Study of non-genetic effects that influences the milk yield in mestizo goats

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Abstract. The objective of this study was to determine the influence of environmental factors on milk yield in mestizo goats. Analyses of variance was performed for milk yield for test-day in the last third of lactation. The information for this study was taken from the goat production system of the Universidad Francisco de Paula Santander, Seccional Ocaña. The productive system has 90 animals, of which 840 samples of milk belonging to 20 goats were analyzed. Milk yield averages for 5th months lactation and 6th months lactation were 1.29±0.85 kg and 0.95±0.55 kg, with coefficients of variation from 29.11% to 39.46%, respectively. The initial results with the available information suggest that the non-genetic effects of birth month and year (and their interactions) were highly significant. While, the covariable age (linear effect) was not significant in any milk yield for test-day and the quadratic effect was highly significant and significant for fifth and sixth month of lactation, respectively. Consequently, it can be suggested that test-day milk yield in mestizo goats of Ocaña’s region is influenced by non-genetic factors such as the month, year and age of the female at kidding.

1. Introduction
In the management of productivity in animal production systems, it is very important to consider the environmental, nutritional, genetic and non-genetic factors that influence the phenotypic expression of the traits of economic importance in domestic animals. In this sense, the milk yield can be influenced by non-genetic factors, such as: age of the individual at kidding, parity number, lactation length, month and year of kidding, number milking’s per day, among others [1,2].

The dairy activity worldwide has been carried out under the conditions of activities that include animals with low productivity, production systems with low number of animals and environmental and non-genetic conditions that significantly influence the productivity of animals. In this sense, the population of goats is largely in the hands of small breeders, which has allowed fulfilling an important economic function and food security in farming communities located in areas of difficult access and concentration of poverty [3-5]. In addition, the easy management of the production systems has allowed the domestic goat to have a wide geographic distribution, due to its adaptability in diverse climatic, environmental, topographic, vegetation and management conditions [1].
In general, the goat milk yield in Colombia in most cases is collected manually. In comparison with bovine and pig production systems, among others, the goat system has not managed to obtain significant improvements or improvements in productivity, due in large part to the lack of implementation in biotechnology, personnel training, improper use of cargo animal, food management and ignorance of environmental and non-genetic factors that specifically affect production at specific points lactation length. On the other hand, to quantify the productivity along the lactation there have used different methodologies, as the test day (TD), which, there uses information repeated of the same individual during the lactation, allowing the accomplishment of longitudinal analyses that describe the path of milk yield and of his constituent ones in the different states of lactation [6].

This methodology would allow realizing productive evaluations (phenotypic) in goats half-caste of Ocaña's region. They might be realized using the TD, and they would have a very important role in the phenotypic evaluation and/or genetic, the breeder, it he, might realize rapid and specific adjustments in the managing, food and/or discarded animals that do not present an ideal productive performance in a specific point of lactation curve. The aim of the present study was to determine the influence of non-genetic factors in milk yield in test day in mestizo goats of Ocaña's region.

2. Materials and methods

2.1 Materials
The information used in the present study was taken of goat production system of the Universidad Francisco de Paula Santander, Seccional Ocaña, Colombia. The productive system counts 90 animals, of which 810 samples of milk yield belonging to 20 goats were analyzed. This herd is located in the municipality of Ocaña, North of Santander, Colombia, with a latitude of 8°14'15.8'' N 73°21'21.7''. At 1150 m.a.s.l, with an average temperature of 23 °C. For the females in production, a manual milking per day was carried out without the support of the young. The different controls carried out on dairy goats were performed in he last third of lactation and were performed at 30-day intervals corresponding to each control (TD5 = 5th month and TD6 = 6th month lactation). The A15 or C15 system was used in daily milk yield control [7]. In those animals without milk TD and without records, training was carried out for the collection of milk samples.

2.2 Methods
One-way analysis of variance (ANOVA) was performed with milk yield for each month of lactation, using the GLM procedure of statistical package SAS [8]. In the statistical analysis were considered the effects of the month, year of kidding, the interaction month by year and the age of the goat at kidding (covariate); the effect of goat was absorbed by the absorbed option.

The TD5 and TD6 were studied, due to their great interest in explaining the variation in milk yield of individuals after the breastfeeding peak. Persistence is defined as the animal's ability to maintain milk yield after reaching the maximum daily milk yield [9]. Indirectly, it can be suggested that the lactation persistence may influence food consumption, reproductive and health problems that may increase production costs [10,11]. The TDs were associated with the monthly weighing of milk yield made during the last third of lactation (TD5 and TD6). The number of observations by milk yields for TD5 and TD6, was 470 and 340, respectively.

3. Results and discussion
Milk yield averages in this study found for TD5 and TD6 were 1.29±0.85 kg and 0.95±0.55 kg, respectively [12]; reported that in dairy goats of Saanen breed from the southeastern region of Brazil, the PDC milk yield averages ranged from 2.60±1.46 kg (TD2) to 2.27±1.36 kg (TD10). Being that milk yield for the TD5 and TD6 were of 2.26±1.33 kg and 2.26±1.31 kg, respectively. In dairy goats of Murciano-Granadina breed of the southern region of Spain, the average daily milk yield was 2.04±0.95 kg [13]. In goats of the Alpina, Saanen and mestizo breeds, the milk yield values at the lactation was 2.11±0.98 kg [1]. In addition, they reported that the general average of daily milk yield was 2.11±0.98
kg. In this study, low values were presented in the coefficients of variation for TD5 and TD6 of 29.11% and 39.46%, respectively. In dairy goats of the Saanen breed, the coefficients of variation were 56% (TD2) up to 60% (TD10). Being that the milk yield for the TD5 and TD6 were of 58% and 59%, respectively [12]. In Murciano-Grenadine goats, the coefficient of variation for average milk yield was 47% [13]. While in Alpina, Saanen and mestizo goats, the coefficient of variation at the milk yield peak was 46.6% [1].

In general, the results obtained in this study for milk yield in the last third of lactation were low (Table 1). Among the possible causes that can explain the low productivity in this period of lactation, it can be considered that environmental conditions, seasonality, small data sets and weak relationship structures can limit the phenotypic expression of milk yield [5,6,14,15]. In addition, it should be considered that the trajectory at the beginning and end of lactation curve (last third in this study) of lactation, suffer considerable alterations (coefficient of variation). This situation can be explained possibly due to the availability of records in those periods, genetic constitution of individuals, age of the goat at kidding and low genetic selection of breeding animal for milk yield traits in goats [1,15].

| Source of variation | Degree of freedom | Mean square | Degree of freedom | Mean square |
|---------------------|-------------------|-------------|-------------------|-------------|
|                     | TD5               | TD6         |                   |             |
| Month kidding       | 1                 | 6.16        | 1                 | 8.04        |
| Year kidding        | 1                 | 2.75        | 1                 | 2.45        |
| Month age           | 6                 | 2.19        | 6                 | 2.34        |
| Linear age          | 1                 | 0.38        | 1                 | 0.49        |
| Linear quadratic    | 1                 | 6.10        | 1                 | 12.57       |
| Model               | 455               | 1.39        | 438               | 1.38        |
| Error               | 335               | 0.37        | 326               | 0.38        |
| R-square            | 0.71              | 0.72        |                   |             |
| Variation coefficient| 29.11             | 39.46       |                   |             |

*Highly significant (P < 0.01); a significant (P < 0.05); c Non-significant

In this study, the results of the ANOVA suggested that the non-genetic effects for the month and year of kidding and the interaction effect of month by year of kidding were highly significant (P <0.01) for TD5 and TD6, respectively (Table 1). While the covariate age of the goat at parity (linear effect) was not significant in the fifth and sixth months of lactation (TD5 and TD6, respectively). While the covariate age of the goat at parity (quadratic effect) was highly significant (P <0.01) for the fifth month and for significant (P <0.05) for the sixth month of lactation (TD5 and TD6, respectively) (Table 1), [13] suggested that the month of lactation, number of parities, season, month and year of parity presented a highly significant influence on milk yield and somatic cell count on the TD in dairy goats of Murciano-Grenadines race [15], reported that non-genetic effects of the herd per year, lactation’s number, season, parity and effect of the lactation stage were highly significant in milk yield on the TD for milk, fat and protein yield in White Shorthaired goats. [1] reported that the time of parity, racial type and number of parities significantly influenced production at 210 days of lactation, peak milk yield and persistence in goats of the Alpina, Saanen and mestizo breeds.

The initial results with the available information suggest that the non-genetic effects of the month and year of parity, and their interactions can significantly affect (P <0.01) milk yield in the fifth and sixth months of lactation in mestizo goats of Ocaña’s region. Therefore, it is suggested to consider these effects when making adjustments in the handling and care of the animals at the time of kidding [16], reported that milk yield in winter season was lower when compared to the summer season, with milk yield of 177 kg and 222 kg, respectively. On the other hand, it would be necessary to consider these effects in the productive evaluation, genetic evaluation and/or selection of the future breeders under the management and environmental conditions of the region. Within this context, [1], suggested that female goats of the Colombian tropics can be considered cross-breeding animals and, in addition to a limited
breeding program, could influence phenotypic performance for economically important traits in dairy herds.

4. Conclusions
It is concluded that factors such as month and year of parity and the age of the goat at parity influence milk yield in the fifth and sixth months of lactation in goats. Our results suggested that considering the effects of the Month kidding to improve the management and feeding processes can positively impact productivity in these periods.

In addition, it is suggested to carry out studies that incorporate a greater number of information and environmental variables that allow a better understanding of the non-genetic effects and their influence on dairy goat productivity.

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