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The influence of breeding intensity on above- and below-average sexual performance rams in single- and multiple-sire breeding environments☆

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Abstract

Two studies were conducted to evaluate the relationship between serving capacity scores and breeding performance of rams. The first study was conducted to determine whether rams with above or below mean serving capacity scores could perform equally in greater and lesser breeding intensity, single-sire mating schemes. The second study was conducted to determine whether rams with above and below mean serving capacity scores could perform equally well when only one or two ewes were in estrus daily in a multiple-sire breeding scheme (two rams/pen). Rams ($n = 68$) were ranked according to average number of ejaculations recorded in serving capacity tests. Sixteen rams with the greatest scores (above-average) and 16 rams with least scores (below-average) were identified for breeding. Half of above-average and half of below-average rams were used in the two studies. For study 1, each ram was individually introduced to 23 estrus-synchronized ewes for 9 d to simulate high breeding intensity. Rams were given a 5-d rest before they were individually introduced to 23–24 naturally cyclic ewes for 17 d (low breeding intensity). For study 2, 16 rams were paired across ram types, and each pair competed for 20 ewes for 18 d (8 pens). For study 1, ewe fertility (ewes lambing/ewes present at lambing) and number of lambs born were greater ($P < 0.001$) for above-average (0.67 ± 0.03 and 27.6 ± 1.2, respectively) than for below-average rams (0.39 ± 0.07 and 15.3 ± 2.7) with greater breeding intensity. Ewe fertility and lambs born did not differ for above-average (0.91 ± 0.03 and 37.8 ± 1.9, respectively) and below-average rams (0.86 ± 0.03 and 39.0 ± 1.9) with less breeding intensity. For study 2, number of ewes lambing (99 ± 8.0 compared with 72 ± 13.6; $P = 0.12$) and number of lambs sired (149 ± 18.5 compared with 101 ± 22.8; $P = 0.14$) did not differ between above- and below-average rams, respectively, in direct competition. Sexual classifications based on serving capacity

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tests are related to breeding performance of rams in certain breeding environments. When breeding intensity is greater, above-average rams impregnate more ewes and sire more lambs than below-average rams. When only a small number of ewes are in estrus daily, below-average rams for serving capacity scores perform as well as above-average rams in multiple-sire and single-sire breeding environments. We suggest that above-average rams should be used to reduce number of rams required when breeding intensity is greater.

Keywords: Ewes lambing; Lambs born; Breeding intensity; Rams; Sexual behavior

1. Introduction

Reproductive performance of rams is highly variable (Terrill, 1937; Price, 1987) and can impact flock productivity. One way to improve flock productivity is to conduct serving capacity tests (Kilgour and Whale, 1980) and eliminate the rams with poor sexual performance. However, the relationship of serving capacity test performance to breeding performance has been controversial. Greater breeding performance rams increased ewe fertility in some studies (Mattner et al., 1971; Perkins et al., 1992; Kilgour, 1993), but others found little relationship between ram test breeding performance and ewe fertility (Kelly et al., 1975; Kilgour and Wilkins, 1980). We hypothesize that these differences may be due, in part, to breeding intensity in each study.

Continuous exposure of ram lambs, when they were 4.5–9.5 months of age, to estrual ewes reduced the incidence of poor performance in serving capacity tests (Katz et al., 1988), as did repeated, intermittent exposure to estrual ewes (Price et al., 1994). A continuous 17-d exposure of ram lambs to estrual ewes improved ram performance in serving capacity tests (Stellflug and Lewis, 2007).

In the present research, two studies were conducted to evaluate the relationship between serving capacity scores and breeding performance of rams. The objective of the first study was to determine whether rams ranked above or below mean serving capacity scores could perform equally well in greater and lesser breeding intensity, single-sire mating schemes. The objective of the second study was to determine whether rams ranked above and below mean serving capacity scores could perform equally well when only one or two ewes were in estrus daily in a competitive multiple-sire breeding scheme with two rams in each pen.

2. Materials and methods

2.1. General

Before breeding, all rams and ewes were maintained on native rangelands at the U.S. Sheep Experiment Station near Dubois, ID. In confinement, rams and ewes were fed daily to meet their nutrient requirements (NRC, 1985). Protocols were approved by the Agricultural Research Service institutional animal care and use committee.

2.2. Ram preparation and classification

Half of 68, 7–8-month-old ram lambs received a constant early exposure to ewes for 17 d and a constant later exposure to estrual ewes for 3 d when they were 16–19 months of age before the serving capacity tests. The other half of the rams had no early or late exposure to ewes before