

## Anti-Inflammatory Effect of Anthill Ointment Extract (Myrmecodia pendens) on White Rats

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### ABSTRACT

Inflammation is the body's response to foreign substances that enter the body and is characterized by redness, fever, swelling, pain, and impaired organ function. Anti-inflammatory is a term for substances or medicines that work to reduce or suppress the inflammatory process. One of the plants originating from Papua is anthill (*Myrmecodia pendens*). Ant nest (*Myrmecodia pendens*) contains lots of synthetic secondary metabolite substances such as flavonoids, saponins, tannins, and alkaloids. That ingredient is presumed to have an effect as anti-inflammatory. This research aims to examine the anti-inflammatory effectiveness of anthill ointment extract (*Myrmecodia pendens*) on the feet of white rats induced by carrageenan. The test group was divided into 5 groups in which each group consisted of 3 rats. The positive control group was subjected to bioplacenton, the negative control to ointment base, and the extract group to anthill ointment extract (*Myrmecodia pendens*) with concentrations of F1 (10%), F2 (20%), and F3 (40%). The test was conducted by inserting 1% carrageenan liquid into the sole of the rat's right paw. The volume of edema was measured using a syrup bottle filled with water every 60 minutes for 360 minutes. The data were analyzed statistically using (ANOVA) and obtained data  $p = 0.580 > 0.05$ . The conclusion of this research is that there is no significant difference in the percent of anti-inflammatory power between the dose groups F1 (10%), F2 (20%) and F3 (40%) with positive control.

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## INTRODUCTION

There are many species of plants that can grow in Papua Islands that most of them can be used as a source of natural medicinal ingredients. They have been widely used by the community for generations for medicinal purposes to treat their health problems. Therefore, these traditional medicines need to be researched and developed for optimal utilization to increase the public health. In addition, there have been many researches conducted for the development in health sector, especially for various diseases and microorganism infections from various plants, one of which is the anthill tuber plant (*Myrmecodia pendens*).

The anthill plant contains chemical components from the phenolic group such as flavonoids, tannins, and terpenoids. From several researches, it is reported that Anthill plant has the ability as anti-inflammatory, antibacterial, antioxidant, and antiviral from the flavonoids and tannins contained in the Ant Nest (1). In addition, anthills (*Myrmecodia pendens*) are often used for the treatment of various diseases. This plant is called an anthill due to the similarity of its tubers with ants which ultimately produce active compounds and are beneficial for treatment (2). Moreover, anthills are commonly used to heal severe diseases such as cancer, coronary heart disease, tumors, rheumatism, and gout (3).

From various research results reported, the chemical components that has anti-inflammatory effects is flavonoids, saponins, and terpenoids. Flavonoids are compounds that have pharmacological activity as anti-inflammatory (4). It also has a function as anti-inflammatory agents by inhibiting the enzymes cyclooxygenase and lipoxygenase for treating symptoms of inflammation and allergies (5). In addition, saponin's anti-inflammatory mechanism inhibits exudate formation and vascular permeability (6). Moreover, terpenoids have a role in treating the inflammation by inhibiting the activity of pro-inflammatory cytokines. In carrageenan-induced rat feet, terpenoids will reduce the inflammation by blocking the expression of COX-

2 and iNOS enzymes (7).

Inflammation is a common and often experienced condition in every individual. Inflammation is one of the body's normal responses caused by injury, physical trauma, damaging chemicals, or microbiological substances (8). Inflammation is the body's response to inactivate or terminate invading organisms, remove irritants and set the stage for tissue repair. In addition, the inflammatory process will usually be relieved when the healing process is complete (9). Inflammation is also implicated in the pathogenesis of many diseases such as arthritis, cancer, neurodegenerative and cardiovascular diseases. Moreover, inflammation typically decreases after the recovery process is complete, but inappropriate activity of the immune system can cause inflammation to become more persistent (10). Inflammation is a condition when the body reacts to infection, irritation or injury characterized by redness, heat, swelling and pain (11).

The treatment of inflammation is usually conducted by consuming steroidal or non-steroidal anti-inflammatory medicines. However, non-steroidal anti-inflammatory medicines have the side effects that can irritate the stomach, while long-term use of steroid medicines can cause hypertension (12). Therefore, there is a need for alternative development for inflammatory treatment, one of which is using anti-inflammatory supplements that aim to achieve high pharmacological effects with low side effects (13).

The knowledge of traditional medicinal plants and their use evolves along with the development of era. The world community has begun to prioritize a healthy lifestyle, using natural medicines as an alternative to synthetic chemical drugs, with the consideration that they are relatively safe due to its lower side effects (14). The use of herbal plants has been traditionally believed for generations, then the use of herbal medicine as an alternative treatment can be utilized as a reference for medicine development in the future (15). However, the lack of information about traditional medicine makes its use become less optimal.

Based on the research problem above, this research was conducted on the anti-inflammatory effectiveness of anthill tubers (*Myrmecodia pendens*). The results obtained are expected to provide additional information about the benefits of using the traditional anthill plant (*Myrmecodia pendens*) as one of the natural medicines with anti-inflammatory benefits.

## METHODOLOGY

### Research Location and Time

This research was conducted for 4 months at the Pharmacology and Toxicology Laboratory of Universitas Pendidikan Muhammadiyah sorong.

### Research Tools and Materials

The tools used in this research are used syrup bottles, bowls, injection syringes (1 ml and 3 ml), analytical scales, erlenmeyer, waterbath, measuring cups, and hotplate.

In addition, the materials used in this research were anthill ointment extract (*Myrmecodia pendens*), carrageenan, NaCl 0.9, bioplacenton, and handscoon. The test animals used in this research were Wistar male white rats.

### Anthill sample preparation

The sample used in this research are anthill tuber that is separated from the parts that are not in use, then the tuber that has been cleaned is chopped to form small pieces and washed using running water. Furthermore, the anthill tubers that have been washed are dried in the sun by covering them with a black cloth to prevent the damage to the compounds contained in the anthill tubers caused by sunlight. After the anthill tubers are dry, the dry sorting is conducted to separate foreign particles that remain during the drying process. After the samples have been sorted dry, they are powdered using a blender and sifted using a mesh 60 sieve.

### Preparation of Anthill Extract

The simplisia that has been obtained is extracted using the maceration method is placed in a glass container and macerated using 70% ethanol solvent for 3 days and remaceration for 2 days. The extracted anthill tubers are filtered to separate the residue and filtrate of the anthill tubers, then it was evaporated using a waterbath until a thick extract is obtained.

### The Formulation of Anthill Ointment Extract

**Table 1.** Ointment Formulation

Concentrations	FI (10%)	FII (20%)	F III (40%)
Anthill extract	2 g	4 g	8 g

Vaseline album	15,3 g	13,6 g	10,2 g
Adeps lanae	2,7 g	2,8 g	1,8 g
<b>Total</b>	<b>20 g</b>	<b>20 g</b>	<b>20 g</b>

The ingredients that have been prepared are weighed and the extract was added to the mortar and mixed until homogeneous. After that, the Vaseline album was added and stirred again. The last step was to add the adeps lanae into the mortar containing the extract and Vaseline album and mix it until homogeneous, then remove it from the mortar and store it in the ointment pot.

### Animal Test Preparation

The test animals used were 15 white rats with the criteria of healthy, lively, and have a standard weight of around 250-300 g. Then, the rats were divided into 5 groups with 3 rats in each group.

### Preparation of 1% Carrageenan Solution

Measured carrageenan as much as 1 g and put in a measuring flask, and dissolve it with 100 ml of 0.9% NaCL solution.

### Anti-inflammatory effectiveness test of anthill ointment extract (*Myrmecodia pendens*)

This research uses 15 white rats as a test animals. The rats are fasted for 8 hours before testing, but they are still allowed to drink. On the day of the test, the rat's foot was marked using a marker up to the desired limit. Each rat from each group was measured with the initial volume of the right hind foot by dipping it into the water contained in the syrup bottle, and the spilled water is the initial volume of the rat's foot ( $V_0$ ). Afterwards, each test group was treated subcutaneously on the sole of the rat's foot. Group 1 was smeared with bioplacenton gel as a positive control, group 2 was smeared with ointment base as a negative control, group 3 was smeared with anthill extract ointment with a concentration of 10%, group 4 smeared ointment with anthill extract ointment with a concentration of 20%, and group 5 was smeared with anthill extract ointment with a concentration of 40%. The measurement of rat feet was conducted every 60 minutes for 360 minutes by dipping the rat feet in the syrup bottle. After 60 minutes, the volume change in the rat's foot was reported as the inflammatory volume after time  $t$  ( $V_t$ ). In addition, the measurement was conducted for 360 minutes.

## RESULTS AND DISCUSSION

The results of this research use anthill extract which is formulated into an ointment preparation to determine the inflammatory activity of anthill ointment extract against edema in carrageenan-induced rat feet.

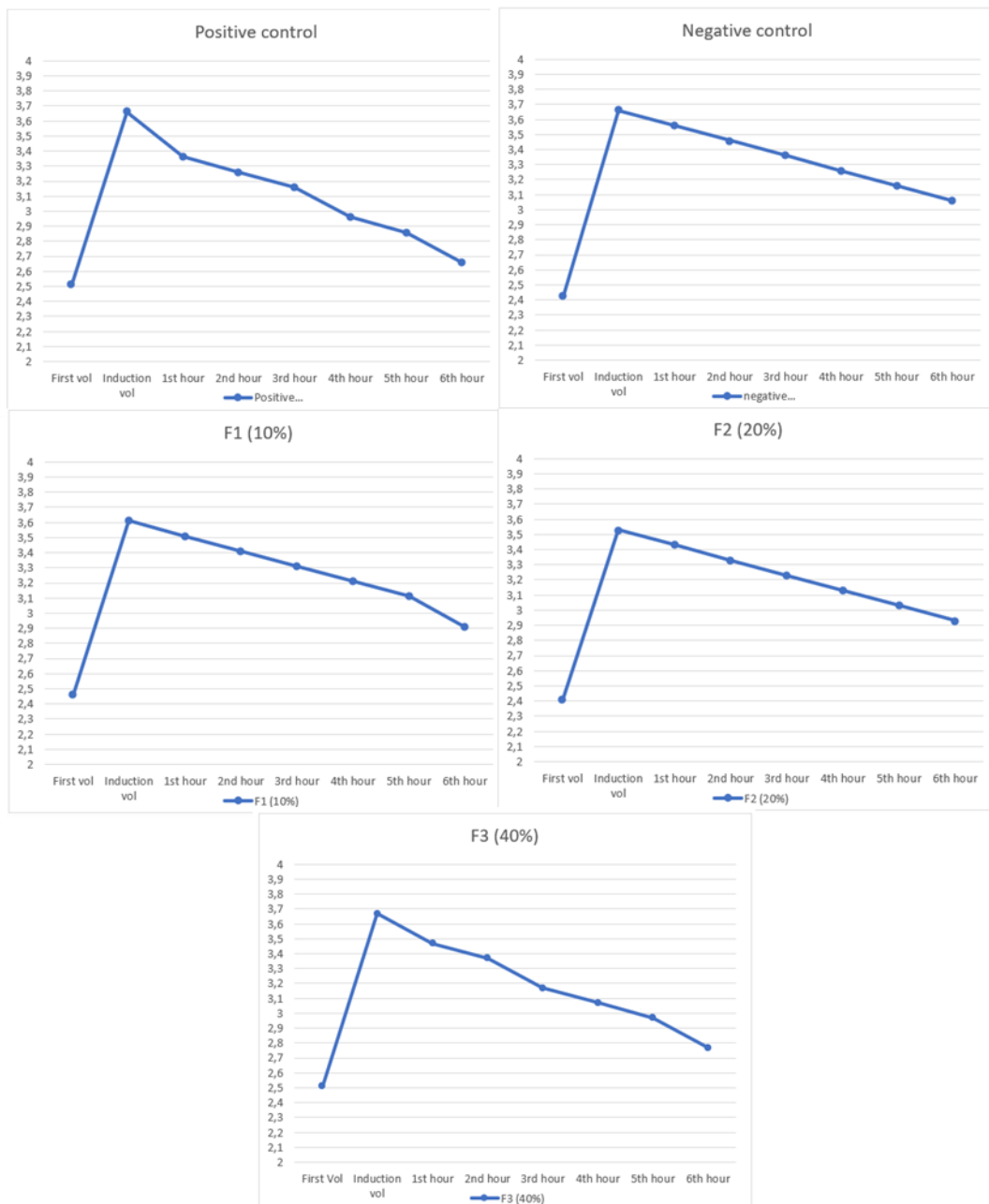
**Table 2.** The observation results of rat feet after treatment

Groups	First vol	Induction vol	1	2	3	4	5	6
F3 (40%)	2,51	3,67	3,47	3,37	3,17	3,07	2,97	2,77
F2 (20%)	2,41	3,53	3,43	3,33	3,23	3,13	3,03	2,93
F1 (10%)	2,46	3,61	3,51	3,41	3,31	3,21	3,11	2,91
Negative control	2,43	3,66	3,56	3,46	3,36	3,26	3,16	3,06
Positive control	2,51	3,66	3,36	3,26	3,16	2,96	2,86	2,66

This research was conducted to prove the anti-inflammatory activity of anthill ointment extract preparations against edema in rat feet. The test animals used in this research were 15 white rats and divided into 5 treatment groups. Group 1 as a group with the highest concentration of 40%, group 2 is a group with an extract concentration of 20%, group 3 is a group with the smallest extract concentration of 10%, group 4 is a group treated with ointment base without extract as a negative control, and group 5 is a positive control group using Bioplacenton gel. The parameter observed in this test is the percentage decrease in the volume of rat feet that have been induced by carrageenan. The percentage decrease in the volume of rat paws was seen every 60 minutes for 360 minutes after inducing carrageenan with a concentration of 1%. The measurement used in this research uses a used syrup bottle filled with water to the top, then the amount of water spilled indicates the volume of the rat's foot.

The anthill plant is one of the typical plants in the Papua and it is usually utilized by the local community to treat diseases such as rheumatism, headaches, and body aches (16). This research was observed for 360 minutes, due to the release of inflammatory mediators occurs that caused maximum edema formation lasts for several hours. In the first hour after carrageenan induction, carrageenan will cause cell injury and will release inflammatory mediators such as histamine, serotonin, bradykinin, and prostaglandins. These mediators will cause the inflammation to occur (17). The mechanism of carrageenan that causing inflammation is by stimulating the lysis of mast cells and releasing inflammatory mediators which can result in dilation of blood vessels, causing exudation of capillary walls and migration of phagocytes to the inflammatory area and resulting in swelling of the edema area (18)

The selection of carrageenan as an inducer of edema is chosen since it has several advantages, such as does not leave scars, does not cause tissue damage, and can produce a more sensitive response to anti-inflammatory medicine than other irritant compounds, making it suitable to be used as an inducer of edema (19).



**Figure 1.** Graph of reduction in rat's foot edema

Figure 1 shows the increase of foot edema volume at 1 hour after the injection with 1% carrageenan. The positive control and group 3 showed anti-inflammatory activity with a steady decrease in the volume of

rat feet. This is caused by the positive control which has a chemical content that is proven to have efficacy as an anti-inflammatory, while group 3 is the formulation group with the highest concentration of 40%. This is because anthill extract contains compounds with anti-inflammatory activity, which can stop the formation and release of substances that cause inflammation due to allergic reactions. In the negative control group, there was a decrease in the volume of rat feet but not significantly, due to the fact that the negative control did not contain active substances and it did not have anti-inflammatory activity to cure edema in rat feet.

In this research on the anti-inflammatory effect of anthill ointment extract, it indicated that the extract had an anti-inflammatory effect. The flavonoid content is found to have various activities, including inhibiting the enzymes cyclooxygenase and lipoxygenase. With the inhibition of these enzymes, the release of eicosanoids (prostaglandins and leukotrienes) is also inactivated. The release of eicosanoids is the initial stage of the general inflammatory response. The saponin content also has an important role as an anti-inflammatory by preventing the formation of exudates and inhibiting the increase in vascular permeability in reducing the inflammation. The alkaloid content in anthill extract has the ability as an anti-inflammatory with a mechanism of action based on inhibiting phagocytosis of leukocytes resulting in a stopped inflammatory cycle (20).

Data on the reduction of edema in the feet of rats were processed using the Shapiro Wilk normality test and Levene homogeneity test. From the results of normality test data, it was found that the data was normally distributed with a data value  $> 0.05$ .

The homogeneity test results indicated that the data were homogeneously distributed with a  $p > 0.05$  value. Furthermore, the parametric analysis was conducted using the Anova method with the results of  $p = 0.580 > 0.05$ . Thus, it can be concluded that there is no significant difference in each treatment.

## CONCLUSION

Based on the research result, it can be indicated that the anthill ointment extract (*Myrmecodia pendens*) has an effect as an anti-inflammatory with the reduction of edema in the feet of rats induced by carrageenan. In addition, the highest concentration of anti-inflammatory effect is F3 40%, F2 20%, and F1 10%.

## RECOMMENDATION

Further research is recommended to isolate certain type of compounds, for example flavonoids to increase the effectiveness of anthill ointment preparations (*Myrmecodia pendens*) on anti-inflammatory effectiveness and other pharmacology.

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