

APRW -45

Semen, Gonadal and Epididymal Characteristics of Pubertal Boars Fed African Porridge Plant (*Tetrapleura tetraptera*) Pod Meal

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Abstract

Semen quality as well as length and circumference of the scrotum; length, weight, volume and circumference of the testes; and length and weight of the epididymides of eighteen Large White-Duroc cross-bred pubertal boars fed 0.00%, 1.00% and 1.50% dietary *Tetrapleura tetraptera* pod meal (TPM), respectively, were studied. The boars were randomly divided into three equal experimental groups. Each treatment was replicated thrice in a completely randomized design. Semen volume, sperm concentration, number of sperm per ejaculate, total viable sperm as well as all scrotal and testicular measurements, except right testicular length and left testicular circumference, were significantly influenced by 1.50% dietary TPM. Dietary TPM improved semen volume, sperm concentration, number of sperm per ejaculate, total viable sperm, and increased the testicular dimensions of pubertal boars at 1.50% inclusion.

Keywords: Semen, testicular, pubertal, epididymides, *Tetrapleura tetraptera*

Introduction

Managing breeding boars for high-quality semen production is one of the ways to improve their reproductive efficiency. Poor reproductive performance, which is a major limitation to animal production in Nigeria, could in part, be linked to semen of poor quality. Factors such as housing, feeding and other management practices may impinge directly on semen output (Ren *et al.*, 2015). Reproductive health disorders have been attributed to diet inadequacy (Enjalbert, 2006). Semen of boars with unilateral cryptorchidism should not be used for insemination, as production and quality might be compromised (Pinart *et al.*, 1999). Dysfunctionality of the epididymides might heighten the incidence of spermatozoa with bent tails and low motility (Kunavongkrit *et al.*, 1988). Some morphological markers that relate to the scrotum, testes and epididymides could be used as bases to identify young boars that will produce high-quality semen (Flowers, 2008). Size of testes is the main factor that determines ejaculate volume and the number of sperm (Ashwood, 2009); and can therefore, be used as a criterion for selection for improved reproductive efficiency (Akpa *et al.*, 2012). A positive correlation exists between testicular size and circulating LH, FSH and testosterone in the blood. Testicular length and circumference, which are measures of size correlate positively with semen quality (Akpa *et al.*, 2012). High spermatogenic activity could be linked with proliferating germ cells (Melo *et al.*, 2010), which in turn, is traceable to increased testicular weight and corresponding sperm concentration (Vidament *et al.*, 2007, Akpa *et al.*, 2012).

The dearth of information on the impact of a phyto-genic additive-*Tetrapleura tetraptera* pod meal on the reproductive integrity of male porcine subjects necessitated this research.

Materials and Methods

The experiment was conducted at the Piggery Unit of the Livestock Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State. Umudike is on co-ordinates 05°29'N and 07° 33' E; and on about 122 m above sea level. Annual rainfall is in the range of 1700-2100 mm; minimum and maximum temperatures range from 18 - 23°C and 26 - 36°C, respectively, while relative humidity is between 57% and 91%.

Eighteen peri-pubertal boars of Large White-Duroc cross-breeds, of about 18 weeks of age, raised at the Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State, were used for the study. Dry pulp of *Tetrapleura tetraptera* pod was milled and included in formulation of three diets at 0.00%, 1.00% and 1.50%, respectively for the boars. The boars were randomly divided into three equal treatment groups. The treatments were replicated three times in a completely randomised design.

At the age of 28 weeks, the boars were trained on how to mount by exposing them to sows in standing heat to serve as dummies. The Gloved hand technique was used for semen collection. Semen samples for analysis were collected when the boars attained 30 weeks of age. Semen collection was done twice a week.

Samples were analysed fresh to forestall possible quality loss if left standing. At the end of semen collection, the boars were slaughtered by decapitation. The scrotal dimensions were taken before each boar was slaughtered. The testes and epididymides were excised and had their dimensions measured. All data for statistical analysis were subjected to ANOVA using SPSS. Means were separated using Duncan's Multiple Range Test (Steel and Torrie, 1980).

Table1: Ingredient composition (%) of experimental diets

Ingredient	0.00%TPM	1.00% TPM	1.50%TPM
Maize	25	25	25
Soya bean meal	8.50	8.50	8.50
Palm kernel meal	42.00	41.00	40.50
Wheat offal	4.80	4.80	4.80
Fish meal	1.00	1.00	1.00
TPM	-	1.00	1.50
Bone meal	1.50	1.50	1.50
Oyster shell	0.50	0.50	0.50
Vitamin/Mineral premix	0.20	0.20	0.20
Methionine	0.01	0.01	0.01
Lysine	0.04	0.04	0.04
Salt	0.45	0.45	0.45
Total	100	100	100
Calculated values			
Crude protein (%)	18.89	18.74	18.66
Digestible energy (kcal/kg)	2894.30	2872.29	2861.28

Results and Discussion

Semen volume, sperm concentration, number of sperm per ejaculate, total viable sperm as well as all scrotal and testicular measurements except right testicular length and left testicular circumference, were significantly influenced by the 1.50% dietary TPM. The values followed the same trend except for the scrotal circumference. No epididymal dimension was significantly influenced by the treatments. The semen colour was the same across the treatments. The results obtained in this study compared with those of Adu and Egbunike (2010), who fed dietary copper to 36-week old pubertal boars. The significant ($p < 0.05$) changes in semen quality parameters related positively with the testicular dynamics. This lends credence to the submission of Ashwood (2009) that size of testes is the main factor that determines ejaculate volume and the number of sperm.

Table 2: Semen characteristics of pubertal boars fed dietary TPM

Parameters	0.00% TPM	1.00% TPM	1.50% TPM	SEM
Colour	Creamy	Creamy	Creamy	
Volume(ml)	84.50 ^b	97.27 ^b	113.43 ^a	4.75
Mass motility score(1-100)	72.93	80.80	80.50	2.31
Live sperm proportion(%)	78.40	89.67	86.23	2.63
Sperm concentration($\times 10^6$ /ml)	132.42 ^b	152.35 ^b	244.98 ^a	21.10
Normal sperm proportion(%)	92.70	94.67	94.82	1.24
Number of sperm cells/Ejaculate($\times 10^4$)	1.12 ^b	1.49 ^b	2.88 ^a	3078.13
Total viable sperm($\times 10^{12}$)	75.69 ^b	114.22 ^b	220.93 ^a	26.45

^{abc} Means on the same row with different superscripts are different ($p < 0.05$), SEM: Standard error of the mean

Testicular size has also been significantly correlated with blood LH, FSH and testosterone; which play key roles in spermatogenesis. Testicular dimensions correlated with body weight (Bratte *et al.*, 1999). Semen quality had positive relationship with length and circumference of the testes. Improvement in the latter will potentiate the former (Akpa *et al.*, 2012). Vidament *et al.* (2007) reported a positive correlation between testicular weight and sperm concentration.

Table 3: Gonadal and epididymal characteristics of pubertal boars fed dietary TPM

Parameter	0.00% TPM	1.00% TPM	1.50% TPM	SEM
Live weight	84.50	97.27	113.43	4.75
Scrotal circumference (cm)	22.25 ^c	26.21 ^b	30.78 ^a	1.35
Scrotal length (cm)	17.40 ^b	23.85 ^a	26.50 ^a	1.42
Right testicular Length (cm)	16.07	15.53	19.84	0.85
Left testicular length (cm)	17.25 ^b	16.42 ^b	21.39 ^a	0.97
Right testicular circumference (cm)	19.27 ^{bc}	20.70 ^{ab}	21.98 ^a	0.49
Left testicular circumference (cm)	19.89	21.13	22.22	0.60
Right testicular weight (g)	100.46 ^b	104.92 ^b	150.92 ^a	8.24
Left testicular weight (g)	104.03 ^b	110.31 ^b	154.40 ^a	8.01
Right epididymal length (cm)	23.45	24.13	26.00	0.61
Left epididymal length (cm)	25.51	28.87	26.76	1.37
Right epididymal weight (g)	26.00	24.40	26.28	0.61
Left epididymal weight (g)	28.65	26.06	27.08	0.67
Right testicular volume (cm ³)	102.04 ^b	102.63 ^b	128.63 ^a	4.70
Left testicular volume (cm ³)	104.19 ^b	104.75 ^b	132.35 ^a	4.91

^{abc} Means on the same row with different superscripts are different (p<0.05) ; SEM: Standard error of the mean

Conclusion

Dietary *Tetrapleura tetraoptera* pod meal improved semen volume, sperm concentration, number of sperm per ejaculate, total viable sperm and increased the testicular dimensions of pubertal boars at 1.50% inclusion.

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