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Potential reproduction and response of selenium and zinc mineral supplementation on quality of goat samosir semen

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Abstract. The present study was conducted to investigate the effect of supplementation of selenium and zinc on semen quality and growth of samosir goat. The experimental design used latin square design (4x4). The treatment supplementation mineral on multi nutrient block (MNB) composed of without supplementation (p0), +10ppm selenium (p1), +10ppm zinc (p2), +10ppm selenium and +10ppm zinc (p3). The result showed that supplementation mineral selenium and zinc increased significantly ($p < 0.05$) average daily growth, feed consumption, and lower feed conversion ratio. Semen quality of goat were supplemented by selenium and zinc influenced motility, viability, volume concentration, and responding hypo osmotic swelling (HOS). Combination supplementation selenium and zinc significantly had higher semen quality than other treatment. It is concluded that supplementation selenium and zinc improve growth and semen quality of samosir goat.

1. Introduction

There are currently eight local goat breeds in Indonesia that have been characterized based on the phenotype samosir, kacang, marica, muara, kosta, gembrong, bengali, and peranakan etawah (PE) [1]. Based on the historic information from local people samosir goat used for the material offering at relegius ceremony of one animism (pamalim). Goat must be white in color, so that the local residents selectively keep white colored goats as can adapt and breed on ecosystem on dry and rocky samosir island with hilly topography [1].

Genetic improvements should be supported by the improvement of nutrition, one of them with supplementation techniques so that can be seen the development and growth as well as livestock productivity is good as well. The success of the supplementation technique is largely determined by the balance and completeness of nutrients added in the feed according to the needs of livestock. One of techniques that can be used by farmers to overcome mineral deficiency is by mineral block separation with mineral blocks containing essential macro minerals such as selenium and zinc mainly in organic form can increase livestock productivity.

Selenium (Se) is present in the mid piece of spermatozoa and is associated with Cys-rich protein of the mitochondrial sheath [2], selenium deficiency resulted in abnormal spermatozoal mitochondria, and supplementation with nano-Se enhanced the testis Se content, testicular and semen GSH-Px activity, protected the membrane system integrity and the tight arrangement of the midpiece of the mitochondria [3]. Zn is an essential nutrient and indispensable element in growth and reproduction. Zn

helps in testicular growth and development of seminiferous tubules, spermatogenesis, steroidogenesis in testes, synthesis and secretion of follicular stimulating hormone (FSH) and luteinizing hormone (LH) [4][5] and [6] and hence improves fertility [7]. Therefore, the aim of this experiment was to study the effect of dietary supplementation of Zn and Se on semen quality of samosir goat.

2. Material And Methods

Animal experimental design ; the present study was conducted on 4 samosir goat (1 ± 0.2 years), weight 12.57 ± 0.58 kg, reared at laboratory animal science, Faculty Agriculture, university of Sumatera Utara, Medan from June to December 2016. The animal were grazed in a block cage in laboratory animal science daily, and test composed with not supplement (p0), supplement with +10ppm selenium (p1), supplement +10ppm zinc (p2), and supplement +10ppm selenium +10ppm zinc (p3) concentrate MNB per animal daily with free access to water. All the experimental animal were regularly dewormed for parasites.

Animal experimental were divided randomly into test containing four by four each. Analysis was conducted for 30 days, and the animal was rested for 7 days before other test. The investigation was undertaken for the entire duration of the experiment. Assessment was done by evaluating the goats body weight and collected the semen for further analysis in the end of each test.

The semen collected and analyzed from the donor samosir goat were trained and semen was collected in the morning using artificial vagina. A nonoestrous doe was used for the mounting of males, and semen was collected into the graduate cups with an accuracy attached to one end of the artificial vagina.

The semen quality was evaluated in terms of gross motility, progressive motility, sperm concentration (hemocytometer chamber method), hypo-osmotic swelling test and percentage live spermatozoa using microscope. The statistical analyzed using two way analysis of variance followed by Tukey's post hoc test using SPSS/PC computer program (version 14.0 SPSS).

3. Result And Discussion

Effect of zinc and selenium supplementation on weight body samosir goat with supplemented by p3 is the higher ($p < 0.05$) from the other test, consumption was no different from other and feed consumption ratio p3 ($p < 0.05$) is the less from the other. In test sperm quality motility p3 ($p < 0.05$) is no different from p1 ($p < 0.05$) but significant higher different with p2 (< 0.05) and p0 ($p < 0.05$). Viability p3 is the higher from the other but p2 is no different from p1 and p0, volume semen p3 is the higher from the other but no different from p1, concentration p3 no different from p2 and p1 but p2 is no different from p0, and HOST-test p3 and p1 the higher is no different and p2 different from p0 and less from p3 and p1. The benefit of zinc and selenium supplement on weight body were observed. Similar result were also reported Cole [8], Widhyari et al., [9] and Kurnia et al., [10]. The effect benefit supplement on sperm was observed and reported Kendal et al., [11] and Lubis et al., [12]. Therefore, the increased higher weight body and semen quality could be due by supplement zinc and selenium.

Table 1. effect of zinc and selenium supplementation on weight body samosir goat

Treatment	Liveweight gain (g/day)	consumtion (g/d)	conversion
p0	23.50 ^d	1872.66 ^a	79.73 ^a
p1	30.92 ^c	1852.83 ^a	59.19 ^b
p2	32.16 ^b	1829.50 ^a	57.61 ^b
p3	40.17 ^a	1760.92 ^a	43.86 ^c

Superscript designate significant difference ($P > 0.05$) between rows and columns of each parameter respectively.

The sperm motility of individual spermatozoa on fresh cement were 65% for p0, 76,25% for p1, 67,50% for p2 and 78,75% for p3. The individual motility was higher in p3 ($p < 0.05$) treatment with

supplement consist of + 10ppm zinc + 10ppm selenium. These results still fall within the normal range of between 60% - 80% (Hafez, 2000) and > 60% (Kartasudjana, 2001).

Table 2. effect of zinc and selenium supplementation on semen quality of samosir goat

treatments	Motility (%)	Viability (%)	Volume Semen (ml)	Sperm concentration (10 ⁶ /ml)	HOST (%)
p0	65.00 ^b	86.608 ^c	0.125 ^b	4150.0 ^b	69.858 ^c
p1	76.25 ^a	91.213 ^b	0.300 ^{ab}	4562.5 ^a	80.033 ^a
p2	67.50 ^b	89.743 ^{bc}	0.200 ^b	4450.0 ^{ab}	73.795 ^b
p3	78.75 ^a	96.515 ^a	0.450 ^a	4587.5 ^a	82.430 ^a

Superscript significant difference (P < 0.05) between rows and columns of each parameter respectively

Viability of the semen was also analyzed as it relates to the survival of spermatozoa [13]. The viability was 86.608% for p0. 91.213% for p1. 89.743% for p2. 96.515% for p3. The percentage percentage of spermatozoa viability obtained by percentage of spermatozoa viability at treatment of p3 better than treatment of p0. p1 and p2. The results of statistical tests showed that the different treatments gave a very real effect (P < 0.05) on the viability of individual spermatozoa. according to Toelihere [14] normal cement usually has a minimum percentage of life of 50%. Therefore, the cement has good quality because the viability on this experiment were >50%.

Table 2 shows that the fresh semen volume of the average samosir goat is p0 0.125. p1 0.300. p2 0.200. p3 0.450 ml/ejaculation. The volume of samosir goat cement obtained in this study range between of 0.1-1.5 cc/ejaculation. the normal volume range which is in accordance to previous result [15]. The varying volume of cement at the time of shelter is influenced by differences in individual livestock. livestock. age. nutrition. ejaculation frequency. cement collection interval and cement collection [16].

The concentration of samosir goat cement for each treatment was 4150X10⁶ml for p0. 4562.5 X10⁶/ml for p1. 4450.05 X10⁶/ ml for p2. 4587.5 X10⁶/ ml p3. Dally et al.. [17] reported that spermatozoa concentration of goat cement fall between 2.5-5.0x10⁹ spermatozoa/mL. similar to the results obtained on this assessment of the concentration is very important because it is used to reduce the quality of cement and loudspeaker [18].

HOST-Test has been proven as a good method to evaluated the integrity of cell membranes of spermatozoa of domestic animals by observing changes in the tail of the sperm [19]. In spermatozoa are alive or have a plasma membrane Which is good then the media were presented HOST enable active biochemistry contained in the membrane to balance the fluid inside and outside the sperm cells. so the solution hypoosmotik get into spermatozoa. media HOST cause expansion of the cell membrane of the tail of spermatozoa to Swast and peak force flagellum to roll Susilawati [20] says that intact plasma membrane characterized by screening the tail. because the plasma membrane of the spermatozoa still function well in absorbing water in an environment that is hypotonic. Instead of sperm with damaged or permeability of the plasma membrane increases. the solution can come out of the membrane hypoosmotik spermatozoa freely and not be trapped so that tail Looks straight [21]. The Host-test of the samosir goat was 69.858%. 80.033%. 73.795%. 82.430% for p0. p1. p2. p3 respectively.. The cell membrane is the outermost portion that confines the interior with the external environment of the cell and acts as a filter on the exchange of intracellular and extracellular substances maintained in the metabolic process [22].

4. Conclusion

It is concluded that the supplementation of zinc and selenium in samosir goat improved the body weight. consumption. and quality semen but can reduce the Feed consumption ratio.

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