

THE EFFECT OF GIVING TURMERIC EXTRACT ON MEMBRANE INTEGRITY IN BUCK SPERMATOZOA

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Abstract: This study aimed to determine the effect of giving turmeric extract to improve the quality of goat sperm. Observations were made microscopically by observing the whole plasma membrane in goat spermatozoa. The material in this study is fresh cement goat and turmeric extract. The experimental design used in the study was a non-factorial complete random design with five treatments and five replications. The treatment given is the addition of turmeric extract 0ml, 25ml, 50ml, 75ml and 100ml. The results showed that giving turmeric extract significantly affected the whole plasma membrane of goat spermatozoa. Conclusion: The administration of turmeric extract can increase the percentage value of membrane integrity in goat spermatozoa.

INTRODUCTION

The problem in the goat breeding business is the male's ability to carry out natural mating and produce fresh semen for making liquid/frozen semen. It is essential to pay attention to the buck's nutritional intake in producing fresh semen and the ability to mate with the goat. The nutritional needs of the buck are undoubtedly different from those of heifers or livestock intended for meat and milk production. Bucks need food supplemented with food ingredients that can increase the ability to breed livestock and increase the quality and quantity of fresh semen.

Herbal plant extracts have several advantages over fresh ingredients. The advantages of herbal plant extracts include that the body more easily absorbs the nutritional content, the chance of being contaminated with pesticides, heavy metals, and others is smaller than fresh ingredients, the handling is practical, and the dosage is easy to adjust, especially if large doses are needed.

Turmeric is an herbal ingredient that is easy to find and cheap. Turmeric contains antioxidant ingredients that can improve sperm quality. The curcumin compound contained in turmeric can increase the percentage value of spermatozoa motility. Motility is essential for fertilization because spermatozoa can move efficiently towards the egg

cell (ovum). Curcumin can also protect sperm against oxidative damage due to exposure to chemicals.

Giving turmeric to animals can increase spermatozoa motility, increase concentration, protect against oxidative damage, and increase testosterone hormone levels. Apart from that, the curcumin compound contained in turmeric can help reduce stress, which also impacts male fertility. Other ingredients contained in turmeric, such as vitamins C and E, are potent antioxidants that help ward off free radicals. This compound can also help increase male sperm volume.

Based on this background, the author is interested in researching the effect of giving turmeric extract to increase the reproductive productivity of goat males, especially regarding the quality of fresh semen. It is hoped that this research will produce concoctions or herbal products that can be applied to male goats, which will be used as rams and for producing fresh semen to produce liquid/frozen semen. Research related to giving turmeric extract to improve the quality of fresh goat semen has been carried out, especially on motility tests (Sitepu et al., 2023) and spermatozoa abnormality tests (Sitepu et al., 2023). Further research will be carried out by observing the membrane integrity of spermatozoa.

RESEARCH METHODS

The demands of globalization and regionalization are major variables in the pursuit of the current modernization of development in the growth of a country (Kurniullah, et al., 2021). This issue has far-reaching consequences for the environment and society due to a lack of comprehensive waste management skills, a lack of available human resources, and a lack of sufficient landfills (Faried, et al., 2023). The population and sample in this study were bucks that had been given additional feed in the form of a combination of turmeric extract, with the treatment given being as follows:

P₀ = Turmeric Extract 0 ml

P₁ = Turmeric Extract 25 ml

P₂ = Turmeric Extract 50 ml

P₃ = Turmeric Extract 75 ml

P₄ = Turmeric Extract 100 ml

Prepared a solution of turmeric extract in 100 ml in a bottle. Turmeric extracts are given orally to bucks every morning after they have finished feeding.

Evaluation of the membrane integrity of spermatozoa. The evaluation uses the hypoosmotic swelling test (HOST) method. Test by mixing 0.1 ml of semen with 9.9 ml of hypoosmotic medium. After mixing, the preparation was incubated in a water bath at 37°C for 30 minutes (Rodriquezgil et al., 1994). Evaluation under a light microscope at 400 times magnification.

$$\text{Membrane Integrity} = \frac{\text{Sperm with curved tails}}{\text{total spermatozoa were counted}} \times 100\%$$

The research method that explains the observed values follows a non-factorial, Completely Randomized Design with five treatments and five replications, which is arranged using a linear model as follows:

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij}$$

Description :

Y_{ij} = Observation value of the effect of treatment using herbal extracts on-i repeat to-j

μ = General average value

τ_i = Effect of treatment using turmeric extracts on-i

ε_{ij} = Experimental errors that arise in the treatment of using herbal extracts to-i dan repeat to-j

RESULTS AND DISCUSSION

Table 1. Spermatozoa motility with turmeric extract supplement feeding

Parameter	Treatment	Percentage (%)
Membrane Integrity	0 ml	75±1.55
	25 ml	77±2.05
	50 ml	80±1.74
	75 ml	80±1.47
	100 ml	80±2.65

Note: Different superscripts in the column indicate a very significant difference ($P < 0.01$)

The research results on membrane integrity of spermatozoa on fresh goat semen showed that the lowest percentage value was without treatment, namely 75%, while the highest was with the addition of 50ml, 75ml, and 100ml of turmeric extract, namely 80% motility. From the data obtained, it means that the addition of turmeric extract increases the percentage value of membrane integrity of spermatozoa in fresh goat semen. The higher the level of turmeric extract administration, the greater the percentage value of membrane integrity of spermatozoa.

The analysis of variance showed that adding turmeric extract feed had a significant effect ($P < 0.01$) on the membrane integrity of spermatozoa in fresh goat semen. Further BNT tests showed that the highest membrane integrity of spermatozoa was found in the 50ml, 75ml, and 100ml treatments, namely 80%.

The analysis of various membrane integrity of goat spermatozoa showed a significant effect ($P < 0.01$) on feeding turmeric extract supplements. Judging from the average value of membrane integrity of goat spermatozoa, the highest was in the 50 ml treatment, namely 80%. Turmeric extract can function as an antioxidant, which is very beneficial for the integrity of the membrane of spermatozoa. The opinion of Maxwell and Watson (1996) stated that the spermatozoa plasma membrane is rich in unsaturated fats, making it susceptible to lipid peroxidation. Lipid peroxidation results in lipid peroxides forming, which will react as free radicals and stimulate autocatalytic reactions, damaging the plasma membrane (Sinha et al., 1996).

The results showed that the percentage of membrane integrity of spermatozoa was also related to live spermatozoa. Spermatozoa with a high survival percentage also show

a high percentage of membrane integrity of spermatozoa. Spermatozoa with a high survival percentage indicate that the plasma membrane is still physically intact so that the spermatozoa cell organelles will be protected. The necessary nutrients and ions for metabolic processes are available (Tambing et al., 1999).

The higher the level of turmeric extract administration, the greater the percentage of membrane integrity of spermatozoa. However, this is different from previous research where turmeric extract levels above 50 ml did not increase the percentage of membrane integrity of spermatozoa. It may be due to the higher lactose concentration causing a change in the osmotic pressure in the diluent towards hypertonic. A hypertonic diluent indicates more molecules or particles outside the cell than inside the cell. As a result, water is released from inside the cell to dilute the molecules outside the cell so that the cell shrinks (Supriatna & Pasaribu, 1992).

Membrane integrity is spermatozoa's integrity, which plays a vital role in the fertilization process for the success of Artificial Insemination. Spermatozoa with intact membranes will retain hypoosmotic fluid in the cells so they are not damaged (Hafez, 2000).

CONCLUSION

The research results showed that the best turmeric extract supplementation obtained was 50 ml of turmeric extract.

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