

Productive Behavior in the First Lactation of Crossbred Holstein Cows at Quimiag and Chambo

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Abstract

Milk production is assumed by prosperous cattle breeders, who have sacrificed to provide protein for the population. Based on this paradigm, the objective was to determine the productive behavior of crossbred Holstein heifers of Químiag and Chambo in their first lactation. In the Methodology, 88 primiparous cows were taken in two stables managed under an open field grazing system with *Lolium multiflorum*, *Dactylis Glomerata*, *Trifolium repens* and *Trifolium prantence* in addition to the supply of water and mineral salts at will. The data obtained were subjected to a hypothesis test of binomial variables with Student's t-test to find differences between identical genetic groups with a similar feeding, sanitary and reproductive management system. Results indicate that the heifers considered in the present study reached a height at the withers of 140.72 ± 5.00 cm, a total length of 205.28 ± 10.93 and a cane load index of 4.32 ± 0.30 being superior to the Chambo heifers, the same that started their reproductive life both at effective service and calving at a later time than the Químiag heifers, even the gestation period is slightly lower. Therefore, it is concluded that the highest accumulated production is registered in the Chambo cows, as well as the adjusted production at 305 days and the average production per day.

Keywords: *production, cow, heifers, milk, lactation.*

Introduction

Dairy farming in Ecuador has been a challenge; despite its difficulty and the lack of incentives

from the state, the farmer has constantly invested capital in providing human food (1).

In Ecuador, mainly in the province of Chimborazo, dairy cattle ranching has developed with an emphasis on small farmers, although its management criteria are empirical, which is why a productive and reproductive morphological variability is determined. These conditions are important in cattle ranching because the farmer can trace his objectives from the productive and reproductive indicators (2).

Cattle ranching in Ecuador began with the arrival of the Spaniards around 1524 (3), which was favorable due to environmental conditions, especially the availability of forage throughout the year.

In Ecuador, milk production can generate an annual flow of approximately US\$700 million in the primary production chain. In addition, the rest of the chain, such as transportation, industrialization, marketing and other aspects, can move more than US\$1 billion annually (1). However, the Asociación de Ganaderos de la Sierra y Oriente (AGSO) points out that the dairy sector of ten years ago is not the same as it is today. "Before milk was imported into the country and harmed national production, there were dubious dairy products and the commercialization of milk from the producer to the industries was deficient." Now Ecuador produces around 5,100,000 liters of milk daily that supply the local demand, and the daily excess is exported around 200,000 liters.

The crossbred Holstein dairy herd of the San Juan de Chuquipogoyo farm during 1987 - 1988

(4) reported an adjusted milk production at 305 days of 5,766.8 liters at adulthood and a lactation period of 366.18 days.

It is also shown that Holstein cows' average milk production adjusted to 305 days in the first lactation was 5207.2 +/- 958.20 liters, corroborating values (5).

Materials and methods

The present research work was carried out in the cattle ranches of Chambo canton and Químiag parish in the province of Chimborazo, located southeast of Riobamba canton, whose latitudes are 1°40'0012" and 1°42'32", longitude 78°34'01194" and 78°35'32", The longitude is 78°34'01194" and 78°35'32", at an altitude of 2900 and 3000 masl, with meteorological conditions of 13 and 14 °C, relative humidity of 67 and 60% and annual rainfall of 500 and 450 mm.

The 18 Químiag and 70 Chambo heifers under observation were first calves grazed in open fields in pastures established with *Dactylis glomerata*, *Lolium multiflorum*, *Lolium perenne*, *Trifolium repens* and *Trifolium pratensis*. The variables measured in this study were: height at withers, total length, and stocking rate, followed by gestation days, lactation period, accumulated milk production, and average milk production per day.

The data obtained were analyzed under a statistic for binomial variable hypothesis such as Student's t-test, which allows differentiation between the two groups of heifers.

Results and discussion

Table I. Productive and reproductive performance of crossbred Holstein cows managed under a free-grazing management system.

Variables	Quimiag	Chambo	t	Prob.
Height at withers (cm)	140,72 ± 5,00	132,49±5,26	6,13	6,5E-07
Total length (cm)	205,28±10,93	188,76±14,60	5,31	3,4E-06

Cane load index	4,32±0,30	4,06±0,34	3,14	0,002
Effective service age	765,17±148,33	861,27±161,14	-2,41	0,011
Age at delivery	1044,39±149,02	1141,40±161,21	-2,42	0,011
Gestation period (days)	279,22±1,96	280,13±1,71	-1,80	0,043
Days of lactation	287,28±10,75	283,80±9,74	1,25	0,11
Total production (liters/lactation)	2934,92±161,64	2962,67±177,06	-0,64	0,26
Total production (305 days)	3120,66±211,86	3186,43±202,94	-1,18	0,12
Average production/day	9,62±0,53	9,71±0,58	-0,64	0,26

T: Student's t.

Prob. Probability.

The height of the crossbred Holstein cattle from the Químiag dairy was 140.72 ± 5.00 , a significantly higher value ($p < 0.01$) compared to the heifers from the Chambo dairy since a height at the withers of 132.49 ± 5.26 could be determined. Studies carried out by the Holstein Association USA (6) recorded a height at the withers of 142 cm. Although the scale used by the World Holstein-Friesian Federation (2004) indicates that the low heifers are lower than 130 cm, the intermediate 142 cm and high over 154 cm, according to this scale, it can be mentioned that the heifers of Químiag correspond to the medium ones and those of the Chambo stable to the small ones, this could be since the animals of this work are young and can continue growing since they are still in the process of development until the fourth calving. Although for the Criollo Limonero cattle, the height at the withers is 124 cm (7).

Like the height, the total length of the Holstein crossbred dairy cattle of Químiag registered a value of 205.28 ± 10.93 cm, being significantly superior ($p < 0.01$) to the Chambo cattle, whose length was 188.76 ± 14.60 cm. ($p < 0.01$) to the Chambo cattle whose length was 188.76 ± 14.60 cm, in this way it can be pointed out that the symmetry between the height at the withers and the total length is maintained, which is considered the occipital-coccygeal distance between the cranial and lateral point of the

scapulohumeral joint and the caudal point of the ischial tuberosity of the heifers (8).

Regarding the relationship of the perimeter of the front cane on the weight of the cattle, better known as the cane load index, the cattle from Químiag are significantly superior ($p < 0.05$) compared to those from Chambo, whose indexes were 4.32 ± 0.30 and 4.06 ± 0.34 . This measure has importance because the bone of the front cane has to support the weight of the animal, and if it is very weak, it means, on the one hand, fineness of the animal and milk producer, it also has a low capacity to support high weights of the heifers (8).

The age of the Químiag heifers that entered the first effective service was 765.17 ± 148.33 days, a time that differs significantly ($p < 0.05$) from the cows from Chambo whose effective service occurred at 861.27 ± 161.14 days, being later in relation to the Químiag heifers. The optimum age at which the heifers should be conceiving is 450 days (9), being lower than the results of the present work. This is due to the idiosyncrasy of the cattle breeder, which favors that the heifers are not covered before the age of two years.

The age at calving of the cows from Químiag was 1044.39 ± 149.02 days, a value that differs significantly ($p < 0.05$) from that of the Chambo heifers, which was 1141.40 ± 161.21 days,

which was later because they entered effective service later. Holstein cows should enter first calving between 23 to 24 months (10). This allows for a good reproductive life and a greater number of calves in the useful life of the cow. These intensive systems are possible under grazing systems (11). Based on different opinions, the optimum age at first calving of dairy cows in grazing systems should be between 22 and 27 months of age (12), which is necessary to know the herd's profitability.

Regarding the gestation period, it was expected that there would be no significant differences; however, it should be noted that the cows from Quimiag registered a gestation period of 279.22 ± 1.96 being significantly different ($p < 0.05$) from the heifers from the Chambo dairy whose gestation period was 280.13 ± 1.71 , this could be due to calving triggering factors. Considering that gestation is the period of development of the calf inside the mother's womb and variations. The average duration is 285 days; however, intervening factors include the mother's age, the calf's sex and other genetic factors (13 & 14).

The lactation period in the cows that come from the Quimiag dairy was 287.28 ± 10.75 and from the Chambo dairy was 283.80 ± 9.74 values between which do not register relevant evidence ($p > 0.05$); this may be since the management these cows receive are similar in the two stables, besides all the cows are primiparous. The duration of lactation is a function of the environmental conditions that affect the productive behavior of the cows, limiting the expression of their genetic potential. That is why the cows are milked twice daily from the postpartum period. In addition, they must be fed under grazing conditions and supplemented with 14% protein (15). It should also be considered that milk production has an estimated repeatability of

$0.25 + 0.04$ and is within the range of values in the scientific literature. And the milk production adjusted to 305 days has repeatabilities of $0.30 + 0.05$ and $0.26 + 0.05$ in pure and crossbred Criollo dairy cattle (16) and (17).

The total production recorded in the first lactation period of the heifers from the Quimiag barn was 2934.92 ± 161.64 liters and from the Chambo barn was 2962.67 ± 177.06 liters, values between which do not register statistical differences ($p > 0.05$), because these cows, despite being in two barns, have a similar feeding system. Therefore, the expected production of a pure Holstein cow is around 6000 liters of milk and 5485.8 ± 1547.8 kg when analyzing different factors that influence lactation in 305 days. In addition, an average production per day of 12 liters is estimated, showing that the cows of the present work produced below the indicator. This is because the cows are first-time cows and are not fed with supplemental feed but only with cultivated pasture and mineral salts (18), (19). It can also be pointed out that milk production can be increased by improving factors such as management, health and feeding (20), which allow them to express their genetic potential (21).

Regarding the production adjusted to 305 days, the Quimiag cows reflect a production of 3120.66 ± 211.86 liters, while the heifers from the Chambo dairy had a production of 3186.43 ± 202.94 liters, values between which share significance ($p > 0.05$). Therefore, it is considered that the age at first calving can affect the volume of milk production per lactation, in addition to the life span and productive life of the cow, since, as the age at first calving increases, the productive life decreases (22), although when analyzing the reproduction and milk production of cows with

different proportion of *Bos Taurus* genes, they indicate that the number of calvings does not influence milk production (23).

The average production per cow/day in the whole lactation in the cows from the Químiag dairy was 9.62 ± 0.53 while in the heifers from the Chambo dairy was 9.71 ± 0.58 liters, values which share significance, although these averages are lower than the standard of 2 liters (3).

Conclusions

Height at withers, total length and shank loading index in cows from the Chemiag barn are statistically superior compared to cows from the Chambo barn.

Reproductive parameters such as age at first effective service, age at calving and gestation period recorded in the Químiag barn are slightly lower than those from the Chambo canton.

The cumulative, adjusted, and daily milk production of the group of cows managed in the Chambo barn is superior to those managed in the Químiag barn.

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