Selection practices for meat goats: Estimation of the relationship between sire's performance on central test and the performance of his progeny

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ABSTRACT: A progeny test, of selected bucks from central performance tests, was conducted in order to establish the relationship between central test performance and progeny performance for meat goats. Progeny (N=285) from 14 different sires over a two yr period were analyzed using a mixed model. Regressions of offspring performance (birth weight, weaning weight, postweaning gain) on sire's central performance were positive but not significantly different from zero. These results suggest that performance records collected during a central performance test were not as accurate for predicting progeny performance as within-herd records.

Key Words: Goats, Growth, Central Test

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Introduction

The goat industry is changing focus with an increased emphasis on meat production. Growth rate of the slaughter animals is one of the most important factors determining the amount of meat produced. Producers that want to increase the growth rate of kids by using breeding stock which are genetically superior for growth rate are in need of objective information on how to select breeding stock. Within-herd selection is straightforward because all animals are raised in a common environment. Therefore, all animals are subject to the same environmental effects and observed differences in performance are largely genetic. The heritability of six- and nine-mo wt averaged .50 in a Boer herd in South Africa (Schoeman et al., 1997). However, many goat producers are acquiring breeding stock, especially males, from other herds. Therefore, environmental differences can affect performance. One method, used in other meat producing species, to partition genetic effects from environmental effects is the central performance test. A central performance test measures performance of animals from several different ranches in one common, central environment.

In the summer of 1995 an annual central performance test for meat goats was reinstated at San Angelo. The groups that were involved in the planning and/or conduct of this test were representatives from the American Meat Goat Association (AMGA), American Boer Goat Association (ABGA), Angelo State University (ASU) and Texas Agricultural Experiment Station (TAES) at San Angelo. The rationale for a central performance test is to try to accurately measure performance of animals from different ranches in a common environment so that performance is not influenced by different environments. If there are no pretest environmental effects that influence performance, the observed differences in performance are assumed to be predictors of genetic differences. There is evidence from 63-d central performance tests of Suffolk ram lambs in the Midwestern U.S. that indicates that pretest environment affects test performance and therefore central test performance is not a reliable predictor of progeny growth rate (Waldron et al., 1990). The objective of this project was to determine the relationship between central test performance and progeny performance in typical environments.

Materials and Methods

Central Performance Test

This study used data from the central tests conducted from 1995 through 1997. There have been management changes across years, but in all years the test was conducted in an environment where the growth of the bucks was not limited by nutrient availability. The participation, in terms of number of goats and number of herds, increased each year (Table 1). This increased participation is evidence of goat breeders' interest in performance recording and genetic improvement. The increase in the mean central test performance over the three-yr period was concurrent with an increase in the proportion of Boer genetic influence.

Table 1. Number of bucks finishing central performance test by year

Year	Number of Goats	Increase	Number of Herds	Mean ADG,lb	Length of test, days
1995	49		7	.43*	112
1996	78	59 %	12	.58	84
1997	121	55 %	19	.63	84

* Gain for the first 84 days of the 112-day test.

Progeny Test

At the conclusion of each of the central tests (1995 - 1997) bucks were selected for a progeny test. Bucks were selected to represent a broad range of performance on the central test. A total of 14 bucks were mated in the progeny test in the three years. The central test performance of selected sires is shown in Table 2. Each buck was mated with approximately 20 Spanish does on the Winters Ranch lease near Brady, Texas. Does were assigned to sires so that the average age and weight of does was similar for each sire. Kids were born in the spring of 1996, 1997 and 1998.

Table 2. Central test performance of progeny tested sires

Year	ADG, lbs/day
1995	.58, .58, .42, .38, .36
1996	.87, .73, .55, .45, .40
1997	.85, .74, .51, .48

The kids were weighed at birth, at weaning (approximately 120 d of age) and during a postweaning gain period up to approximately 6 months of age. The numbers of kids with records are listed in Table 3. There was an average of 20 kids/sire for birth weight. In order to obtain information from two different environments, kids were randomly assigned, within sire group, to either a feedlot or pasture group for the postweaning gain period. The average weights and rates of gain are shown in Table 4.

Table 3. Number of birth, weaning, and postweaning records by year.

Year	Birth	Weaning	Postweaning	Number of sires
1996	142	129	129	5
1997	83	80	66	5
1998	60	53	53	4

Table 4. Progeny performance means by year.

Year	Birth wt	Weaning wt	Feedlot ADG	Pasture ADG	Feedlot final wt	Pasture final wt
			(lbs)			
1996	5.7	37.2	.41	-.01	59.6	43.2
1997	6.3	38.1	.45	.11	64.8	47.9
1998	5.9	59.5	.47	.09	86.7	63.0

Data were analyzed to estimate the extent to which central test performance is a predictor of progeny performance. The statistical model included fixed effects for year, sex and type of birth, (single vs. multiple) linear covariates for age within year and sire's central test performance, and a random effect for sire. The sire's central test performance was expressed as a deviation from the test average for that year.

Results

The estimated regression coefficients are shown in Table 5. A plot of sire means for central test performance and progeny performance is shown in Figure 1. The variability in sire groups and the deviations about the regression are evident in Figure 1. The ADG of the sires is expressed as a deviation from the mean of all bucks on test in that year.

Table 5. Regression of progeny performance on sire's ADG as measured on central test

Trait	Regression coefficient ± s.e.	P
Birth weight	.47 ± .35	.18
Weaning weight	.56 ± 4.30	.89
Postweaning gain		
Feedlot	.066 ± .092	.48
Pasture	.013 ± .052	.80
Final weight		
Feedlot	-.3 ± 8.4	.97
Pasture	9.1 ± 5.3	.09

* 42 day postweaning growth period

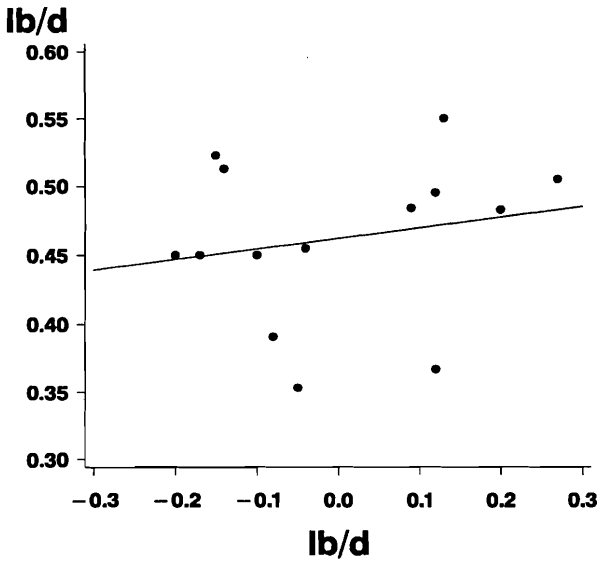

Figure 1. Progeny postweaning ADG versus Sire's central test ADG deviation.

The regression results indicate there was not a significant relationship between central test performance of the sire and birth or weaning weights of the progeny. Progeny postweaning gain in the feedlot environment is the trait that is the most similar to central test performance. There was not a significant relationship between sire's central test performance and progeny postweaning gain in either the feedlot or pasture environments, even though the estimates were positive. The final weight recorded on the progeny was at approximately 6 mo of age. The regression results for final weight indicate no significant relationship between sire's central test performance and progeny performance in the feedlot and only a weak relationship (P = .09) with progeny performance on pasture.

The data suggest that the central performance tests did not accurately identify genetic superiority for growth rate. These results are based on data from progeny of 14 sires over a three-yr period. It would have been desirable to evaluate progeny from a larger number of bucks. The lack of a strong relationship between sire and progeny performance may have been due to the pre-test environmental differences among the goats tested. Louca and Hancock (1977) found no significant genotype by environment interactions when growing goats on different levels of protein and suggested that genotype by environmental interactions may not hinder selection programs.

The range of birth dates of bucks that were on the central performance test was approximately three mo. When older bucks were compared to younger bucks within this three-mo range, the period of growth being measured may have been at different stages of maturity and therefore the central test evaluation may have been biased. Presently, there is not enough data available to adequately evaluate the effect of starting age on central test performance. Possible changes for the test to improve accuracy are 1) lengthen the test period, and 2) restrict range of birthdates of kids on test. The expected negative consequences of these changes would be an increased cost of testing and lower participation because of the restriction on kidding dates.

Central performance test data did not accurately identify genetic differences among goats from different herds for growth rate. Variation in performance among half-sibs on the central performance test indicates that breeders should be encouraged to test several sons from a sire rather than only one or two sons from each sire. This will result in a more accurate genetic evaluation of the sires. Perhaps the central test should be considered as a progeny performance test. Because most goats are raised in extensive management systems, little performance data is

collected on ranches. Therefore, the central performance test concept has appeal for many breeders. While the results of the current trial do not indicate a significant relationship between central test performance and progeny performance, a stronger relationship may exist when animals are compared within a group of bucks from a single herd. The bucks used in the progeny test came from different herds. A breeder may use the central test to obtain growth data on kids and use that data in selection decisions, because pre-test management will be the same for all kids from one flock. Breeders should also be encouraged to record performance at their own ranch on a greater proportion of kids so that performance information can be combined with pedigree information to more accurately identify genetically superior animals.

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