Reproductive parameters of white-tailed deer (Odocoileus virginianus) bucks
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White-tailed deer (WTD) farming is an expanding industry in the United States, leading to an increased demand for improving breeding practices in captive cervids. While studies in other cervid species have shown superior semen quality at peak breeding season, there is limited information regarding breeding soundness parameters for WTD bucks. The objective of this study was to establish reproductive parameters for WTD early (September, SEPT) and at peak rut season (December, DEC). We hypothesized that reproductive parameters would improve at the peak of the breeding season. In SEPT and DEC 2016, mature WTD bucks (n=11 and 8, mean age of 2.6 ± 0.3 y, range 2.5-3.5 y) were remotely anesthetized with tiletamine-zolazepam (0.4 mg/lb) and xylazine (1 mg/lb) intramuscularly. All bucks were in hard antler at the time of first sample collection (SEPT), and two bucks were sold and one was euthanized between SEPT and DEC collections. Semen was collected by electroejaculation and evaluated for total sperm ejaculated and morphology. Computer-assisted semen analysis was used to immediately assess sperm motility. Scrotal circumference (SC) was measured using tape, and testicular length (TL), width (TW), and height (TH) were measured with ultrasound. Transrectal ultrasound (linear 5 MHz transducer) was used to measure the length (L) and width (W) of the bulbourethral (BBG) and vesicular (VG) glands. Data were analyzed using two-sample t-test and Wilcoxon rank sum test in R. Data are expressed as mean ± SEM and ranges. Semen output had a tendency to be higher in DEC (2±0.6 billion, range: 0.65-6.39) than in SEPT (1±0.2 billion, range: 0.22-2.08; p=0.08). Percent of total (TM%) and progressive (PM%) sperm motility were increased in DEC (TM%: 80±8.0, range: 21-95; PM%: 75±8.7, range: 11-91) as compared to SEPT (TM%: 71±4.4, range: 34-86; PM%: 58±5.0, range: 29-81; p≤0.01). The percentage of morphologically normal sperm increased in DEC (85±4.8 %, range: 58-96%) vs. SEPT (63±7.8%, range: 4-93%; p=0.05), with fewer primary defects observed in DEC (8.5±3.8%) than in SEPT (27±8.9%; p=0.03). There were no significant differences for secondary defects between SEPT (11±2.4%, range: 0-23%) and DEC (6.6±3.1%, range 0-29%; p=0.18) collections. Interestingly, proximal droplets were the most common primary defect recorded in SEPT (16.4±8.5%, range: 1-95%), whereas no animals presented this defect in DEC. In SEPT, two bucks produced semen with remarkable asthenozoospermia and teratozoospermia; one of these bucks had normozoospermia in DEC, but the second buck was euthanized before DEC collection. Surprisingly, SC was larger in SEPT (19±0.6 cm, range: 17-23 cm) than in DEC (17±0.3 cm, range: 15.5-18.5 cm; p<0.01). Measurements of TL, TW, and TH were symmetrical (p≥0.7), with a tendency for increased TL (3.7±0.2 cm) and TW (3.3±0.1 cm) in SEPT vs. DEC (TL 3.0±0.05 cm; TW 2.7±0.03 cm; p≤0.07). The BBG were symmetrical in L and W (p≥0.7) with no differences between SEPT (L 2.5±0.09 cm; W 1.3±0.01 cm) and DEC (L 2.4±0.08; W 1.3±0.07 cm; p≥0.7). The VG were symmetrical in L and W (p≥0.7), with a tendency for L to be increased in DEC (2.8±0.1 cm) vs. SEPT (2.4±0.1 cm; p=0.07). Collectively, these results supported our hypothesis that reproductive parameters improved at peak rut. However, despite semen quality being inferior early in the breeding season for most bucks, the semen quality appeared to be suitable for cryopreservation or fresh insemination, though with a reduced yield.

**Keywords:** Accessory sex glands, andrology, cervid, semen analysis