Productive Performance of F_1 Dorper *vs.* Katahdin Ewes Under Semi-extensive Conditions of Northern México

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Introduction

Like in other countries (Leymaster, 2002; Simm *et al*., 2001), in northern México a 3-way terminal cross has been recommended for lamb production. Two hair type composite, medium-size, non-seasonal sire breeds (Kt and Dp), have been crossed to either of two traditional hair type dam breeds (Pb and Bb) to obtain the F_1 ewes. The Katahdin breed was originated in the northeastern U.S.A. and from there extended to different regions of that country (Hawkins and Morgan, 2001), especially in the Golf coast, Canada and all across México. The Dorper breed was developed in South Africa (Schöeman, 2000), under harsh arid conditions, and introduced to different countries worldwide.

According to origin and selection history, it has been hypothesized (Notter, 2005) that Katahdin would adapt best under humid, warm conditions, while Dorper would be best suited for dry arid and semiarid rangeland conditions. Therefore, the aim of the present study was to compare productive performance of F_1 Dp *vs.* Kt ewes under low-input semiarid conditions of northern México.

Materials and methods

The study was conducted from 2006 to 2009, with a total of 158 F_1 ewes in five different lots, according to lambing dates. Animals were obtained from estrus syncronization and artificial insemination programs in a reproduction study with 51 Blackbelly and 37 Pelibuey ewes, and semen from seven Dorper and eight Katahdin rams (Table 1). One ram of each breed was used for natural service breeding on ewes repeating heats in the following estrus cycle.

Table 1: Distribution of F_1 ewes by birth lot, sire (♂) and dam (♀) breed.

		Breed[a]			
		Dp (♂)		Kt (♂)	
Lot	Birth date	Bb (♀)	Pb (♀)	Bb (♀)	Pb (♀)
1	16-02-2006 to 12-03-2006	16	2	8	10
2	26-11-2006 to 16-12-2006	16	8	5	4
3	10-02-2007 to 10-03-2007	4	4	9	9
4	29-09-2007 to 11-11-2007	21	5	4	3
5	13-11-2007 to 08-12-2007	15	10	2	3
	TOTAL	**72**	**29**	**28**	**29**

[a]Dp = Dorper; Kt = Katahdin; Bb = Barbados Blackbelly; Pb = Pelibuey

At least one ram per breed was repeated from one lot to another to keep the experimental design connected. Also, some dams were repeated across lots. Dams were those from the experimental station flock, including both, stud and commercial ewes. Sires were stud

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rams from different flocks in the state of Chihuahua, which were bought in flocks from central México. Blackbelly and Pelibuey sires used in the experimental station had been brought from the states of Jalisco and Aguascalientes in central México, but were not a wide representative genetic sample for those breeds in the country.

The flock was managed under rangeland conditions during the day and kept in the corral at night. During the dry season (October to June), non-lactating ewes were supplemented with ~300 g of concentrate, and late gestation and lactating ewes with 500 to 800 g. While lambing, ewes were kept in a corral and fed with either corn silage, oats hay and(or) corn stubble plus the supplement. Lambs were creep fed from 15 d of age and beyond. Weaning was at 90 d of age. After weaning, F_1 ewe lambs were reared in a feed lot until they underwent ultrasound evaluations and detected pregnant. They were weighed every 14 d. Feeding was based on alfalfa hay and ~500 g of concentrate (46.4% ground corn, 31% soybean meal, 11.7% sugar cane molasses, 4.39% bypass fat Energivac®, 2.93% tallow, and 3.68% minerals, salt, vitamins and additives). By the time ewe lambs reached an average weight of 30 kg, a morning-afternoon heat detection program was implemented with a vasectomized ram. Once all ewes were detected in estrus at least once, the lot was breed with a Charollais ram, which was a different one for some of the lots. Pregnant ewes were turned into the rangeland management mentioned previously, providing them with 500 g per ewe of a daily supplement until lambing. During lactation (90 d), the amount of supplement was increase to 800 g per animal per day. After lambing and a waiting period of 45 d, breeding was started with a natural service ram for at least 60 d.

The weather in the region is characterized by cool winters, hot summers and low temperatures at night. The average temperature in January ranges from -5.9 to 13^0 C and in June is 31.6^0 C. The average annual precipitation from 2006 to 2009 was 446 mm. The rainy season is on average 64 d long. The elevation is 1950 m above the sea level.

Analyzed variables were weights from birth to around nine months of age; age (AE) and weight (WE) at first estrus; and for first and second lambing: percentage of twining, birth and weaning weight (adjusted to 90 d) of lambs, rate (%) of ewes with dead lambs from birth to weaning, weaned weight per lambing ewe (WWL), weaned weight per weaned ewe (WWW), and lambing interval. Statistical analyses were done with MIXED and CATMOD procedures of SAS (2002) for linear and categorical variables, respectively. A second degree regression curve of weight on age was adjusted from birth to 280 d, including sire and dam breed, type of lambing (single and twins), lot, and all significant interactions as class fixed effects, and sire within sire breed and dam within dam breed as random effects. A Toeplitz(9) banded covariance structure was adjusted for residuals of repeated weight measures. The model for AE and WE included type of weaning instead of type of lambing. Variables related to productivity on F_1 ewes were analyzed separately for first and second lambing using the same model. For rate of dead lambs at first lambing the model included only main effects of sire and dam breed, and type of lambing. For birth and 90-d weaning weight of lambs, the model also included the sex effect.

Results

Figure 1 shows pooled estimated quadratic regression growth curves according to sire breed. Significant effects were linear and quadratic regressions on age, linear age by sire breed interaction, type of lambing, lot and interaction of quadratic age by lot. From birth to 99 d of age, weight of ewe lambs was similar for both breeds (P>0.05; 21.06±0.68 *vs.* 19.26±0.67 kg). Behind 100 d of age, F_1 Kt ewes had a higher (P<0.05) weight than F_1 Dp ewes, with averages of 48.16±0.74 and 44.23±0.71 kg at 280 d.

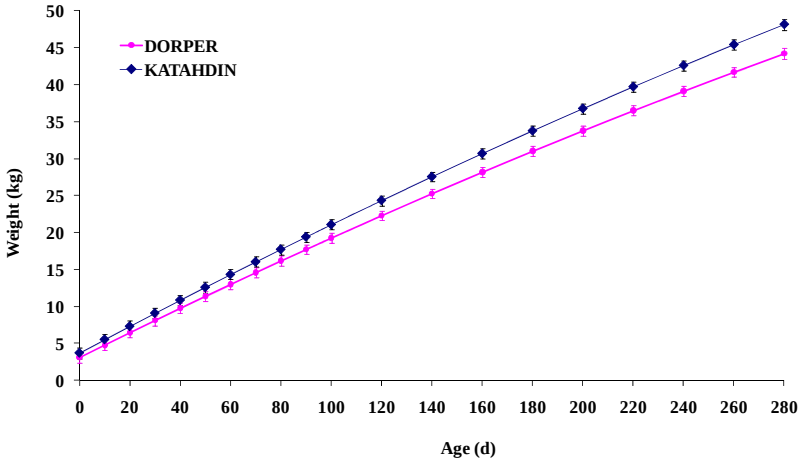

Figure 1: Pooled estimated quadratic regression growth curves for F_1 ewes sired by Dorper (Dp) and Katahdin (Kt) rams.

At first estrus (Table 2), Kt F_1 ewes of lots 4 and 5 were older and, on average for all lots, heavier than Dp F_1 ewes. Moreover, Dp F_1 ewes (Table 3) showed around 15% (P<0.05) higher twining rates, weaned on average 5 kg more (P<0.05) lamb per ewe weaning, and became pregnant 26 d sooner (P<0.05) than Kt F_1 ewes at first lambing; although, the trend was similar for second lambing, it did not reach significance (P>0.10).

Table 2: Least squares means (±E.E.) for age and weight of Dorper (Dp) and Katahdin (Kt) F_1 ewes at first estrus.

	Age		Weight	
Lot	Dp	Kt	Dp	Kt
1	203±7.9[a]	192±6.6[a]	37.6±1.7[a]	38.4±1.4[a]
2	224±6.0[a]	231±10.6[a]	34.8±1.3[b]	40.4±2.3[a]
3	200±9.6[a]	207±6.4[a]	31.9±2.1[a]	36.5±1.4[a]
4	222±6.1[b]	304±11.4[a]	40.8±1.3[b]	51.8±2.4[a]
5	232±5.9[b]	258±12.3[a]	38.5±1.2[a]	41.0±2.6[a]
Mean	**216±3**	**238±4.4**	**36.7±0.7[b]**	**41.6±0.9[a]**

[a,b] Different letters between columns indicate differences on means of age (P<0.05) and weight (P<0.06) at first estrus by sire breed.

Table 3: Percentages and least squares means (± E.E.) for variables measured on Dorper (Dp) and Katahdin (Kt) F_1 ewes and(or) their lambs

	First Lambing		Second Lambing	
Variable	Dp	Kt	Dp	Kt
Twining rate (%)	45.0[a]	29.2[b]	55.0	39.4
Lamb birth weight (kg)	2.8±0.07	2.9±0.08	2.8±0.08	2.8±0.08
Lamb 90-d weaning weight (kg)	18.5±0.5	17.8±0.7	19.5±0.9	17.7±0.9
Percentage of ewes with dead lambs	18.7	14.6	12.8	12.1
Weaned weight (kg) per lambing ewe	23.3±1.3	19.7±1.7	25.3±1.8	22.6±1.6
Weaned weight (kg) per weaned ewe	25.9±1.2[a]	20.8±1.5[b]	25.5±1.7	22.6±1.6
Lambing interval (d)	---	---	280±9[b]	316±11[a]

[a,b] Different letters between columns indicate differences (P<0.05) on means of sire breeds.

Discussion

When a genetic resource is to be introduced into a production environment, in addition to productive traits, fitness must be taken into consideration. Animals were designed by natural selection to have the genetic potential to express adequate fitness under those conditions that prevailed during their evolutionary history (W. D. Hohenboken, personal communication). Sheep production in northern México was down for some years due to lack of a market for wool. The change on the production objective, from wool to meat, required adaptation in the components of the system. Rambouillet, a well adapted breed to arid and semiarid conditions, has been replaced by hair type sheep, which have an evolutionary history in the hot and humid conditions of the tropics. Their easy care properties (Notter, 2005) have been incorporated into composites like Kt and Dp that could adapt better to cold, dry, arid conditions than traditional hair type breeds. The results obtained in this study, especially on reproduction traits, may have reflected a better adaptation of Dp than Kt to those conditions, given their evolutionary history; however, indicators of adaptation to stress challenges like nutritional deficiencies, extreme changes on daily temperatures, among others, should be evaluated to support these results. Also, because evaluated animals were crossbreds of those composite breeds with pure hair type breeds, and Dp is more genetically distant from them than Kt, hybrid vigor could be playing a role on the observed results.

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