

IN VITRO OVICIDAL ACTIVITY OF COMBINATION *Illicium verum* EXTRACT AND COCONUT OIL AGAINST *Pediculus humanus capitis*

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Abstract

Permethrine is still the main therapy for human head infestation *Pediculosis capitis* in several countries, including Indonesia. However, permethrine is not effective for egg stage. Therefore, alternative therapy from herbs are needed for the treatment of head lice which is effective for both egg and adult stage. The aim of this study was to determine the efficacy of *Illicium verum* extract and coconut oil formula against eggs of head lice. An in vitro immersion test was applied with four treatment group (*Illicium verum* extract and coconut oil formula with four different composition) as well as negative control group (distilled water) and positive control group (permethrine 1%) against eggs of head lice. The eggs of head lice were immersed for 0.5, 1, or 2 min in 1 ml of each solution. Mortality rates of the eggs were recorded after 5 days of incubation. The formula of *Illicium verum* extract and palm oil with composition 60:40 had the best efficacy with mortality rate of head lice eggs reached 86,67%, after immersion for 2 minutes. The combination of *Illicium verum* extract and coconut oil could be an alternative ovicide, but this formula requires precise composition which can be applied for *Pediculus humanus capitis*.

Keywords: head lice, ovicide, *Illicium verum*, palm oil, efficacy

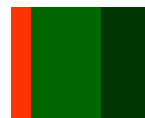
1. Introduction

Pediculosis capitis spreads throughout the world, both developed and developing countries, including Indonesia [1]. In Indonesia, pediculosis infest in girl's hair mostly, especially those who live in crowded communities such as Islamic boarding schools. Previous research by Lukman (2018) stated that as many as 74.6% of the 287 students at the Miftahul Ulum Islamic Boarding School in Jember Regency were infested with capitis pediculosis [2].

Treatment of head lice generally uses insecticides that are sold in the market, such as permethrin, hexachlorocyclohexane (lindane), malathion, and pyrethrin [3]. These insecticides have side effects that are harmful to humans, for example lindane has been reported to have neurotoxic side effects, including dizziness, seizures, and even death when used for a long

time [4]. The incidence of head lice resistance to the insecticides permethrin, lindane, malathion, and pyrethrin has also been widely reported in the United States, United Kingdom, Australia and Argentina which causes less effective treatment [5].

The existence of side effects and resistance from chemical pediculocides requires an alternative treatment of natural pediculocide. Previous research conducted by Soonwera (2016) on natural insecticides showed that only *Illicium verum* (anise flower) was able to kill one hundred percent of head lice after six hours of experiments [5]. Coconut oil is also able to eradicate head lice with regular use [6]. The content of coconut oil, namely lauric acid, can be a natural insecticide [7]. Therefore, the combination of *Illicium verum* extract and coconut oil is expected to increase the effectiveness of the natural ovicides to head lice.



2. Methods

The anise flower is extracted in the way described previously. The anise flower extract is mixed with coconut oil in a ratio of 30:70, 40:60, 50:50, and 60:40 using a 100 mL measuring cup based on previous research [8,9]. The mixture was added with 0.5 mL of dimethyl sulfoxide (DMSO) so that the liquid became homogeneous [10].

180 eggs of head lice that attached to the hair were divided into 18 groups with 10 nits each. Nits are attached to the object glass by using the tape. The object glass was then dropped until the nits were immersed in distilled water for negative control, 1% permethrin for positive control, and the test solution in the treatment

group for 0.5; 1; or 2 minutes. Object glass was dried using filter paper and incubated at room temperature. Observations were made on the fifth day under a light microscope with 400x magnification after signs of removal of nymphs from control eggs. The egg was assessed to die when the operculum was closed or the operculum was open with the nymph inside [11].

The statistical tests used were the Kolmogorov-Smirnov normality test, Levene's homogeneity test of the equality of error variance test, and the oneway ANOVA test. The next test uses the probit test to determine the IC50 value of the mixture of anise flowers and coconut oil.

3. Results

Table 1. The mean percentage of lice egg mortality at immersion time was 0.5; 1; and 2 minutes

Groups	Treatment	Average Mortality of Nits at Immersion Time (%)			Mean Percentage of Mortality (%)
		0,5 minutes	1 minutes	2 minutes	
K-	Aquades	0	0	0	0
K+	Permethrin 1%	3,33	6,67	30	13,33
P1	Anise flower:coconut oil 30:70	20	23,33	40	27,78
P2	Anise flower:coconut oil 40:60	23,33	30	50	34,44
P3	Anise flower:coconut oil 50:50	23,33	43,33	66,67	44,44
P4	Anise flower:coconut oil 60:40	70	90	100	86,67

4. Discussion

Table 1 showed the treatment group has an increase in the average number of lice egg deaths higher than the negative control group and the positive control mainly in P4 (mixture of anise with coconut oil, ratio 60:40) of 86.67%. Anise flower contains various compounds, such as resins, fats, tannins, terpenoids, limonene, estradol, safrol, timokuinones, flavonoids, glucosides, phenyl propanoids, and saponins [12]. Flavonoids have the properties as stomach poisoning [13]. Phenyl propanoid works by dissolving in membranes and disrupting the

fluidity and function of cell membrane proteins [14]. Those effects may cause lice eggs death. Data analysis used the One Way ANOVA test showed the p value = 0.000 ($p < 0.05$) which means that there were differences between groups. The results of the Post Hoc Tukey test in the P4 group of mixed anise flowers with coconut oil with the ratio of 60:40 showed a significant difference with the negative control group and the positive control group ($p < 0.05$). This results showed that the P4 group had a higher ovicide effect than 1% permethin. Analysis with the Probit test to get the IC50 value of a mixture of

anise flowers with coconut oil was 1.073% lower than permethrin which has an IC50 value of 3.3% [15]. These results indicate that a mixture of anise and coconut oil was more effective as ovicide to lice eggs than permethrin.

5. Conclusion

The mixture of lawang flowers with coconut oil has the potential as an ovicide so that it can be a safe alternative for the treatment of pediculosis capitis.

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