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Research note: Effect of diet based corn fodder on semen quality of Ettawah grade bucks

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ABSTRACT

This study evaluated the impact of corn fodder supplementation on the semen quality of Ettawah grade bucks. The bucks used in this study were three Etawah crossbred goats with ages 2-6 years. Feed treatment this study, T0: Concentrate without corn fodder, T1: Concentrate with corn fodder. The parameters observed were: Macroscopic parameters included volume, colour, consistency, and pH; and microscopic parameters included mass motility, motility, viability, abnormality, concentration. Results revealed that the addition of corn feed to the diet of bucks did not have a significant effect on sperm quality macroscopically, but it did improve microscopic indicators such as motility and viability. However, there was an increase in abnormalities and a decrease in sperm concentration, which raises concerns about the overall reproductive potential of bucks. Therefore, further research is needed to determine the optimal corn feed mixture in the diet and to investigate mitigation strategies for the negative effects on sperm quality.

The breeding efficiency and reproductive performance of livestock are critical factors influencing the overall productivity of a livestock enterprise. In recent years, there has been a growing interest in exploring dietary interventions that can positively impact on semen quality, a pivotal aspect of male reproductive function (Bello *et al*., 2020; Novaesa *et al*., 2020). Ettawah Grade goats, a breed recognized for their robustness and adaptability to diverse environmental conditions, play a significant role in meat and dairy production in various regions in Indonesia. However, limited research has been conducted on optimizing their reproductive potential through dietary manipulation. This research article delves into the potential effects of incorporating corn fodder into the diet of Ettawah buck goats, aiming to elucidate the impact on semen quality parameters. As a primary source of energy and essential nutrients, diet composition is known to influence the physiological processes involved in spermatogenesis and semen quality (Bello *et al*., 2020). Due to its distinct nutritional makeup, corn fodder has drawn interest as a possible dietary supplement that might improve reproductive performance of goats. It is essential to comprehend the precise effects of corn fodder on the semen quality of Ettawah Grade bucks in order to further our understanding of the reproductive physiology of this breed and to offer useful advice on dietary practices that farmers can use to improve breeding efficiency and herd productivity.

The subject of the current study was to evaluate the effect corn fodder on semen quality of Ettawah Grade Bucks. Our research intends to make a significant contribution to the area of animal science by illuminating the complex link between nutrition and semen quality in this specific breed, promoting efficient and sustainable livestock production methods.

The research was conducted at Mendo Kencono Seto Farm, Lerep Village, West Ungaran District, Semarang Regency. Macroscopic and microscopic semen analysis was carried out in Genetics, Breeding and Reproduction Animal Laboratory, Faculty of Animal and Agriculture Sciences, Universitas Diponegoro. All procedures were strictly conducted in accordance with the standard operating procedure (SOP). The researchers oversaw the use and care of healthy, disease-free bucks. The experimental protocol received approval from the Research Ethics Committee of the Faculty of Animal and Agricultural Sciences, Universitas Diponegoro (No. 60-09/A-17/KEP-FPP). The bucks used in this study were three Etawah crossbred goats with ages 2-6 years. The bucks were managed under an intensive management system and diet composition: corn fodder and concentrate (cassava meal, soybean meal, corn bran, coconut meal, coffee husk waste, sprout skin of mug bean, and sugarcane molasses). Nutrient composition from proximate analysis shown in Tables 1 and 2.

Table 1. Nutrition Corn Fodder.

Feed	Percentage (%)					
	Dry Matter	Crude Protein	Crude Fiber	Crude Fat	Ash	TDN
Corn Fodder	11.44	14.25	20.56	5.75	10.12	59.58
Concentrate	89.91	17.05	14.02	4.03	7.42	63.03

Note: TDN= Total Digestible Nutrient

Table 2. Nutrients composition complete feed (corn fodder and concentrate).

Nutrient	Percentage (%)
NFE*	37.89
Water	11.44
Dry Matter	88.56
Ash	10.12
Crude Fat	5.75
Crude Protein	14.24
Crude Fiber	20.56
TDN**	54.08

*NFE: Nitrogen free extract; **TDN: Total digestible nutrients.

Corn fodder is made by soaked corn seeds in water. Soaking is done for 12 hours, then drained. The drained corn seeds were then sown on a hydroponic rack evenly so that they do not pile up between one seed and another and then covered for 3 days and kept moist. The sown corn

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seeds were watered 3 times a day using a water spray. Corn fodder was harvested after 14 days, as in Figure 1. Feed treatment in this study, T0: Concentrate without corn fodder, T1: Concentrate with corn fodder. For the level ratio corn fodder and concentrate (40%: 60%) given for 3 weeks. Corn fodder was given at 08.00 a.m, 12.00 and 04.00 p.m., before being given to bucks, corn fodder was aired first, while concentrate was given at 05.00 a.m. and 15.00 p.m. Drinking water was supplied ad libitum.

Fig 1. Corn Fodder.

The parameters observed were: Macroscopic parameters, which included volume, colour, consistency, and pH; and microscopic parameters that included mass motility, motility, viability, abnormality and concentration. The ejaculate volume was measured with a semen collection vial. Semen colour was visually evaluated immediately after collection and graded on colour (watery, slightly creamy, creamy, milky). Semen pH was measured using a pH test strip (Usman *et al.*, 2019). Mass movement was measured by using a microscope with 100x magnification. Motility was observed using a microscope with 400x magnification. The number of live spermatozoa was done through differential staining. Direct calculation of sperm concentration with a hemocytometer was done by using the Neubauer counting chamber method Perumal *et al.*, 2017). The recorded data were compiled and organized using Microsoft Excel. For each semen parameter including volume (mL), consistency, pH, color, odor, mass motility movement, motility (%), viability (%), abnormality (%), and concentration (10^6/mL) descriptive statistics were calculated and expressed as mean values. Statistical comparisons between groups were performed using an independent sample t-test in SPSS® Version 27.0. A p-value of <0.05 was considered statistically significant for all analyses.

Macroscopic and microscopic parameters for semen quality after adding cord fodder were shown in Tables 3 and 4.

Table 3. Macroscopic parameters in semen quality after added corn fodder.

Characteristics	T0	T1
Volume (mL)	0.83±0.08	0.81±0.41
Consistency	Thick	Thick
pH	6.5	6.98±0.47
Colour	Creamy white	Milky white
Odor	Typical	Typical

T0: Complete feed without corn fodder, T1: Complete feed with corn fodder

Table 4. Microscopic parameters in semen quality after added corn fodder.

Characteristics	T0	T1
Mass Motility Movement	2+	2+
Motility (%)	73.00±6.11	75.55±4.14
Viability (%)	88.12±19.25	92.31±41.49
Abnormality (%)	5.99±0.04	7.12±0.02
Concentration (10^6/mL) *	562.00±130.11	351.00±101.80

* Means in the same row differ significantly (p<0.05). T0: complete feed without corn fodder, T1: complete feed with corn fodder

As shown in Table 3, the macroscopic semen parameters did not differ significantly between T0 and T1. The semen volume remained relatively consistent, with T0 (0.83±0.08 mL) and T1 (0.81±0.41 mL) showing no significant variation ($p > 0.05$), suggesting that corn fodder supplementation had no measurable effect on semen volume. This observation aligns with Ducha*et al.* (2021), who reported that semen volume can be influenced by factors such as the animal's age, collection frequency, and health status.

Additionally, semen color, consistency, and odor serve as key indicators of quality, with optimal samples typically exhibiting a thick texture and a distinct aroma (Nuswantara *et al.*, 2025; Slamet *et al.*, 2023). According to Ax *et al.* (2008) and Hafez and Hafez (2008), typically, normal semen appears milky or yellowish-white coloration to the presence of riboflavin, while reddish hue may indicate possible blood contamination. Normal semen pH range of 6.5–7.8, semen volume of 0.3–2.0 mL. Moreover, semen viscosity shows a positive correlation with concentration, higher number of spermatozoa contributes to increased seminal thickness (Duch *et al.*, 2021).

As shown in Table 4, mass motility scores remained consistent between T0 and T1, both registering a value of 2+. Mass motility constitutes a crucial parameter for evaluation of semen quality, reflected the spermatozoa's capacity to the fertilization site and strongly correlated to conception outcomes (Islam *et al.*, 2019). According to Wurlina *et al.* (2020), mass motility scores of 2+ or ++ indicated good sperm wave movement, corresponds to the findings of Almahdy *et al.* (2000), reported that a minimum of mass motility level of ++ was required for cryopreservation. Based on the findings of Hafez and Hafez (2008), normal mass motility typically ranges between 2+ and 3+, suggesting that the sperm movement observed in this study was within the expected physiological range.

In addition to motility, sperm viability increased from T0 to T1, indicating that supplementation corn fodder may enhance sperm survival. This finding is important because decreased sperm viability, often caused by nutritional deficiencies, can have a negative impact on fertility, low birth rates, and ultimately cause economic losses for farmers (Castellini *et al.*, 2000; Mellado *et al.*, 2006). Microscopic analysis further revealed that while mass motility remained similar between groups, the percentage of individual motility increased from 73% at T0 to 75.55% at T1, with viability also rising from 88.12% to 92.31%. These results indicate that corn fodder may positively influence sperm function. However, a slight increase in sperm abnormalities was observed in T1 (7.12%) compared to T0 (5.99%), though values remained within acceptable limits for fertile semen (Ax *et al.*, 2000).

Interestingly, sperm concentration significantly declined in T1 (351×10^6/mL) relative to T0 (62×10^6/mL); $p < 0.05$, possibly due to physiological adaptation to dietary changes. Despite this reduction, the preserved motility and viability suggest that sperm functionality was not adversely affected. This study investigated the effects of feeding diverse forages on goats. The inclusion of alfalfa and timothy grass in the diet enhanced nutrient digestibility, increased total antioxidant capacity (TAC), and altered serum metabolites related to lipid metabolism. These changes suggest that dietary forage diversity can improve antioxidant status and energy metabolism in ruminants (Aldian *et al.*, 2023).

Abnormalities in sperm have been categorized according to the defect's location (head, midpiece, tail). Figure 2 showed that the sperm head was severed, categorized as abnormality sperm. Blom (1983), sort sperm abnormalities based on how they affect fertility: looped tails, detached sperm heads, and distal cytoplasmic droplets are minor defects, while the majority of head and midpiece abnormalities, proximal cytoplasmic droplets, and single abnormalities present in a high percentage were major defects.

It could be concluded that adding corn fodder to bucks diets had no significant effect on macroscopic sperm quality, it did improve microscopic indicators like as motility and viability. However, the increase in sperm abnormalities and decrease in concentration raises questions about the overall reproductive potential. More research is needed to find the best corn fodder mix in the diet and to investigate possible strategies for mitigating the negative impact on sperm quality.

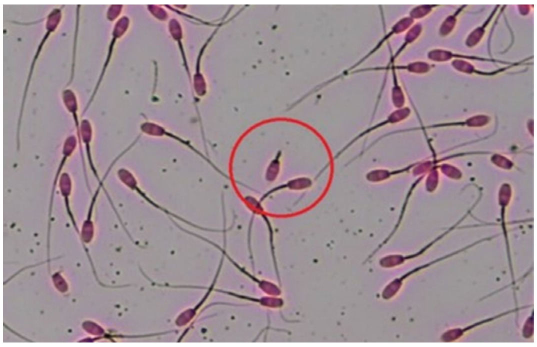

Fig 2. Abnormality in sperm.

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Conflict of interest

The authors have no conflict of interest to declare.

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