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EFFECTIVENESS TEST OF SEMBUNG RAMBAT LEAF EXTRACT (MIKANIA MICRANTHA KUNTH) AND ALOE VERA GEL ON HEAD LICE (PEDICULUS HUMANUS CAPITIS) MORTALITY

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ABSTRACT

Presence of potential side effects and resistance as well as ineffectiveness of pyrethrin and pyrethroid-based pediculicides so that a new therapy is needed in managing head lice (Pediculus humanus capitis). The development of sembung rambat (Mikania micrantha Kunth) and aloe vera gel contains secondary metabolites such as flavonoids which have the potential to eradicate head lice. This research aims determine the effectiveness of a mixture of Mikania micrantha Kunth leaf extract and Aloe vera gel on the mortality of head lice. This is a true experimental design study with a post test only control group, consist of a positive control using 1% permethrin and a negative control using aquadest and treatment groups using a mixture of Mikania micrantha Kunth leaf and Aloe vera gel with a ratio of 30:70, 50:50, 70 :30. The treatment group had a mortality percentage from highest to lowest at 240 minutes P2 of 63.33%, P3 of 60%, P1 of 43.33 %. As for the results of the one-way ANOVA test, the difference in the average percentage of head lice mortality in the test group was p <0.05. A mixture of Mikania micrantha Kunth leaves and Aloe vera gel is effective in causing head lice mortality.

Keywords: *Aloe Vera Gel, Mikania Micrantha Kunth Leaf, Mortality, Pediculocide, Head Lice.*

ABSTRAK

Adanya potensi efek samping dan resistensi serta ketidakefektifan piretrin dan pedikulisida berbasis piretroid sehingga diperlukan terapi baru dalam penanganan kutu rambut (Pediculus humanus capitis). Perkembangan sembung rambat (Mikania micrantha Kunth) dan gel lidah buaya mengandung metabolit sekunder seperti flavonoid yang berpotensi membasmi kutu rambut. Penelitian ini bertujuan untuk mengetahui efektivitas campuran ekstrak daun Mikania micrantha Kunth dan gel lidah buaya terhadap mortalitas kutu rambut. Ini adalah penelitian desain eksperimen sejati dengan post test only kelompok kontrol, terdiri dari kontrol positif menggunakan permetrin 1% dan kontrol negatif menggunakan aquadest dan kelompok perlakuan menggunakan campuran Mikania micrantha daun Kunth dan gel lidah buaya dengan perbandingan 30:70, 50:50, 70:30. Kelompok perlakuan memiliki persentase mortalitas dari tertinggi ke terendah pada 240 menit P2 sebesar 63,33%, P3 sebesar 60%, P1 sebesar 43,33%. Sedangkan untuk hasil uji one-way ANOVA, perbedaan rata-rata persentase kematian kutu rambut pada kelompok uji adalah p <0,05. Campuran daun Mikania micrantha Kunth dan gel lidah buaya efektif dalam menyebabkan kematian kutu kepala.

Kata Kunci: Aloe Vera Gel, Mikania micrantha Kunth Daun, Mortalitas, Pediculocide, Kutu Kepala.

INTRODUCTION

Pediculus humanus capitis also known as head lice is an ectoparasite that lives on the human scalp. Head lice (Pediculus humanus capitis) are classified as insects that live on the base of the hair and attach to the human scalp. This animal is very small and maintains its life by sucking blood (hemophagydea) [1]. Transmission of head lice occurs by direct contact with an infected person (ie, head-to-head contact). Contact is common during play (sports activities, playgrounds, at camp, and slumber parties) at school and at home [2].

This pediculosis treatment method can be carried out using two methods which include physical and chemical methods. Chemical methods, namely the use of insecticides or pediculicides, have been widely used throughout the world. Insecticides are easy and convenient to use and the results are very effective [3]. However, there are potential side effects and there are also many mites/lice resistance to several insecticides, one of which is pyrethroids. The mean frequency of pyrethroid resistance is estimated to be 76.9%. Of the resistant ticks collected, 64.4% were homozygous and 30.3% heterozygous resistant. Globally, four countries (Australia, UK, Israel, and Turkey) have 100% kdr gene, possibly resulting in ineffectiveness of pyrethrin and pyrethroid based pediculides, pyrethroid resistance is found at a relatively high frequency in many countries [4].

Indonesia is a rich herbal products country including sembung rambat leaf (Mikania micrantha Kunth) and Aloe vera. Both contain secondary metabolites such as flavonoids which can kill head lice [5,6]. This study aims to test the effectiveness of a mixture of sembung rambat leaf extract (Mikania micrantha Kunth) and Aloe vera gel on the mortality of head lice (Pediculus humanus capitis).

METODS

This experimental research used a post-test only control group design by giving treatment using sembung rambat leaf (Mikania micrantha Kunth) and Aloe vera gel against head lice (Pediculus humanus capitis). As much as 283 grams of sembung rambat leaf powder was macerated using 96% ethanol and allowed to stand for 3 days. Then the macerate was evaporated using a rotary evaporator at 60ºC with a rotational speed of 100 rpm and a pressure of 0.06-0.08 MPa for ±5 hours to obtain a thick extract. Sembung rambat leaf extract was then diluted using distilled water to a concentration of 10%. The process of making aloe vera gel is done using a blender and diluted to a concentration of 40%.

The mixing of the two materials was carried out using a magnetic stirrer with a ratio between Sembung rambat leaf extract and aloe vera gel, including 30:70 (P1), 50:50 (P2), and 70:30 (P3). In this study, there were 5 test groups, including positive control (1% permethrin), negative control (distilled water), and the three treatment groups (P1-P3).

Before the observation, the filter paper was soaked for 2 minutes in the material provided according to the test group. Observation of head lice mortality was carried out with 3 replications so that 10 head lice per group were needed which were calculated using the Federer formula so that the total head lice used in this study were 150 head lice. Mortality observations were made at 5, 10, 60, 120, 180, 240, and 1080 minutes. Head lice were considered dead if there was no movement of the legs or antennae. After the data is obtained, the LT 50 value is then determined and the data processing cut-off is at that minute. The data was processed using One-way ANOVA and continued with the Post hoc test to see the difference in values between the test groups.

RESULT AND DISCUCCION

Table 1.
Average Mortality of Head Lice (Pediculus humanus capitis) in the Control Group and Treatment Group Based on Time of Observation

Group	Materials	Mean Mortality of Head Lice (Minutes)						
		5	10	60	120	180	240	1080
Control -	Aquadest	0	0	0	0	16,67	23,33	40
Control +	Permethrin 1%	0	43,33	46,67	63,33	100	100	100
P1	Sembung Rambat leaf extract dan Aloe vera gel 30:70	0	0	6,67	20	33,33	43,33	73,33
P2	Sembung Rambat leaf extract dan Aloe vera gel 50:50	0	3,33	16,67	33,33	43,33	63,33	93,33
P3	Sembung Rambat leaf extract dan Aloe vera gel 70:30	0	0	13,33	26,67	43,33	60	90

Based on the data above, it is known that the positive control group and P2 group can kill head lice (Pediculus humanus capitis) starting at 10 minutes, while groups P1 and P3 start at 60 minutes.

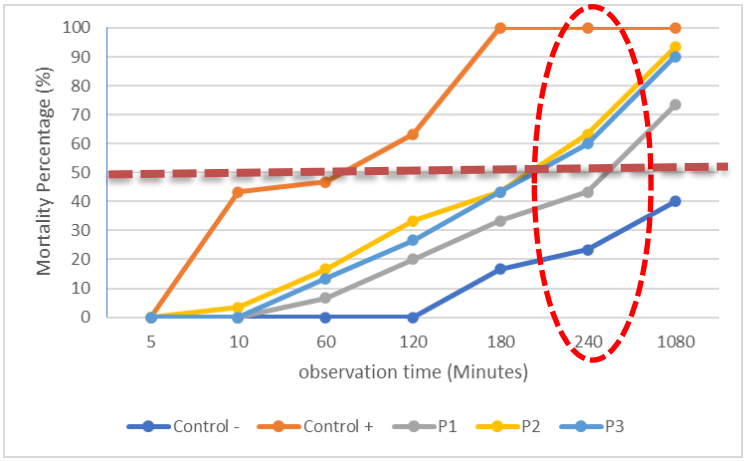

Figure 1. Percentage Graph of Head Lice Mortality (Pediculus humanus capitis) in the Test Group Based on Time of Observation

Based on Figure 1, the graph showed us the highest 50% mortality for head lice (Pediculus humanus capitis) is at 240 minutes, namely in the positive control group of 100%. The treatment group that had the highest average mortality was group P2 with a ratio of sembung rambat leaf extract (Mikania micrantha Kunth) and Aloe vera Linn gel 50:50 of 63.33% so that the 240th minute was the cut-off point in data processing on this research.

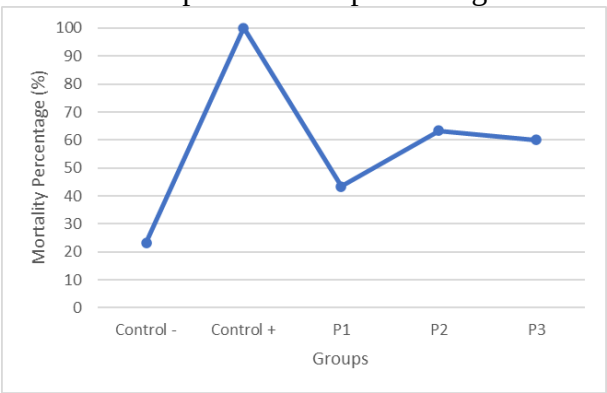

Figure 2. Percentage Graph of Head Lice Mortality (Pediculus humanus capitis) in the Test Group at 240 minutes

Based on the picture above, it can be seen that in the 240th minute, 100% death of head lice (Pediculus humanus capitis) were obtained in the positive control and the negative control had the lowest mortality percentage with a value of 23.33%. The percentage of head lice (Pediculus humanus capitis) mortality in group P1 was 43.33%, group P2 was 63.33%, and group P3 was 60%. The data obtained at the 240th minute was followed by the One-Way ANOVA test on the data and obtained a value of p = 0.001 (P <0.05) where this value indicated that there was a significant difference in the average mortality of head lice (Pediculus humanus capitis). Then the LSD Post Hoc Test was carried out to find out the significant difference between the two groups which can be seen in Table 2.

Table 2. LSD Post Hoc Test Results Average Head Lice Mortality (Pediculus humanus capitis) for the Control Group and the Treatment Group at 240 Minutes

Group	Control -	Control +	P1	P2	P3
Control -		Significant	Significant	Significant	Significant
Control +	Significant		Significant	Significant	Significant
P1	Significant	Significant		Significant	Significant
P2	Significant	Significant	Significant		Not Significant
P3	Significant	Significant	Significant	Not Significant	

From the table above it can be seen that there are differences between the control group and the treatment group. Insignificant values were obtained in the P2 and P3 groups.

Table 3. Phytochemical Test Results of Sembung Rambat leaf extract and Aloe vera gel

Compound	**Results**		**Standard**
	Sembung rambat leaf Extract	**Aloe vera gel**	
Saponins	Contained	Contained	Formed stable foam
Tannins	Contained	Not contained	Black Green Color
Glycosides	Contained	Contained	Brownish red ring
Flavonoids	Contained	Contained	Red, yellow, or orange
Terpenoids	Contained	Not Contained	Purple
Steroids	Contained	Not contained	Green
Alkaloids	Contained	Not contained	Precipitate formed
Atsiri oils	Not contained	Not contained	Residue has a distinctive odor

Based on the table above, Sembung rambat leaf extract contains saponins, tannins, glycosides, flavonoids, terpenoids, steroids, and alkaloids. Aloe vera gel produced in this study contains saponins, glycosides, and flavonoids.

The effectiveness of determining the mortality of head lice by sembung rambat leaf extract and aloe vera gel is because the two ingredients have a synergistic effect with each other so the death rate exceeds the negative control rate. Based on the number of comparisons, it was found that the ratio of sembung rambat leaf extract and aloe vera gel that was the best in eradicating head lice was 50:50. The long mortality time was obtained because the observation method used was different from the others. This study used filter paper which was soaked using the components according to each group for 2 minutes then aerated and placed a head lice on it to be observed. the method was carried out to minimize the bias effect of head lice that died due to drowning if the material was dripped directly

There has been no research which states that sembung rambat and aloe vera leaves can

kill head lice until now. However, the secondary metabolites contained in sembung rambat leaf and aloe vera gel which can cause head lice mortality such as flavonoids, glycosides, terpenoids/steroids, alkaloids, saponins, tannins and other secondary metabolites.

This is in line with the research by Darmadi et al. 2018 which stated that flavonoids are contact poisons that enter the body of head lice directly [7]. Other research states that flavonoids can act as stomach poisons so that they directly interfere with digestion and inhibit taste receptors in the mouth area of head lice and cause head lice to starve to death [8]. Not only that, flavonoids also work as strong inhibitors of cell respiration processes so that head lice die as a result [9,10]. This is because the structure of the 2,3/3-OH double bond group in conjugation with 4-oxo in the C ring in the flavonoid structure is able to make the interaction of flavonoids with the mitochondrial membrane thereby reducing fluidity and inhibiting the mitochondrial respiratory chain [11,12].

Herdiansyah (2019) in his research stated it was found that the ethanol extract of sembung rambat leaves had a high toxicity effect on A. aegypti larvae at 24 hours of observation [13]. The presence of active compounds contained in sembung creeper leaves indicates that there is a change in egg hatchability and disrupts larval development. The content of saponins that enter the larvae can reduce the pressure on the surface of the mucous membrane of the digestive tract so that the walls of the digestive tract become corrosive. This toxic substance then goes to the larva's mouth through the respiratory system and causes damage to the nerves, as well as damage to the spiral which causes the larvae to be unable to breathe and eventually die. Saponins can act as inhibitors of the acetylcholinesterase enzyme. Acetylcholine will negate impulses from nerve cells to muscle cells. After the impulse is released, the process is stopped by the enzyme acetylcholinesterase which breaks down acetylcholine into acetyl Co-A and choline. The presence of compounds such as alkaloids and saponins will also inhibit the action of the acetylcholinesterase enzyme resulting in the accumulation of acetylcholine which will cause damage to the impulse delivery system to the muscles and subsequently cause muscle spasms, paralysis which can lead to death [14-16]. The mechanism of action of the compounds also supports the death of head lice.

CONCLUSION

Sembung rambat leaf extract (Mikania micrantha Kunth) 10% and Aloe vera gel 40% are effective in eradicating 50% of head lice (Pediculus humanus capitis) in the 240th minute with the highest ratio of sembung rambat leaf extract (Mikania micrantha Kunth) and Aloe vera gel in eradicating head lice is 50:50. This shows that a balanced composition between the two mixtures has better activity in killin head lice than a composition with a higher ratio of one ingredient alone.

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