The Professional Animal Scientist 32 (2016):854–860; http://dx.doi.org/10.15232/pas.2016-01527

Technical Note: Behavior effects of mixing different breeds to evaluate electric fence strand additions to barbed wire fence to contain mature and growing meat goats

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ABSTRACT

In Exp. 1, 80 Boer and 80 Spanish does were used to evaluate effects of grouping method, single breed (SGL) and breeds combined (COM), on behavior when exposed to electric fence treatments (FT). Five evaluation pens with one side consisting of a 5-strand barbed wire fence for cattle had electric fence strands added at 15 and 43 (LwHi), 15 and 23 (LwMd), 15 (Lw), 23 (Md), and 43 cm (Hi) from the ground. After 5 wk for becoming accustomed to measurement conditions, does were divided into 2 replication sets per grouping. Each of 5 evaluation pens held 4 does for 1 h exposure to FT while behavior was observed. Grouping method and FT interacted ($P < 0.01$) in percentage of does exiting pens (Boer-COM: 0, 50, 50, 88, and 75%; Boer-SGL: 0, 13, 13, 50, and 63%; Spanish-COM: 25, 88, 100, 100, and 100%; and Spanish-SGL: 75, 100, 63, 100, and 63% for LwHi, LwMd, Lw, Md, and Hi, respectively; SE = 13.2). In Exp. 2, 78 Boer and 80 Spanish growing kids were used with similar procedures. Grouping method and FT interacted ($P = 0.01$) in pen exit (Boer-COM: 50, 25, 75, 86, and 43%; Boer-SGL: 13, 75, 88, 75, and 100%; Spanish-COM: 63, 63, 76, 88, and 75%; and Spanish-SGL: 25, 38, 88, 100, and 100% for LwHi, LwMd, Lw, Md, and Hi, respectively; SE = 15.4). In conclusion, grouping mature but not growing Boer and Spanish goats together was effective in decreasing breed differences in behavior for evaluating electric fence strand treatments.

Key words: behavior, breed, fence, goat

INTRODUCTION

Co-grazing of cattle and goats can improve efficiency of vegetation use (Walker, 1994), increase total animal production per land area (Hart, 2001), and reduce internal parasitism of goats (Sahlu et al., 2009). One constraint to co-grazing of cattle and goats is the fact that different types of fence are required for containment. Therefore, knowledge of effective modifications of cattle barbed wire fences for goat containment, which vary in cost and labor of installation and maintenance, would be beneficial. The most common method employed is to add electric fence strands to cattle barbed wire fence. From interaction with livestock producers and electric fence supply companies, relevant information available regarding such modifications is largely anecdotal. In this regard, there is need for an accurate and repeatable means of evaluating, rating, ranking, or comparing efficacy of different additions of electric fence strands to cattle barbed wire fence for goat containment.

In previous experiments of this project in which behavior of Boer and Spanish goats was compared, testing was either with the breeds separately or together (Goetsch et al., 2012; Tsukahara et al., 2013, 2016). Use of

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more than one breed is preferred to maximize the number of observations, of particular importance because designs such as the Latin square with repeated periods and using small animal numbers do not appear suitable (Goetsch et al., 2012; Tsukahara et al., 2013, 2016). Some casual observations were made in these studies regarding whether mixing different breeds could have influenced behavior, but there were no direct comparisons. Furthermore, because of differences in previous experiences and establishment of social behaviors, it is possible that such influences vary with animal age. As alluded to earlier, having similar behavior of different breeds and ages is desirable for repeatability of the model being developed. Therefore, the objectives of this study were to determine effects of mixing Boer and Spanish goats of different ages during preliminary and evaluation periods on behavior when exposed to different electric fence strand additions to cattle barbed wire fence.

MATERIALS AND METHODS

Protocols for both experiments were approved by the Langston University Animal Care and Use Committee.

Exp. 1

Study Area. The study area was located at one end of a 0.4-ha pasture with abundant vegetation, including various grasses, forbs, and mimosa (*Albizia julibrissin*) trees. Six 2.4 × 3.7 m evaluation pens with 3 sides of welded wire mesh panels (16.2 × 20.3 cm openings; 4 gauge, 19 mm^2), with plywood attached to minimize visual contact of goats between pens, were situated adjacent to one another. One short side of the pens had a portion used as a gate. The other short side had 5 strands of barbed wire [Style No. 33 of Sheffield Wire Products, manufactured by The Burly Corporation of North America, Burleson, TX; 12.5 gauge (3 mm^2) with 14 gauge (2 mm^2) 4-point barbs at a 12.7-cm spacing] at 30.5, 55.9, 81.3, 106.7, and 132.1 cm from the ground (Figure 1). However, points had been ground to be blunt. Strands were attached to steel T-posts at the corners. The area was covered with UV-resistant 24-mm poly shade (ClearSpan, ClearSpan Fabric Structures Inc., South Windsor, CT). Vegetation in evaluation pens was removed by clipping before each testing period. Soil Moisture Tester (Model KS-D1, Delmhorst Instrument Co., Towaco, NJ) probes were installed at depths of 5.1, 10.2, and 15.2 cm at 9 locations near the barbed wire fence side and between evaluation pens and the grounding site. Before the measurement, soil moisture level was determined. When the level was very low, the ground surface under and near electric fence strands, as well as the area between evaluation pens and the grounding site, were wetted to ensure ample grounding upon electric fence strand contact.

Fence Treatments. Electric fence strands were situated 12.7 cm from the barbed wire strands within the evaluation pens, connected to insulators on 2 T-posts in the corners of each pen. There were 5 electric fence strand treatments (**FT**): 2 electric strands at 15.2 and 43.2 cm (**LwHi**); 2 strands at 15.2 and 22.9 cm (**LwMd**); 1 strand at 15.2 cm (**Lw**); 1 strand at 22.9 cm (**Md**); and 1 strand at 43.2 cm (**Hi**) from the ground (Figure 1). Electric fence strands were 14 gauge (2 mm^2) XL aluminum wire of Gallagher USA (North Kansas City, MO). A fence charger or energizer was connected to electric strands. Voltage was checked at the beginning, middle, and end of measurement periods, with ground contact of an additional wire varied to achieve 6.0 kV.

Animals. Eighty Boer (3.9 yr initial age, SE = 0.17; 56.3 kg of initial BW, SE = 1.11) and 80 Spanish (3.5 yr, SE = 0.18; 37.6 kg, SE = 0.52) nursing does were used. The 160 does, including 53 Boer and 40 Spanish does used in one or more similar previous experiments, were selected from a larger group (i.e., 124 Boer and 110 Spanish) through removal of those exhibiting a very low propensity for exiting evaluation or test pens during the preliminary period. Does were divided into 4 groups [i.e., 2 single breed (**SGL**) and 2 breed combined (**COM**) groups] based on breed and BW, each consisting of 40 Boer (Boer-SGL), 40 Spanish (Spanish-SGL), and 20 Boer and 20 Spanish (COM) (Figure 2). The groups resided separately in 4 grass-based pastures and were supplemented once daily (approximately 20 kg per group) with a pelleted concentrate (15% cottonseed hulls, 19.75% alfalfa meal, 30% ground corn, 28.85% wheat middlings, 5% pelleting aid, 0.25% dicalcium phosphate, 0.4% calcium carbonate). Two stands of electric fence with a voltage of approximately 6 kV were

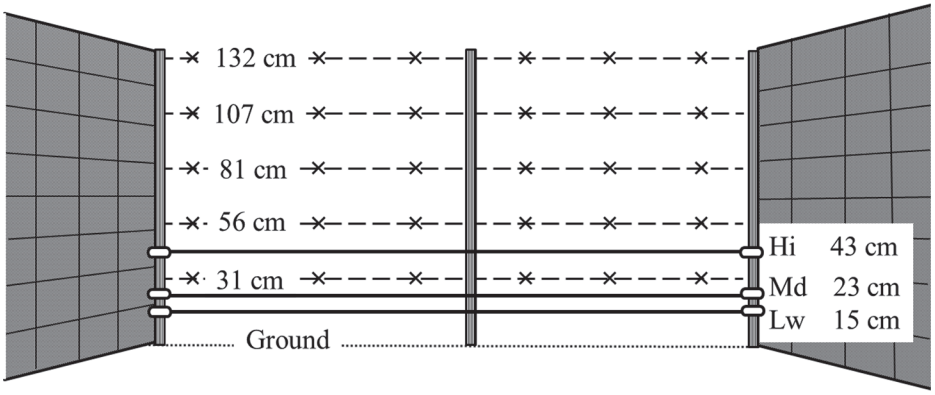

Figure 1. An evaluation pen listing the height of the 5 strands of barbed wire (–×–) and electric fence strands (—) from the ground. Electric fence strands were 13 cm from the barbed wire strands inside the evaluation pens, connected to insulators on 2 T-posts in the corners of each pen. The other 3 sides of the pens of welded wire mesh panels had plywood attached to minimize visual contact of goats between pens. Hi = high; Md = medium; Lw = low.