

# PRODUCTIVITY OF GOAT NATIVE, ALPINE AND NUBIAN BREEDS AND THEIR CROSSES IN VENEZUELA

## PRODUCTIVIDAD DE LAS RAZAS CAPRINAS NATIVA, ALPINA, NUBIA Y SUS CRUCES EN VENEZUELA

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### Additional keywords

Criollo goat. Milk production. Growth. Reproductive characteristics.

### Palabras clave adicionales

Cabra criolla. Producción de leche. Crecimiento. Caracteres reproductivos.

### SUMMARY

A review is done on productive, growth and reproductive performance of native goat breed - Criollo (CC) -; improved breeds - Alpine (AA) and Nubian (NN) - and their crosses in Venezuela. Milk yield from first (P1) to third lactation (P3), per year of life (YYL), individual birth weight (BW), at weaning (WW), six month weight (W6) yearling weight (YW), fertility (YK), prolificacy (LS) and survival at yearling (YS) were compared. An aggregated value (AV) is estimated, weighting milk yield per year of life and the 80% of yearling weight per year of life produced at the end of third lactation by the milk/body weight, price relationship (1:2). Improved breeds are superior for all production traits and Criollo for all reproductive traits, except LS, which is associated to natural selection. Only AA surpasses CC in AV. The superiority of AA and NN breeds tends to decrease as they become older, due mainly to their low reproductive performance.

otras razas selectas Alpina (AA) y Nubiana (NN) y sus cruces en Venezuela. Se comparó el rendimiento lechero por año de vida (YYL) desde la primera (P1) hasta la tercera (P3) lactación, los pesos al nacimiento (BW), al destete (WW), a los seis meses (W6), al año (YW), fertilidad (YK), prolificidad (LS) y supervivencia al año (YS). Un valor agregado (AV) fue estimado pesando la leche por año de vida y el 80% del peso al año por año de vida al final de la tercera lactación por la relación de precios leche/peso corporal (1:2). Las razas mejoradas superan a la Criolla en las características productivas y la criolla es mejor en las características reproductivas excepto LS, lo que está asociado con la selección natural. Sólo AA sobrepasa a CC en AV. Se concluye que la superioridad de las razas AA y NN tiende a disminuir con la edad debido principalmente a su escasa eficacia reproductiva.

### RESUMEN

Se revisa la producción, crecimiento y reproducción de la raza caprina criolla (CC) y

### INTRODUCTION

The commemoration of the five centuries of Christopher Columbus first arriving to America has motivated

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reflexions from different points of view. Regarding to livestock brought up by Spanish conquerors; most species, though they spreaded abroad very quickly, remind without any significative improvement other than mother nature has done. The purpose of this paper is to review the genetic distance in productivity between native goat and improved, Alpine and Nubian breeds, and their crosses in Venezuela.

### COMPARISON CRITERIA

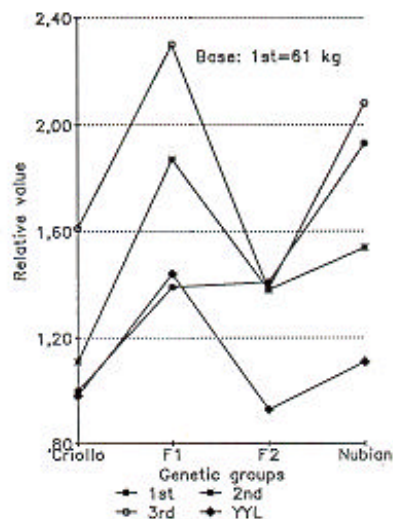
Animal production is the result of a complexed interaction between animal x environment, where the environment can be divided into phisical environment, that is related to general climatic condition and cultural environment which is concerned with technological level used as a integrated part of people, as well as political and economical constraints. Then, the production level observed in a given situation is a funtion of the animal genetic potential, that is its production level reached without any stress, and the resistance animal may have to environmental stress. Among breeds, there exist a genetic antagonism between production and resistance or adaptability traits. We can expect that natural selection will favor adaptability with detriment to productive traits.

It is also assumed that final goal must tend to maximize profit. This means that attention should be payed to production but also to reproduction and adaptability traits, for the effect they have over profit during an individual productive life span.

A total understanding of traits and identification of productivity influencing factors provides a frame within which we can take rational decision, and so minimize stress or select the most adaptable breed as convenience may be.

### PURE BREEDS PERFORMANCE

**MILK YIELD PER LACTATION:** Per lactation milk yield is one of traits most directly associated to profit and it reminds, in most cases, as a unique cri-



**Figure 1.** Nubian and crossbred relative value from first to third lactation and yield per year of life (YYL). (Valores relativos de los rendimientos por año de vida (YYL) desde la primera a la tercera lactación en Nubiana y cruces)

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terion to evaluate genetic groups. A relative value, related to Criollo, is given in **figures 1 and 2** for each group, taken from García (1986) and García *et al.* (1977).

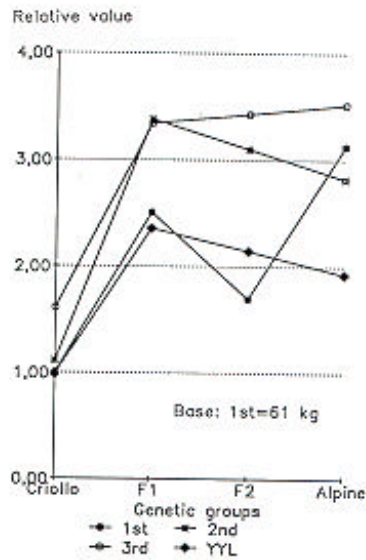
The results show that Criollo, opposite to Alpine and Nubian, increases its milk yield substantially from 1<sup>st</sup> to 3<sup>rd</sup> lactation. The Alpine and Nubian second lactation shrinkage make evident a genotypic x environment interaction that can be explained by its lesser resistance to second lactation stress.

Seem this trait as unique criterion

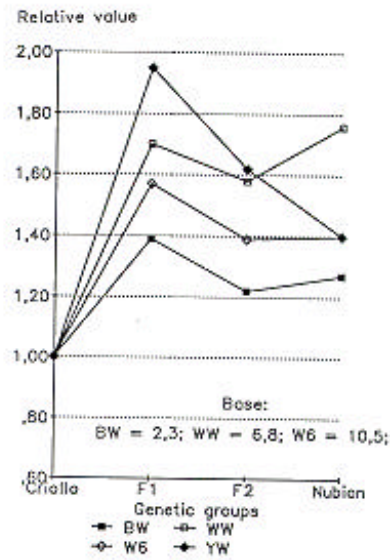
to evaluate the groups, there should be no doubt about superiority of improved breeds in relation to Criollo.

The relative value within lactation being for Nubian of 1.9, 1.4 and 1.3 and for Alpine of 3.1, 2.5 and 2.2 from first to third lactation respectively. However, we can observe that, in both cases, the distance become less as we go from first to third lactation.

It is necessary to be aware that this comparison is worthwhile if environmental conditions are common to each group. If this does not occur, part of the observed distance may be



**Figure 2.** Alpine and crossbred relative value from first to third lactation and yield per year of life (YYL). (Rendimiento por año de vida (YYL) de la primera a la tercera lactación en Alpina y cruces).



**Figure 3.** Nubian and crossbred relative value for birth (BW), weaning (WW), six month (W6) and yearling weight (YW). (Valores relativos para el peso al nacimiento, al destete, a los seis meses y al año en Nubiana y cruces).

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associated to a better management conditions given to improved breeds, as it is usually the case. Unfortunately most paper cited here in do not describe the environmental condition under which research took place.

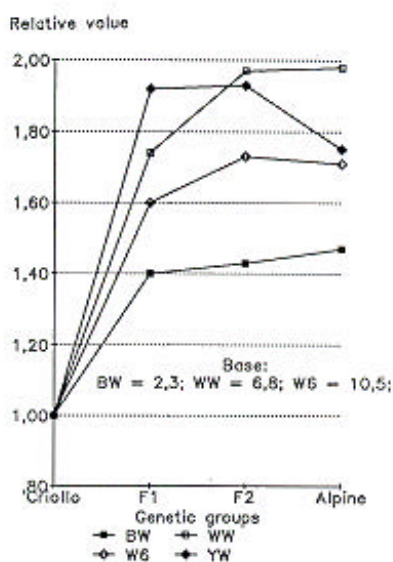
**MILK YIELD PER YEAR OF LIFE:** From an economical point of view, producer should care about individual milk yield during its productive life span. In our case, to get the milk yielded per year of life, we divided accumulated milk yield by the age at which third lactation ended. This way the produc-

tion level is subjected to, beside milk yield itself, first kidding age and kidding interval. Relative value for each group is given in **figures 1 and 2**.

Regarding to this trait, we still can see superiority of improved breeds in relation to Criollo, though quite less in comparison to what it is for milk yield per lactation. This result suggests that Alpine and Nubian superiority, in relation to Criollo, tends to decrease as they become older and may be due to a lower reproductive efficiency. If it is the case, such superiority will be even less if we take into consideration survival rate.

**GROWTH:** Growth includes joined economical important traits, not only for the amount of body weight that can be sold, but also for the effect they may have over the age at which females should be incorporated to reproductive and productive programs. Each group relative value for some of these traits is (**figures 3 and 4**) taken from Castillo *et al.* (1973a and b) and Pariacote and Plaza (1990).

Improved breeds superiority for growth traits goes from 1.3, 1.8, 1.4, 1.4 in Nubian to 1.5, 2.0, 1.7, 1.8 in Alpine for birth, weaning, six month and yearling weights, respectively. Here again it is observed, if we take out birth weight, a slightly decrease in superiority as the animal become older. The difference in relative value between birth and weaning weight can be explained, in the first place, by Alpine and Nubian higher prolificacy, since we are considering individual birth weight. In the second place it may be associated to maternal hability or management condition what the



**Figure 4.** Alpine and crossbred relative value for birth (BW), weaning (WW), six month (W6) and yearling weight (YW). (Valores relativos para el peso al nacimiento (BW), al destete (WW) a los seis meses (W6) y al año (YW) en Alpina y cruces)

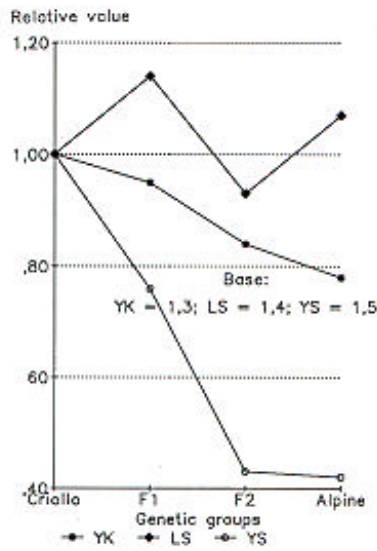
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case may be. It also explains why superiority decreases as the animal is separated from maternal environment.

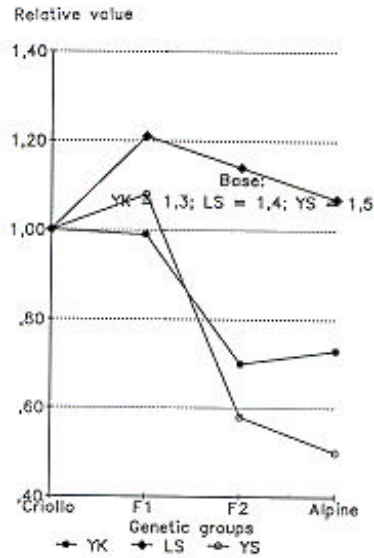
**REPRODUCTIVE EFFICIENCY:** Reproductive efficiency contribution to net profit occurs not only by increasing total population proportion that is producing and the number of animal for sale, but also by reducing improductive life periods within the population. From a biological point of view; reproductive efficiency should be understood as the contribution an individual does to next generation,

which means, beside the animal must be fertile, that its progeny survives its own generation.

Reproductive performance for the groups under comparison has been reported by García (1986), García *et al.* (1977) and Guichard (1985). **figures 5 and 6** show a clear superiority of Criollo in relation to Alpine and Nubian, for yearly kidding and survival at yearling. This places improved breeds production in a compromising situation because of difficulties to preserve themselves under the new condition to which are going to be ex-



**Figure 5.** Alpine and crossbred relative value for yearly kidding (YK), litter size (LS) and survival at yearling (YS). (Valores relativos de fertilidad (YK), tamaño de la camada (LS) y supervivencia al año (YS) en Alpina y cruces).



**Figure 6.** Nubian and crossbred relative value for yearly kidding (YK), litter size (LS) and survival at yearling (YS). (Valores relativos para la fertilidad (YK), tamaño de camada (LS) y supervivencia al año (YS) en Nubiana y cruces).

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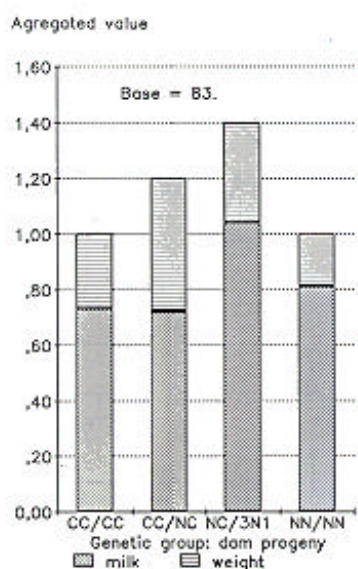
posed. Criollo inferiority for litter size is associated to natural selection; under adversed environment, an individual from small litter has a greater survival rate than those coming from bigger ones.

On the whole there seem not to be doubt about improved breeds superiority for production traits, though such superiority tends to become less as they get older and mainly when production is measured as a function of time. On the other hand, it also seems clear that improved breeds has a poor reproductive

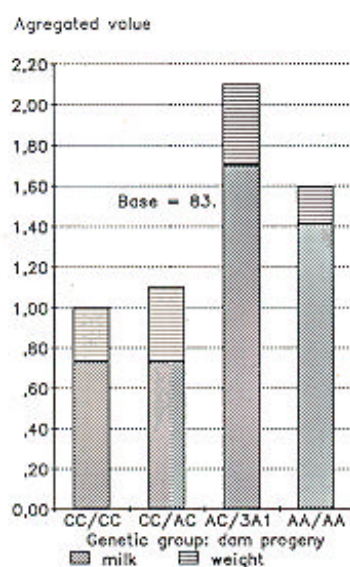
performance under tropical conditions.

**AGREGATED VALUE:** In order to have a better idea of each group total productivity, an agregated value is estimated by weighting milk yield per year of life and the 80 p.c. of yearling weight per year of life produced, at the end of third lactation, by the milk/body weight price relationship (1:2).

The results, given in **figures 7** and **8**, show that only Alpine breed is superior to Criollo in total productivity. However, none of the improved



**Figure 7.** Nubian and crossbred relative aggregated value and its composition. (Valor relativo del Valor Agregado (AV) y su composición en Nubiana y cruces).



**Figure 8.** Alpine and crossbred relative aggregated value and its composition. (Valor agregado relativo y su composición en Alpina y cruces).

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breeds surpasses Criollo body weight contribution to aggregated value. Alpine superiority is due mainly to milk yield that accounts 88% of its aggregated value, whereas in Criollo milk yield accounts 73% and 81% in Nubian. Here, we notice the important contribution of reproduction traits to productivity.

Of course, in this comparison we are concerned only about groups productive aspects and it is necessary to determinate required costs for a more definite comparison. Improved breeds will succeed if their superiority in production compensates the required costs to achieve it. It will also depend on the proportion of total population that are able to produce for long time as well as to survive at the new environmental condition to which are going to be exposed.

### CROSSBRED PERFORMANCE

With a few exception; we can see in **figures 1** and **6** a typical greek temple model, where F1 is a little higher than the improved pure breed. This is associated, of course, to F1 heterosis and, in some cases, with detriment in the improved pure breed performance due to environmental effects and has been discussed by many authors (Madalena, 1981; Plase, 1983; Prada, 1979; Vaccaro, 1979; Verde, 1979). The exception can be associated, as the case of Alpine growth traits (**figure 4**), to maternal effects, since F1 comes from Criollo dam and Alpine is the highest

producing group. As it is known, F2 lower level in relation to F1 is due to heterosis loss, showing less decrease in maternal influencing traits because of dam heterosis. **figures 7** and **8** show that the greatest total productivity is reached by F1 dam and F2 kids due to individual and maternal heterosis.

Although there exist a great degree of heterosis, F1 does not surpasses the best of the improved pure breed but when producing traits are measured as a function of time. Contrary to what we will expect, the compared groups show less heterosis for reproduction than for productive traits.

### CONCLUSIONS

There exist a considerable genetic distance between goat native and improved breeds, regarding to production traits. Such a distance tends to cancel out as the animals become older and it is associated mainly to improved breeds low reproductive performance under the new environmental condition to which has been exposed. Only Alpine breed is superior to Criollo in total productivity, due mainly to its milk yield that accounts 88% of its aggregated value. None of the improved breeds surpasses Criollo body weight contribution to aggregated value, which evidences the importance of reproduction traits to total productivity. Improved breeds low reproductive performance places them in a compromising situation because of difficulties to preserve themselves as a population. The F1 surpasses the best of the pure



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mainly when production traits are measured as a function of time. The

highest productivity is reached when individual and maternal heterosis is combined.

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