124	4329 ± 93	4184 ±101	4037 ** ±104
Duration of lactation (d)	336 ±8	343 ±9	322 ±9	324 ±8	325 ±7	318 ±7	332 ±8	320 ±9	313 ±7	325 ±7	326 ±7	302 ±8
Reproductive parameters												
No. of records	45	48	46	44	47	66	58	46	50	67	48	51
First post-partum oestrus (d)	77 ±6	72 ± 6	69 ±6	67 ±6	55 ±6	55 ±3	67 ±4	57 ±3	58 ±6	74 ±5	63 ±6	69 * ±5
Interval between calving and conception (d)	166 ±11	192 ±11	156 ±11	154 ±11	154 ±11	129 ± 9	150 ±10	140 ±11	137 ±11	143 ± 9	147 ±11	129 ** ±10
Services/conception	2.84 ±.31	3.97 ±.30	2.64 ±.31	3.10 ±.32	2.82 ±.30	2.44 ±.26	2.93 ±.27	2.40 ±.31	2.22 ±.30	2.05 ±.26	2.58 ±.30	2.09 ** ±.29

Table 4:

Influence of number of lactations on productive and reproductive parameters

	Lactation number 1	2	3	4	
Productive parameters					
No. of records	324	187	100	50	
Total milk production (kg)	3969 ± 72	4181 ± 80	4433 ± 12	4594 ± 153	**
305 d milk production (kg)	3775 ± 50	3968 ± 61	4232 ± 85	4455 ± 117	**
Duration of lactation (d)	329 ± 4	328 ± 5	327 ± 6	321 ± 9	NS
Reproductive parameters					
No. of records	247	174	100	62	
First post-partum oestrus (d)	65 ± 3	74 ± 3	65 ± 4	62 ± 5	NS
Interval between calving and conception (d)	147 ± 7	146 ± 6	151 ± 7	152 ± 9	NS
Services/conception	2.54 ± 0.18	2.16 ± 0.17	2.87 ± 0.21	2.74 ± 0.26	*

Table 5:

Influence of normal and abnormal calving on productive and reproductive parameters

	Normal calving	Abnormal calving	
Productive parameters			
No. of records	510	182	
Total milk production (kg)	4293 ± 70	4287 ± 92	NS
305 d milk production (kg)	4153 ± 53	4094 ± 70	NS
Duration of lactation (d)	320 ± 4	327 ± 5	NS
Reproductive parameters			
No. of records	421	195	
First post-partum oestrus (d)	62 ± 3	69 ± 3	**
Interval between calving and conception (d)	144 ± 5	156 ± 6	**
Services/conception	2.59 ± 0.13	2.75 ± 0.16	NS

Discussion

The average milk production of the herd studied was 4291 ± 68 kg/lactation. This figure is similar to the best production figures obtained not only in Venezuela (Verde 1979) but also in other tropical countries (Kiwuwa 1974). However this production is much lower than that obtained in the herds from which the cows originated in North America (6317 ± 499 kg). The appreciable difference is attributable fundimentally to the environment but it is not possible to establish how much of it is due to climatic factors and how much to the management and nutrition of the animals. The animals were managed under a system of semi-confinement and it is hoped that the detrimental effects of climate were reduced. However, these did not disappear as is demonstrated by the lower reproductive performance of the cows which gave birth at the beginning of the year and were served during the rainy season. The nutrition could also have had a negative effect on the expression of the potential of the animals. The basal ration consisted of cut elephant grass and occasionally there were limited supplies. Furthermore,more recent observations have shown the low consumption of this forage and responses in milk production to levels of supplementation with concentrates,superior to those used in this herd (Combellas & Martinez 1981).

Imported cows and those born in the country were not contemporaries and in the measurements taken there could have been an interaction between origin and environment. However, the differences in milk production and body weight between the two groups are notable (Table 1), a consequence of the different environments in which both groups developed. Selection for fertility in the herd could also have had a negative effect on milk production. Similar results but less marked differences were obtained by Román-García et al (1979) with Holstein heifers in Puerto Rico, where total milk production of 4004 and 3815 kg were recorded and body weights of 460 and 485 kg in animals born locally and imported from the USA at the age of 7 months, respectively. On the other hand Ribas et al (1980) did not observe differences between Holstein cows of between 1 and 4 lactations imported from Canada and those born in Cuba, with average production of 3554 kg. The appearance of first oestrus was a little earlier, although not significantly, in cows born in Maracay but they required more services per conception with the result that the interval between calving and conception was similar in both groups. Román-García et al (1979) also did not observe differences in these parameters attributable to the origin of the cows.

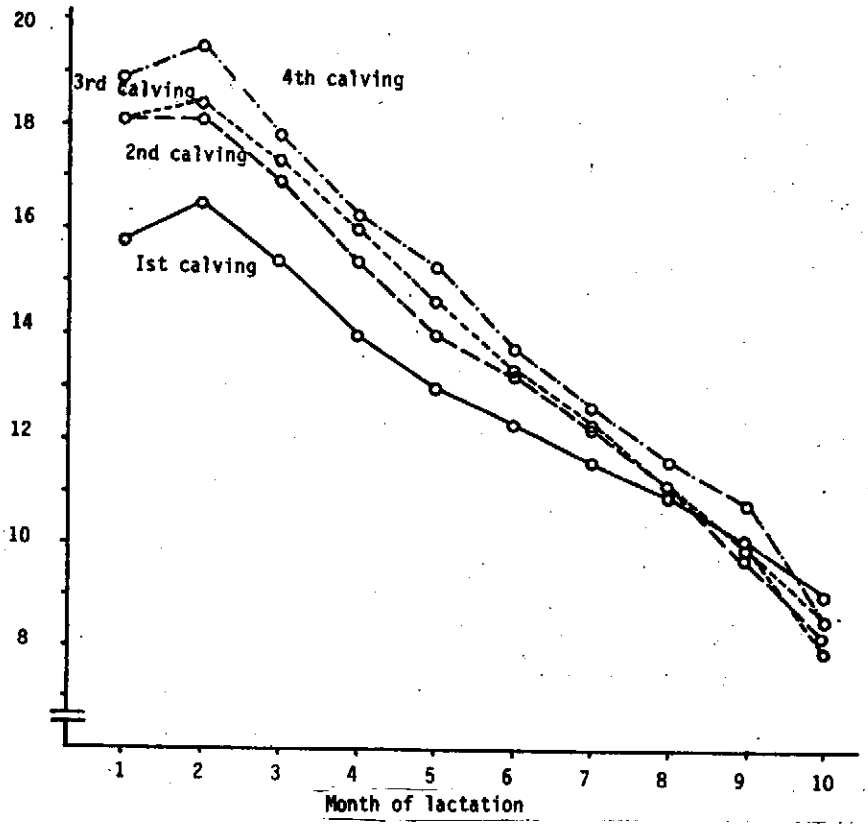
The higher average production of the herd in the years 1969-1971 is partly attributable to the fact that the majority of the herd at this stage consisted of imported cows. The interval between calving and conception dropped appreciably after 1974 despite the delay in the appearance of first oestrus, due to a higher conception rate in this period. The high reproductive efficiency of the herd achieved after 1974 was reported previously by Fenton et al (1976), who pointed out that this level is normal for Holstein cows and similar to that of many herds in temperate zones.

The season of calving did not have a defined influence on the production of milk although an influence was seen on reproductive efficiency (Table 3). In Figure 1 it can be seen that the cows which calved down between January and May,and which were subsequently served during the rainy season required a greater number of services per conception. This observation was previously made by Fenton et al (1972) who pointed out that the

period from May to October, although it is not that of the highest temperatures, is the season where the least difference occurs between minimum and maximum temperature. Vaccaro (1973) observed in her revision of literature a decrease in reproductive performance during the rainy season, suggesting that this could be a consequence of a reduction in grazing time and consumption due to the rains. However, this cannot be the case in herds under a system of zero-grazing and other factors must be involved. The high relative humidity in this season associated with the high temperatures could explain the results. The work of Ingraham et al (1976) has demonstrated that there is a negative correlation between conception rate and the temperature - humidity index.

As was expected as the number of lactations increased, milk production (Table 4 and Figure 2), and the body weight of the animals (Figure 3) increased. The heifers reached a lower peak milk production but showed a greater

Figure 2:
Lactation curves

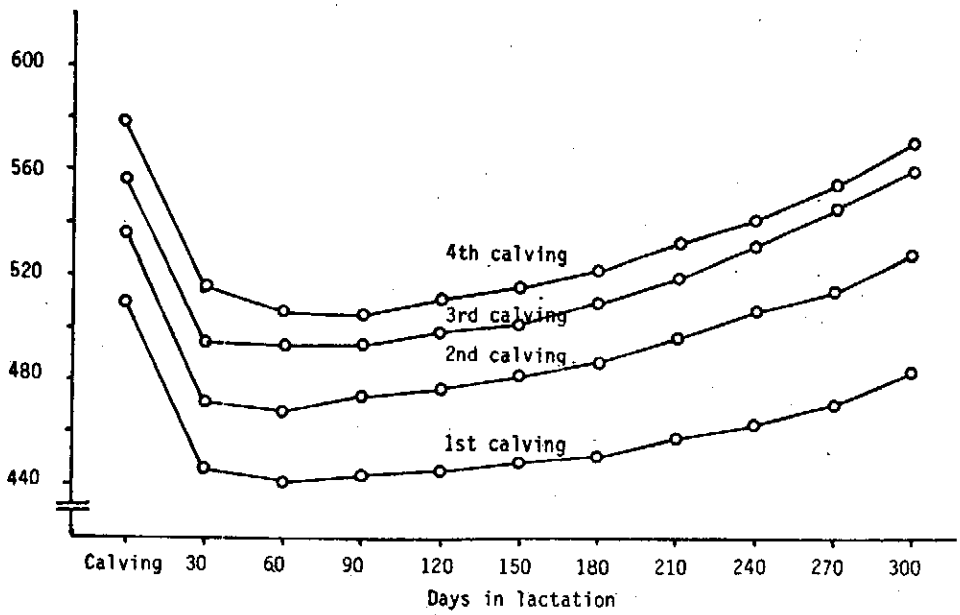


persistency than that obtained in the study of Román-García et al (1979). All the animals began to gain weight after 60 days in milk.

The values presented in Table 5 show the high incidence of post calving abnormalities in these animals. These problems did not affect milk production during the lactation but did affect the appearance of first oestrus and the interval between calving and conception. Fenton et al (1976) in the study on the reproductive performance of this herd pointed out the high prop -

ortion of cows with retained placentas among those which were selected out for health problems, which reflects the detrimental effect of retained placentas on the health of the cows and the tendency of the cow in bad health to retain the placenta.

Figure 3:
Variation in liveweight



The results obtained in this work permit the conclusion that, with the use of the Holstein breed in a zero-grazing management system based on cut forage and high levels of concentrates, with satisfactory management, it is possible to obtain an acceptable reproductive efficiency and production levels which, although they may be inferior to those obtained in temperate regions are much higher than the present averages of many tropical countries. This, however, does not imply that this system should be adopted in practice. Other economic, social or other factors not considered here (Combellas et al 1981) could limit, and appreciably reduce the use of this system in our environment.

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