

The Effectiveness of Eco Enzymes to Suppress the Development of *Sarcoptes scabiei* Mites in Goat In Vivo

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ARTICLE INFO

Article history:

Received 3 July 2024

Revised 30 July 2024

Accepted 31 July 2024

Available online 2 August 2024

E-ISSN: 2808-2753

How to cite:

Dzakwan Naufal, Nurzainah Ginting, Peni Patriani, Anwar, "The Effectiveness of Eco Enzymes to Suppress the Development of *Sarcoptes scabiei* Mites in Goat In Vivo" Jurnal Peternakan Integratif, Vol. 12, No. 02, pp. 1-9 August. 2024, doi: 10.32734/jpi.v11i2.16757



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ABSTRACT

Scabies is a disease caused by the *Sarcoptes scabiei* mite that attacks goats. It is quite difficult for traditional goat farmers to get scabies medicine because the price is expensive so alternative treatment is needed. The purpose of this study was to determine the effectiveness of eco enzymes in suppressing the growth of *Sarcoptes scabiei* mites in vivo. This study has 5 treatments. P0 (Sulfidex 100ml), P1 (Aquades 100ml), K1 (25% eco enzyme + 75% aquades), K2 (50% eco enzyme + 50% aquades), K3 (75% eco enzyme + 25% aquades). Goat samples used were 5 heads in each sample. The parameters observed were alopecia, thickening, and scab. The results of the study on the parameters of alopecia, thickening, and scab. The use of ekoenzim at a dose of 75% was able to balance the provision of sulfadex on the parameters of alopecia, and scab. In the thickening parameter, the provision of eco enzyme at a dose of 75% is better than the provision of 100 ml sulfadex. In conclusion eco enzyme as a scabicide solution with a dose of 75% is considered capable of suppressing the growth of *Sarcoptes scabiei*, as well as being able to balance the administration of sulfadex on alopecia and scab parameters.

Keyword: Alopecia, Eco enzyme, Goat, In vivo, Scabies

1. Introduction

Livestock is the largest contributor to the provision of animal protein needs, in addition to fisheries. One of the contributors to animal protein is goats. Goats have advantages over other ruminants. In terms of maintenance and business techniques, goats are relatively easier to breed and maintain compared to cattle [1]. One of the challenges affecting the production of traditionally reared goats is disease as it can slow down the growth rate resulting in economic losses. The high price of medicines and the limited supply of medicines cause farmers to experience difficulties in dealing with various diseases. These problems need to be addressed immediately, by maximizing the use of traditional medicine that is easy to obtain and relatively lower in cost [2]. Scabies is a disease often found in goats caused by the mite *Sarcoptes scabiei*. Scabies mites are small and sufficient light is needed to see them with the naked eye [3]. Livestock infected with scabies mites are usually emaciated and

therefore have low market value [4]. Farmers generally only realize that their animals are infested with scabies after the mites have spread and formed wounds on the skin surface. The spread of mites is accelerated by cattle scratching their itchy skin or rubbing their bodies against other cattle or logs [5]. Environmental conditions are a factor that greatly affects the development of mites. During the rainy season, the number of mites will increase and result in conditions where the health of livestock is getting worse. Meanwhile, during the dry season, the disease will subside and the number of mites will decrease. This situation occurs because mites are sensitive to sweat and cannot live long in such conditions [6]. To treat severe cases of scabies in livestock, veterinarians will usually treat it with certain medications such as ivermectin, neguvon and asuntol [7]. Qualitative and quantitative analysis results showed that the eco enzyme solution contained acetic acid and lactic acid with a total acid concentration of $0.94 \pm 0.00\%$ v/v. The anti-mite activity of eco enzyme is strongly related to the content of acetic acid and lactic acid [8].

2. Materials and Methods

This research was conducted at the Sei Putih Goat Research, Galang District, Deli Serdang Regency, Sumatera Utara, Indonesia. The study took place from September 2021 to October 2021.

The materials used in this study were pineapple waste, papaya waste, and orange waste, molasses, and well water. Distilled water as a solvent, and betadine as a wound medicine for goats. The materials used include the mite *Sarcoptes scabiei* originating from goats as research subjects.

The tools used in this research are scales, dropper pipettes, microscopes, towels / cloths, sudips, or spatulas, spray bottles, scalpels, object glass, cover glass, vials, and cameras..

2.1. Research design

This study uses experimental methods with treatments tested in vivo. By using a completely randomized design with each treatment being repeated. The treatments in this study can be known as follows.

P0 = administration of Sulfadex 100 ml

P1 = administration of distilled water 100 ml

P2 = Administration of 25% eco enzyme + 75% distilled water

P3 = 50% eco enzyme + 50% distilled water

P4 = Application of 75% eco enzyme + 25% distilled water

The number of replicates in this study was calculated using the Federer Formula [9].

$$(n-1) (5-1) = 15$$

$$(n-1) (4) = 15$$

$$4n-4 = 15$$

$$4n = 15+4$$

$$n = 19/4$$

$$n = 4,75$$

$$n = 5$$

Based on the above calculation, each treatment consists of 5 replicates. Each replicate used 1 goat affected by *Sarcoptes scabiei* infection. So the study used 25 goats divided into five treatments.

2.2. Research Parameters

The parameters in this study were observations of alopecia, thickening, and scabbing. In this study, the parameters were measured by scoring. Scoring in this study can be seen in Table 1.

Table 1. Research scoring				
No	Parameters	Scoring		
		0	1	2
1	Alopecia	The entire wound surface has alopecia	Uneven alopecia ($\geq 2/3$) on the wound surface	Alopecia $< 2/3$ of the wound surface
2	Thickening	The entire wound surface has Thickening	Uneven Thickening ($\geq 2/3$) on the wound surface	Thickening $< 2/3$ of the wound surface
3	Scabbing	The entire wound surface has Scabbing	Uneven Scabbing ($\geq 2/3$) on the wound surface	Scabbing $< 2/3$ of the wound surface

2.3. Research Stages

2.3.1. Eco Enzyme Making

In this study, eco-enzymes were made with molasses, fruit and water in a ratio of 1: 3: 10. The fruits used in the manufacture of eco-enzymes for this study were pineapple, papaya and orange. With this comparison, the eco-enzyme was made with 500 grams of molasses, 1.5 kg of fruit (pineapple, papaya and orange each 500 grams) that had been cut into small pieces and 5 liters of water. The resulting mixture of all these ingredients is then put into a 10 liter jerry can then fermented for 3 months in a dark room.

2.3.2. Sample preparation

Goats showing scabies symptoms such as rubbing against the walls of the pen and having skin lesions with thickening, scabbing and alopecia were sampled for skin scrapings. The scrapings were stored in vials. After taking the skin samples from the goats, the scraped skin areas were then treated with 70% alcohol and betadine to accelerate wound healing.

2.3.3. Microscopic examination

The skin scrapings stored in the vial tube were brought to the laboratory and dripped with 10% KOH to taste which was first diluted by adding distilled water, where to make 10% KOH as much as 100 ml, namely 10 gr KOH added to distilled water until it reached 100 ml. Then the sample is dripped on the glass object and covered with cover glass.

2.3.4. Preparation of eco enzyme concentration

The eco enzyme solution to be made in this study has different concentrations of eco enzyme solution, namely 25%, 50%, 75%. The process of making the concentration of the eco enzyme solution uses distilled water as a mixture. In making the concentration of the eco enzyme solution, the first thing that needs to be done is to prepare distilled water as a mixture for the eco enzyme solution. For the preparation of 25% concentration of eco enzyme solution, 25 ml of eco enzyme solution was used, 50 ml for 50% concentration of eco enzyme and 75 ml for 75% concentration of eco enzyme. Then mixed with distilled water until each reached 100 ml. Then stirred until mixed (homogeneous) then each concentration is put in a spray bottle which will be sprayed onto a towel / cloth to rub or wipe slowly and slowly on the entire surface of the scabies wound.

2.3.5. Drug Administration and Eco enzyme Concentration Solution

Administration of drugs and eco enzyme concentration solution, the samples were divided into 5 treatments. One group for negative control with distilled water, one group for positive control with Sulfadex, and three groups for the administration of eco enzyme concentration solution with each concentration of 25%, 50%, 75%. The treatment was sprayed evenly on a towel / cloth and then rubbed or rubbed slowly and slowly on the entire surface of the scabies wound. This is done so that the drug can be applied evenly on the surface of the scabies wound. This treatment was carried out once a day and carried out for 7 days.

2.3.6. Observations on the wound

Wound observation was conducted after 30 days of treatment by observing signs of healing by looking at skin changes and indications of tissue repair with hair growth. Observation and assessment of wound healing was carried out by scoring method on each parameter of scabies wound healing.

2.4. Data Analysis

Homogeneity data were analyzed using the Levene Test. Data variation between homogeneous groups continued with the Kruskal-Wallis Test. If there is a significant difference, then to find out

the difference between treatments proceed with the Mann-Whitney Test.

3. Results and Discussion

3.1. Descriptive Observations of Alopecia, Thickening, and Scabbing

Observation of scabies wound healing is done by scoring method which is characterized by skin changes that indicate scabies with hair growth due to alopecia, cleanliness of scabs and changes in skin thickening in goats.

Table 2. Percentage in alopecia (%)

Treatment group	Alopecia		
	0	1	2
P0	0	0	100
P1	60	40	0
P2	0	60	40
P3	0	20	80
P4	0	0	100

Based on Table 2, it can be seen that the treatment of 100 ml sulfadex resulted in all hair growth treatments at score 2. In the treatment of 100 ml distilled water (P1) resulted in 60% at score 0, and 40% at score 1. In the 25% ecoenzim treatment (P2) resulted in 60% at score 1, and 40% at score 2. The 50% eco enzyme treatment (P3) resulted in 80% scoring on score 2, and 20% on score 1. The 75% eco enzyme treatment (P4) resulted in scoring 2 in all treatments given. Based on the percentage results, the provision of eco enzyme at a dose of 75% is able to compensate for the provision of 100 ml sulfadex. One of the results of eco enzyme is the content of alcohol and acetic acid. With this content, eco enzyme has the ability to eradicate bacteria and prevent pathogenic bacteria. This causes the ability of eco enzyme in hair growth in goats to be able to match the positive control treatment, namely the administration of sulfadex [10].

Table 3. Percentage on skin thickening (%)

Treatment group	Thickening		
	0	1	2
P0	0	100	0
P1	100	0	0
P2	20	80	0
P3	0	40	60
P4	0	20	80

Based on Table 3, it can be seen that the treatment of 100 ml sulfadex (P0) resulted in all hair growth treatments at score 1. In the treatment of 100 ml distilled water (P1) resulted in all samples at score 0. In the treatment of 25% eco enzyme (P2) resulted in 80% at score 1, and 20% at score 0. The 50% eco enzyme treatment (P3) resulted in a score of 60% at score 2, and 40% at score 1. The 75% eco enzyme treatment (P4) resulted in a score of 2 by 80%, and 20% at score 1. Based on these percentage results, the provision of eco enzyme at a dose of 75% is better than the provision of 100

ml sulfadex.

Table 4. Percentage on scab recovery (%)

Treatment group	Scabbing		
	0	1	2
P0	0	20	80
P1	100	0	0
P2	0	100	0
P3	0	60	2
P4	0	40	3

Based on Table 4, it can be seen that the treatment of 100 ml sulfadex (P0) resulted in 80% score 2, and 20% score 1. In the treatment of 100 ml distilled water (P1) resulted in all samples at score 0. In the treatment of 25% eco enzyme group (P2) resulted in all samples being at score 1. The 50% eco enzyme treatment group (P3) resulted in a score of 60% at score 1, and 40% at score 2. The 75% eco enzyme treatment group (P4) resulted in a score of 2 by 60%, and 40% at score 1. Based on the results of these percentages, the provision of 100 ml sulfadex is the best treatment compared to other treatments on scab recovery. The treatment group given sulfadex showed the best recovery rate. This is because the composition of Sulfadex is Povidone iodine, Zink Bacitracin, Neomycin Sulfate, Sulfadiazine, Cilfutrin. Sulfadiazine is an antibiotic and antiprotocoa. The mechanism of action is by inhibiting enzymes responsible for growth. Sulfadiazine can prevent or relieve infection [11].

3.2. Eco enzyme Utilization in Scabies Wound Healing

Table 5. *Kruskall-Wallis Test* on eco enzyme

Parameters	N	Df	Sig
Alopecia *	25	4	0.002
Thickening *	25	4	0.001
Scabbing *	25	4	0.002

Based on Table 5 *Kruskall-Wallis Test* on 25 samples with alopecia, thickening and scab values, the $P\text{-value} \leq 0.05$ was obtained on all three parameters, in which case there is a significant difference. This indicates that there is a difference between each treatment. Furthermore, to see the difference continued with the *Mann-Whitney Test* by comparing all treatment groups with each other. The results of the *Mann-Whitney Test* can be seen in the table below.

Table 6. *Mann-Whitney Test Results*

No	Perbandingan	Signifikansi		
		Alopecia	Thickening	Scabbing
1	Sulfadex dan Aquades	0.008*	0.008*	0.008*
2	Sulfadex dan 25% eco enzyme	0.151	0.69	0.032*
3	Sulfadex dan 50% eco enzyme	0.69	0.151	0.31
4	Sulfadex dan 75% eco enzyme	1	0.032*	0.69

5	Aquades dan 25% eco enzyme	0.056*	0.032*	0.008*
6	Aquades dan 50% eco enzyme	0.016*	0.008*	0.008*
7	Aquades dan 75% eco enzyme	0.008*	0.008*	0.008*
8	25% eco enzyme dan 75% eco enzyme	0.31	0.095	0.31
9	25% eco enzyme dan 50% eco enzyme	0.151	0.032*	0.151
10	50% eco enzyme dan 75% eco enzyme	0.69	0.69	0.69

Based on Table 6 above, the Mann-Whitney test results show differences in the level of healing in each treatment group in each parameter of scabies wound healing. The alopecia parameter of each treatment group obtained significant differences with a value of $p \leq 0.05$ seen in the positive control treatment with negative control ($p = 0.008$), negative control with 25% eco enzyme ($p = 0.056$), negative control with 50% eco enzyme ($p = 0.016$), and negative control with 75% eco enzyme ($p = 0.008$). Skin thickening parameter, each treatment group obtained significant difference results seen in the treatment of positive control with negative control ($p = 0.008$), positive control with 75% eco enzyme ($p = 0.032$), negative control with 25% eco enzyme ($p = 0.032$), negative control with 50% eco enzyme ($p = 0.008$), negative control and 75% eco enzyme ($p = 0.008$), and 25% eco enzyme with 50% eco enzyme ($p = 0.032$). Scab cleanliness parameters, each treatment group obtained significant differences in the results seen in the positive control treatment with negative control ($p = 0.008$), positive control with 25% eco enzyme ($p = 0.032$), negative control with 25% eco enzyme ($p = 0.008$), negative control with 50% eco enzyme ($p = 0.008$), and negative control with 75% eco enzyme ($p = 0.008$).

3.3. Eco enzyme Effectiveness against Alopecia

Based on Table 2 and Table 6, the effect of eco enzyme on alopecia can be seen. Based on Table 2, it can be seen that the administration of eco enzyme by 75% is able to offset the administration of sulfadex on alopecia. This is also evidenced by Mann-Whitney testing on sulfadex and 75% eco enzyme which does not provide significant differences. Based on Table 6, it can be seen that there is no difference between all eco enzyme treatments on alopecia. The provision of 75% eco enzyme can compensate for the provision of sulfadex on alopecia, this is because eco enzyme has the ability to kill bacteria and prevent pathogenic bacteria because it contains alcohol and acetic acid. Eco enzyme is a solution of complex organic substances produced from the fermentation process of organic waste, sugar, and water. One of the contents in eco enzyme is acetic acid (H_3COOH) which can kill bacteria by damaging cell membranes with a pH gradient, and causing disruption of cell metabolic activity [12].

3.4. Effectiveness of Eco enzymes on Thickening

Based on Table 2 and Table 6, the effect of eco enzyme on thickening can be seen. Based on Table 2, it can be seen that the administration of 75% eco enzyme is better than the administration of 100 ml sulfadex. This is also evidenced by Mann-Whitney testing on sulfadex and 75% eco enzyme which provides a significant difference. Based on Table 6, it can be seen that there is a difference between giving 25% eco enzyme and giving 50% eco enzyme. the administration of eco enzyme by 75% was

able to replace the administration of sulfadex on alopecia in accordance with research conducted in mice. Orange peel waste eco-enzyme has the highest anti-inflammatory power, which is worth 33.05%. The anti-inflammatory contents detected were Aloxiprin, Hydroperoxide, 1 methylpentyl, Hexadecanoic acid (CAS) Palmitic acid, 2 Hydroxy-1,1,10-trimethyl-6,9-epidioxydecali and Acetaldehyde cis-3-hexenyl pentyl acetal. This indicates that the orange peel waste eco-enzyme outperforms the anti-inflammatory effectiveness of a standardized commercial drug (Betametasone) [13].

3.5. Eco enzyme Effectiveness on Scab

Based on Table 2 and Table 6, it can be seen the effect of eco enzyme administration on scab. Based on Table 2, it can be seen that the administration of eco enzyme with a dose of 50%, and 75% can offset the administration of sulfadex 100 ml. This is evidenced by the Mann-Whitney test on sulfadex and 50%, and 75% eco enzyme which did not have a significant effect. While the administration of 100ml sulfadex is better than the administration of 25% eco enzyme. This research is a type of alternative utilization other than conventional. The results of this study have similar results to the utilization of kirinyuh leaf extract in the treatment of scabs.

Tannin compounds act as anti-inflammatory, proliferation and remodeling by accelerating the response of neutrophils and macrophages and stimulating the formation of phagocytosis in the body. Tannins also function as antibacterials and antimicrobials that increase epithelialization and play a role in wound recovery [14]. The eco enzyme indicated to contain kojic acid. Kojic acid is a fungal metabolic product produced by some *Aspergillus* species. Kojic acid is an inhibitor of mite multiplication growth. Due to its properties as an antibiotic, kojic acid is used in the food industry as a precursor, in cut fruits to prevent oxidative browning, antistaling fruits and vegetables, and in seafood and meat to maintain meat color [15].

4. Conclusion

The utilization of eco enzyme as a scabicide solution at a dose of 75% is considered capable of suppressing the growth of *Sarcoptes scabiei*, and is able to balance the provision of sulfadex on the parameters of alopecia, and scab. In the thickening parameter, the provision of eco enzyme at a dose of 75% is better than the provision of 100 ml sulfadex.

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