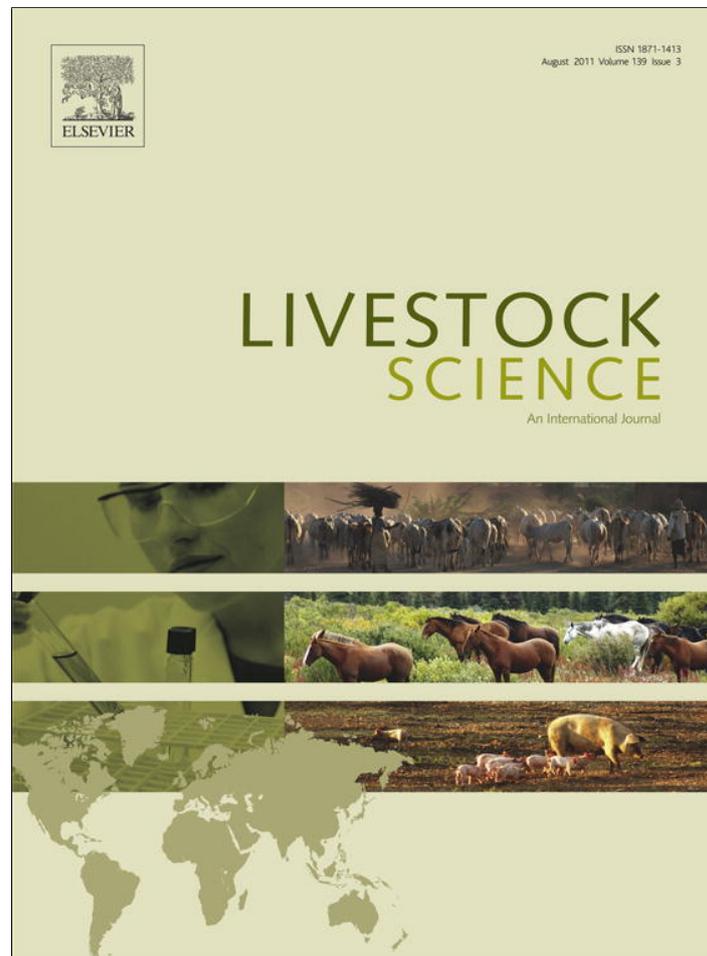


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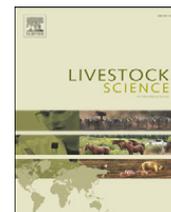
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Short communication

Males' sexual preference toward heavier heifers is only observed in competitive situations with lighter heifers

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ABSTRACT

The objectives of the present study were to determine if the sexual behavior of androgenized steers (AS) toward heavier or lighter heifers was different in competitive and non-competitive sexual tests. Hereford × Aberdeen Angus heifers (12–24 mo-old, 256.7 ± 4.4 kg) were assigned according to body weight to one of the following groups: 1) High weight heifers (HWH, $n = 8$), heifers with body weights between 260 and 290 kg (mean = 273.0 ± 2.8 kg), and 2) Low weight heifers (LWH, $n = 8$), heifers with body weights between 220 and 250 kg (mean = 241.0 ± 2.2 kg). In Trial 1, the behavior of each AS with heifers in competitive situations was determined in tests with one AS, one HWH and one LWH simultaneously, while in Trial 2 AS' behavior with one HWH and one LWH in non-competitive environments was recorded. Variables evaluated in both trials were: time to first approach (s), total time <1 body length between AS and the female/s (s), time the AS tracked each female, and time each female tracked the AS (s), and number of times that they were <1 body length, number of times that AS followed females and females followed AS, number of vocalizations, number of nods and number of sniffing. In Trial 1, HWH were more number of times at <1 body lengths from the AS than LWH ($P < 0.05$), and tended to be more at <1 body length from AS ($P = 0.1$). Both the total time of tracking and number of times that females followed the AS, tended to be greater in HWH than LWH ($P = 0.1$), and HWH tended to receive more sniffing from the males than LWH ($P = 0.1$). In Trial 2, no differences were observed in none of the variables evaluated between HWH and LWH. We concluded that AS' preferences for heavier heifers were only observed when they were in competitive environments with lighter heifers. Therefore, factors associated with females' competition and not the body weight of the heifers itself, may be determinants of the greater stimulus received from the males.

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1. Introduction

In domestic ruminants, most mating systems imply that each male mates multiple females (polygyny), which in turn determines that males' partner preferences became more important. Mating preferences for particular females are dependent on females' "attractiveness". In sheep, attractiveness determinants are related to the individual, as different rams have similar preferences between ewes (Tilbrook and Lindsay, 1987). In cattle, studies on male partner preferences

were related to serving capacity tests, comparing the preferences of estrous or "cold" females (Wallach and Price, 1988; Geary et al., 1991), and the effect of female "novelty" ("coolidge effect"; Bailey et al., 2005). In both species, there is scarce information regarding the relation between females' body weight and males' sexual preferences. In rodents, lighter females are less attractive than heavier females (Pierce et al., 2005), but males' sexual behavior does not differ in relation to females' body weight in non-competitive environments (Costello et al., 2009).

Biostimulation is an effective alternative to reduce anestrus periods in beef cattle (Roberson et al., 1991; Monje et al., 1992). Heifer's body weight at the beginning of the exposure period

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(Quadros and Lobato, 2004; Fiol et al., 2010) and physical proximity between androgenized steers (AS) and females (Fiol et al., 2010) are positively associated with the probability of ovulating when heifers are exposed to males. However, in those studies it was not disentangled the influence of females itself from the competitive results between females of different weights. In this study, two hypotheses were tested: 1) AS interact more with heavier heifers than lighter heifers, determining a greater physical proximity between AS and heavier heifers, and 2) body weight is positively related to physical proximity between males and females. Therefore, the objectives were to determine if the sexual behavior of AS toward heavier or lighter heifers is different in competitive and non-competitive sexual tests.

2. Materials and methods

2.1. Animals and management

The experiment was performed during April (autumn) in the Unidad Experimental Prof. Bernardo Rosengurtt of the Facultad de Agronomía, in Cerro Largo, Uruguay (34° S; 55° W). Sixteen anestrus Hereford × Aberdeen Angus heifers (12–24 mo-old, 256.7 ± 4.4 kg; range = 229.0 to 284.0 kg) were assigned according to body weight to one of the following groups: 1) High weight heifers (HWH, $n = 8$), heifers with body weights between 260 and 290 kg (273.0 ± 2.8 kg), and 2) Low weight heifers (LWH, $n = 8$), heifers with body weights between 220 and 250 kg (241.0 ± 2.2 kg). Age at the beginning of the experiment was 18.1 ± 0.6 and 18.3 ± 0.5 mo-old, for HWH and LWH, respectively. Anestrus was determined as the absence of corpus luteum in two ovarian scannings, performed on each heifer on Day – 14 and Day – 7 using an Aloka 500 (Aloka, Tokyo, Japan) ultrasound scanner with a 5.0 MHz linear transducer. Eight steers received two doses of testosterone propionate (500 mg im, Testosterona Ultralenta, Dispert, Uruguay) on Day – 14 and Day – 7. During the course of the experiment, all AS displayed male sexual behavior.

On Day 0, animals were grouped in 8 triplets (one AS with one HWH and one LWH), homogeneous according to body weight difference between HWH and LWH (average = 30.3 ± 2.2 kg, of body weight difference between HWH and LWH).

2.2. Trial 1

The behavior of each AS with heifers in competitive situations was determined in tests in which the males had direct contact with both females at the same time: one HWH and one LWH. Those tests were recorded with a video camera.

2.3. Trial 2

Two tests were performed with one HWH and one LWH and the AS, allowing direct contact between the AS and each heifer alone in each test. Those tests were recorded simultaneously by two observers: one recorded the duration of each behavior and the other one the number of times each behavior was performed.

2.4. Courtship tests

In both trials, tests were performed in a 300 m² pen, with 8 repetitions, one with each triplet. Before the first test was performed, animals get used during several days to the environment in which tests were performed. Sequences of the tests were defined avoiding repetition of any triplet during the same day, and overcrossing the orders in different triplets to block possible learning effects.

The heifers were introduced first into the pen, and then AS were joined with the heifers. Heifers were allowed to move free, so distance from the entrance of the AS was not controlled. During the time between trials, males and females were grazing native pastures in two paddocks located at a minimum distance of 600 m.

During 30 min the following variables were recorded in both trials: 1) time to first approach, since the entrance of the AS to the first contact to <1 body length with the heifers (s); 2) total time that AS remained at <1 body length from the females (s); 3) total time tracking, both the AS to the female, and the female to the AS (s); 4) number of times that AS was <1 body length from the heifer; 5) number of times that AS followed females and females followed the AS; 6) number of vocalizations; 7) number of nods; and 8) number of sniffing. The last three were evaluated both from AS to females, and from females to AS.

2.5. Statistical analysis

Time lengths were compared with ANOVA; the number of times each behavior was performed in each trial was compared with the Wilcoxon test.

3. Results

In both trials, few nods and sniffing from heifers to AS were observed, so those behaviors are presented only from AS to females.

3.1. Trial 1. Competition

Time to first approach of AS to HWH and LWH did not differ (70.6 ± 49.0 vs 20.3 ± 8.3 s; $P = 0.4$). High weight heifers were more frequently at less than 1 body length from the AS than LWH ($P < .05$), and spent more time at less than 1 body length from AS ($P = 0.1$) (Table 1). Both, total tracking time and number of times that females followed the AS, tended to be greater in HWH than LWH ($P = 0.1$). In addition, HWH tended to receive more sniffing from the AS than LWH ($P = 0.1$) (Table 1). There were no differences between HWH and LWH in the total time (38.0 ± 15.0 s; $P = 0.6$) nor in the number of times (2.0 ± 0.3 times; $P = 0.2$) that the AS followed the females, and in the number of vocalizations (3.2 ± 1.5 times; $P = 0.6$) and nods (1.6 ± 0.3 times; $P = 0.6$) from the AS.

3.2. Trial 2. No competition

No differences were observed in any variables recorded between HWH and LWH. Time to first approach was 262.0 ± 220.0 and 78.2 ± 25.0 s, for LWH and HWH, respectively

Table 1

Variables (mean \pm SEM) evaluated in courtships tests when heifers of high (HWH, 260–290 kg; n = 8) and low (LWH, 220–250 kg; n = 8) body weights were with one androgenized steer (AS) in competitive (Trial 1-Competitive) and non-competitive (Trial 2-Non competitive) situations. Total time (s) of each one of the behaviors, and total numbers of times (times) each behavior was performed.

	Trial 1-Competitive			Trial 2-Non competitive		
	HWH	LWH	p ^f	HWH	LWH	p ^g
<1 BL (s) ^a	159.1 \pm 87.0	19.0 \pm 9.1	0.1	212.3 \pm 68.0	146.0 \pm 55.5	ns
<1 BL (times) ^b	4.2 \pm 1.0	2.0 \pm 0.5	0.01	9.6 \pm 2.0	9.3 \pm 1.6	ns
F H-AS (s) ^c	41.2 \pm 17.0	18.0 \pm 6.2	0.1	52.5 \pm 24.2	32.0 \pm 17.0	ns
F H-AS (times) ^d	2.7 \pm 1.0	1.4 \pm 0.4	0.1	4.5 \pm 1.2	5.0 \pm 1.7	ns
S AS (times) ^e	1.6 \pm 0.5	0.5 \pm 0.3	0.1	1.8 \pm 1.0	1.0 \pm 0.4	ns

ns = no statistic difference.

^a Total time AS and heifers were at <1 body length (<1 BL).

^b Total number of times that AS and heifers were at <1 body length (<1 BL).

^c Total time heifers followed AS (F H-AS).

^d Total numbers of times heifers followed AS (F H-AS).

^e Total numbers of times AS sniffing the heifers (S AS).

^f HWH vs LWH in competitive situations (Trial 1).

^g HWH vs LWH in non-competitive situations (Trial 2).

($P=0.4$). Total time and number of times that AS followed the females were 6.1 ± 3.0 s ($P=0.4$) and 2.1 ± 1.0 times ($P=0.5$). Number of vocalizations from the AS to the females was 19.0 ± 5.0 times ($P=0.3$), and 22.0 ± 6.1 times ($P=0.6$) from the females to the AS. Number of nods from the AS was 2.3 ± 1.0 times ($P=0.3$).

4. Discussion

When heifers were with the AS in competitive situations (Trial 1), more interactions were observed between AS and the HWH than LWH. These results confirm our initial hypotheses based on previous results in which heavier heifers presented a closer proximity with the AS than lighter ones (Fiol et al., 2010). Due to the design of this experiment, it was not possible to determine whether the closer proximity between HWH and the AS was a result of males' preferences for HWH, and caused a greater proceptive behavior of the HWH heifers, or both behaviors simultaneously. However, it confirms and expands the results observed in goats, in which heavier females had a closer proximity with the bucks and were more stimulated by males' presence (Alvarez et al., 2003). When females were in competitive situations, a much more closer proximity between heavier heifers and AS was observed, which in turn could be determinant of the more intense stimulus received from the males compared to the lighter heifers in the previous experiment (Fiol et al., 2010). In addition, in those competitive situations, HWH were more frequently and spent more time following the AS than LWH, which may be related to a more proceptivity behavior of those females. Finally, heavier heifers tended to receive more sniffing from the males than LWH, which in addition to the more number of times that they were at <1 body length, determine that the more interest that they showed to the males was positively related with a more stimulus from the males.

No differences were observed when AS were tested alone with one HWH or one LWH, in non-competitive situations (Trial 2). This may indicate that the potential stimulus that males could perform on females might be independent of females' body weight, or at least it is not affected in heifers

with body weight differences such as the ones used in this experiment if there are no other females competing. Scarce information is available in relation to males' preferences in cattle. In rodents, Costello et al. (2009) reported that there are no differences in males' preferences for females of different nutritional status in non-competitive tests. Pierce et al. (2005) reported that when female rodents lose body weight, their sexual attractiveness is reduced, as well as proceptive and receptive behaviors. The same authors confirmed that re-feeding was useful to restore female sexual activity, but the original body weight was obtained after the normal sexual behavior was restored (Pierce and Ferkin, 2005). Although those observations cannot be directly expanded to cattle, according to the results of the present experiment body weight itself probably does not affect males' sexual preferences. In goats, Alvarez et al. (2003) reported that high-ranked females, which are heavier than low-ranked ones (Ungerfeld and Correa, 2007), had closer physical relationships with bucks. Therefore, it is probable that social dominance of heavier heifers over lighter ones in competitive situations might be a determinant of the closer proximity of HWH with the males. As a result, the less time males expended in courtship of LWH may be, at least partially explained by the competition between females.

Body weight is one of the factors that affect the onset of puberty in beef heifers (Short and Bellows, 1971; Schillo et al., 1992). In the present experiment, all the heifers were peripubertal or in anestrus at the beginning of the study, so no interferences of estrous in AS' preferences were possible. It is probable that HWH were nearer the spontaneous onset of puberty than LWH (Quintans et al., 2007), so it is possible to speculate that AS could have perceived that difference when they were with HWH and LWH together. Therefore, the closer proximity to the onset of puberty in heavier heifers may be another factor determining a closer proximity between AS and HWH.

We concluded that AS had preference for heavier heifers only when they were under competitive situations with lighter heifers. Therefore, factors associated with females' competition and not the body weight of the heifers itself, may be determinants of the greater stimulus received from the males.

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