*Tropical and Subtropical Agroecosystems*

**NOTA CORTA [SHORT NOTE]**

# EVALUATION OF GOAT PRODUCTION IN THE HUMID GULF COAST OF TEXAS

# [EVALUACIÓN DE LA PRODUCCIÓN CAPRINA EN LA COSTA HÚMEDA DEL GOLFO DE TEXAS]

**J. M. Dzakuma, N. C. Beckford, B. M. Johnson, E. Risch**

*International Goat Research Center, Prairie View A&M University, Box 519, MS 2008, Prairie View, TX 77446. Tel: 936-857-3916; Fax: 936-857-4519; E-mail: jmdzakuma@pvamu.edu*

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## SUMMARY

Our research activities are designed to support increased economic opportunities and improved quality of life for rural American farmers. The objective of this paper is to evaluate our research efforts and determine where we can be more productive and sustainable. Goat research activities using Tennessee Stiff-legged (TS), Spanish (SP), Nubian (NU) and Boer (BR) breeds in different production systems at the International Goat Research Center at Prairie View A&M University, located on the northeastern corridor of the Gulf Coast region of Texas, approximately 45 miles from Houston, have been examined. From a diallel crossing experiment we recommended the use of terminal sire TS on the cross of NU*x*SP females. Goats that were fed at intermediate level of a ration (70% of *ad libitum*) were significantly more efficient ($P< 0.05$) in converting feed to gain. Comparison of intensive and pasture rearing systems indicated that pasture raised SP kids were significantly heavier ($P< 0.05$) than intensively raised SP kids, while the opposite was true for TS and BR kids. It would appear that on pasture, the SP kids grew faster than the TS kids. Between breeds, growth performance was higher for the BR and TS breeds in the intensive system, while growth performance was higher for the SP in the pasture system. It would appear that the SP breed is more adapted to production under pasture (or extensive) production system. Even though the TS breed is smaller, under intensive system it grows more efficiently ($P< 0.05$) than the SP, an intermediate size breed. Under conditions existing in the Gulf Coast region of Texas, breeds that are adapted to the environment are recommended for use in initiating goat production programs. Tremendous potential exist to make a living with goats in this region

**Key Words**: Tennessee Stiff-legged, Spanish, Nubian, Boer, Goats.

## INTRODUCTION

Prairie View A&M University is located approximately 45 miles from Houston on the northeastern corridor of the Gulf Coast region of Texas. Prairie View A&M University is situated on the "farm gate to the consumer area" because of its proximity to Houston, a city of approximately 4 million people. This creates an opportunity to be capitalized upon for efficient goat production practices in order to satisfy consumer demands. At Prairie View A&M University we have conducted several research projects: We have evaluated the productivity of crossbred goats in pasture situations (Dzakuma, el al.,1994) and crossbred goats when raised intensively and in pasture situations (Smith, 2000; Beckford, 2002, Dzakuma et al., 2004). Currently our efforts are on conservation of goat genetic resources both *in situ* and *ex situ* and using kids produced out of the *in situ* conservation population to select goats for resistance to intestinal parasites. We have placed emphasis on selection for parasite resistance (Dzakuma et al., 2006) because it has been estimated that southeast Texas goat producers lose approximately $3.7 million annually in anthelmintics and feed costs due to subclinical infections and subsequent loss in production. Annually, rainfall in the gulf coast region averages 50.8 (range 60.1 -78.7) inches, temperatures range from 7 - 109$^{O}$C and humid. (There are 97 average day where temperature is above 90$^{O}$C). The objective of this paper is to examine our efforts over the years and determine where we can be more productive and sustainable because our research activities are designed to support increased economic opportunities and increase the quality of life for rural American farmers.

## MATERIALS STUDIED, AREA DESCRIPTIONS, METHODS, TECHNIQUES

Our experimental trials at the International Goat Research Center at Prairie View A&M University

started off with a three breed diallel crossbreeding program in 1992 using Nubian (NU), Spanish(SP) and Tennessee Stiff-legged (TS) breeds. Prior to this time the emphasis had been on cashmere production. Crossbreeding was undertaken in order to provide recommendation to producers as to what types of breeds will be suited to their environments. Also producers desired increased size in their goats for economic reasons.

The introduction of the Boer breed followed in 1993. The latter breed was too expensive to afford and crossbreeding became more favorable to purebreeding. Boer semen and embryos costs even became too prohibitive. This led to a study where we decided to raise the Spanish (SP), Tennessee Stiff legged (TS) and Boer (BR) goats in confinement rearing under different levels of the same nutritional environment. In the first group, equal numbers per breed were given the same ration *ad libitum*, the next group at 85% of the *ad lib* ration and the third group at 70%. Comparisons were also made between confinement and pasture rearing. Goats raised on pasture were slaughtered at 6 mo of age. Prior to slaughter, one-half the population had been creep fed. After they were weaned, kids that were creep fed and those not creep fed were randomly assigned to two groups. One group was supplemented and the other group was not, until they were slaughtered at 6 mo of age. Under pasture situation, comparison were made between kids that were creep fed and supplemented, versus those that were not. Kids raised intensively were compared to those raised on pasture.

With the outbreak of foot and mouth disease in Europe and Canada and bio-terrorism, with consequences of having to slaughter or kill livestock, we realized the importance of germplasm conservation. Boer goats were and still are being crossed to Landrace goat breeds, such as Angora, Spanish and Tennessee Stiff-legged, for income generation. Subsidy on wool and mohair production was also removed in 1993, coincidental with the introduction of the Boer breed and thus exacerbated the loss of genetic diversity in the Landrace breeds. *In situ* conservation of SP, TS and BR was initiated in 2002. We have designated this population as "Reference population" for long term genetic studies. Simultaneously in 2002, we also initiated *ex situ* collection of goat germplasm. The reference population is extensively raised on pasture and naturally bred once a year. Offspring produced yearly are challenged with a known dose of infective *Haemonchus contortus* larvae and selected for tolerance/resistance to parasites.

## RESULTS AND DISCUSSION

**Crossbreeding**. From our crossbreeding experiments we were able to recommend NU*x*SP females to be used in terminal sire crossbreeding programs with TS males (Dzakuma and Risch, 1994). The SP*x*NU females would have been more suitable; however, the large udders of the NU females in pastures predispose them to mastitis and other udder diseases. In the diallel crossing system, significant differences ($P< 0.05$) existed between birth weight (BW) of TS and SP (2.6 vs 3.4 kg), and TS and NU (2.6 vs 3.3 kg) kids. No differences ($P> 0.05$) were obtained in BW of crossbred kids. The same pattern was observed in weaning weigh (WW) of these kids. Weaning weight for purebred TS, SP and NU kids, respectively, were: 9.4, 10.8 and 12.7 kg; and for crossbred TS*x*SP and TS*x*NU kids, respectively, were: 10.4 and 11.6 kg. This would indicate that TS breed when used in crosses is able to produce kids of comparable birth and weaning weights as SP and NU breeds (Dzakuma & Risch, 1996).

**Effects of creep and supplementation**. Our results indicated that kids that were creep fed were significantly heavier ($P<.05$) than those that were not creep fed, at weaning (WNWT=17.3 vs 15.9 kg), and at slaughter (SLWT=25.1 vs 21.8 kg), respectively, (Table 1). Supplementing kids diet on pasture (native grass pastures) with a formulated ration also had a statistically significant effect on slaughter weights of kids supplemented compared to those not supplemented (25.2 vs 20.9 kg). Providing creep feed and supplemental rations to kids raised on pasture could result in them reaching heavier market weights. Kids weighed about the same at weaning (18.3 and 18.4 kg) before they were either supplemented or not supplemented. Creep feeding in conjunction with high quality forage and limited low-cost supplementation have the potential to maximize profits.

Table 1. Effect of Creep and Supplementation on all Breeds

| Dietary Level | n | WNWT | n | 6 mo SLWT |
|---|---|---|---|---|
| Creep | 42 | 17.3[a] | 25 | 24.1[a] |
| Non-Creep | 35 | 15.9[b] | 27 | 21.8[b] |
| Supplemented | 38 | 18.3 | 26 | 25.2[a] |
| Non-Supplemented | 39 | 18.4 | 26 | 20.9[b] |

$P < 0.05$

**Intensive rearing**. The intensive rearing of three goat breeds (SP, TS & BR) at different levels of the same ration was planned so as to show trends in growth, represented by TS (small), SP (medium) and BR (large) size breeds.

Trends observed (Dzakuma *et al*., 2000) pointed to the fact that goats fed at the *ad libitum* or 100% (21.0 and 28.5 kg) dietary level were significantly heavier (P< 0.05) than those fed at 85% (18.3 and 23.8 kg) or at 70% (17.2 and 25.7 kg) level at six and 12 mo ages, respectively.

**Growth weights in intensive and pasture systems**. In Table 2, growth weight of kids raised in intensive (boldface type) and pasture systems have been superimposed on each other. Birth weight of the BR and SP kids produced in the intensive and pasture systems, respectively, for BR (3.5 and 3.5 kg) and SP (3.3 and 3.4 kg) are similar and differed significantly (P<.05) from the birth weight of TS (2.8 and 3.0 kg) kids. Weaning weight for kids in the intensive rearing system differed significantly (P<.05) for BR (19.8 kg), SP (10.5 kg) and TS (14.3 kg) and similarly differed in

Table 2: Least Squares Means for Growth Weights (kg) in Intensive and Pasture Rearing Systems.

| Breeds | BRWT | WNWT | 6 mo SLWT | ADG |
|---|---|---|---|---|
| BR Intensive | 3.5[a] | 19.8[a] | 36.1[a] | 0.12[a] |
| pasture | 3.5[a] | 17.0[2a] | 26.4[2a] | 0.08 |
| SP Intensive | 3.3[a] | 10.5[b] | 20.4[b] | 0.80[b] |
| pasture | 3.4[a] | 14.0[2b] | 24.3[2a] | 0.07 |
| TS Intensive | 2.8[b] | 14.3[c] | 24.0[c] | 0.09[b] |
| pasture | 3.0[b] | 11.2[2c] | 19.6[2b] | 0.06 |

P < 0.05

the pasture rearing system BR (17.0 kg), SP (14.0 kg) and TS (11.2 kg). Between breeds and for WNWT, BR and TS kids raised intensively were significantly heavier (P<.05) than those raised on pasture. In the SP breed, however, the opposite was true. Pasture raised kids were significantly heavier than kids raised intensively (P<.05). A similar pattern was observed at SLWT. The BR (36.1 kg) breed was significantly heavier than the TS (24.0 kg) breed and the TS was in turn, heavier than the SP (20.4 kg) breed, when raised intensively. On pasture, the BR (26.4 kg) breed was heavier than the SP (24.3 kg) breed which was, in turn, heavier than the TS (19.6 kg) breed. Pasture raised SP kids were significantly heavier (P<.05) than intensively raised SP kids, while the opposite was true for BR and TS kids. It would appear that on pasture, the SP kids grew faster than the TS kids. In the intensive rearing system, however, the TS grew faster than the SP kids.

**G x E interaction**. Results in Table 2 demonstrate genotype *x* environment interaction: Failure of the breeds to perform the same in the intensive as well as the pasture production systems. Within breeds, growth performance was higher for the BR and the TS breeds in the intensive system, while, growth performance was higher for the SP in the pasture system. It would appear that the SP breed is more adapted to production under pasture (or extensive) production system.

Results from this study indicate that the bigger breeds had higher BRWT and reached higher WNWT. This is in accordance with the findings of Warmington and Kirton (1990). The responses of the breeds to different dietary management practices, suggest that, the BR breed performed well intensively and on pasture with or without supplementation. This concurs with the findings of Cameron *et al.* (2001), Malan (2000) and Blackburn (1995) who all reported superior performance of BR when feed is at optimum levels. The TS breed appeared to have better growth performance when raised intensively, especially at the lower dietary level of intake (Beckford, 2002).

Our parasite study has demonstrated that the Landrace breeds (TS and SP) are able to tolerate severe parasite loads (two sources of challenge: artificial challenge in addition to pasture challenge) under extensive production system, than the BR breed (Dzakuma *et al*., 2006). Under conditions existing in the Gulf Coast region of Texas, breeds that are adapted to the environment are recommended for use in initiating goat production programs. Tremendous potential exists to make a living with goats in this region.

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