
THE EFFECTIVENESS OF CUCUMBER SQUEEZE WATER ON MORTALITY OF PEDICULUS HUMANUS CAPITIS

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Abstract

Pediculosis capitis is a scalp infection caused by infestation of *Pediculus humanus capitis*. So far, head lice can be killed with chemical pediculocides such as lindane and permethrin 1%, but it could cause human health problems as well as the emergence of insect resistance to insecticides. The purpose of this study was to determine the effect of cucumber juice on the mortality of head lice (*Pediculus humanus capitis*), and to determine the concentration of cucumber juice that is effective on head lice mortality. The type of research used is Quasi Experiment with the aim of knowing the effectiveness of cucumber juice on the mortality of head lice (*Pediculus humanus capitis*). By using the Kruskal-Wallis test, the results obtained Asymp. Sig <0.05, which is 0.016, which indicates a significant difference in the concentration variation of cucumber juice on head lice mortality. It could be concluded that cucumber juice is effective against *Pediculus humanus capitis* mortality. The higher the concentration of cucumber juice, the higher the mortality of *Pediculus humanus capitis*. Within 1 hour of observation, 40% concentration of cucumber juice has an effectiveness of 50%, 60% concentration of cucumber juice has an effectiveness of 60%, while 80% concentration of cucumber juice has an effectiveness of 90%. In the Kruskal-wallis test, it was found that there was a significant difference between the three concentrations of cucumber juice on head lice mortality. The results of this study are expected to make an important contribution in the development of cucumber juice as an effective and safe head lice insecticide.

Keywords: Insecticide, Pediculosis, *Pediculus humanus capitis*

Introduction

Pediculosis capitis is a scalp infection caused by infestation of *Pediculus humanus capitis*. The prevalence of this disease is quite high especially in school- aged children. Pediculosis capitis is an obligate parasitic infection of the scalp caused by *Pediculus humanus capitis* which spend their entire lives attached to the human scalp and suck blood little by little over a long period of time (Gandahusada et al., 2006). *Pediculus humanus capitis* can infect quickly by direct or indirect contact because head lice cannot jump or fly. The spread is also rapid in a densely populated and poor hygiene environment. Factors that influence the occurrence of Pediculosis capitis include age, gender, use of shared bedding or pillows, use of shared combs or hair accessories, hair length, frequency of hair washing, and economy status (Hardiyanti, N.I., et al, 2015).

Head lice are an imperfect metamorphosis, starting from eggs then becoming nymphs and then becoming adults. Head lice when laying eggs to become adults takes 18 days. From the stage of Hatching eggs into nymphs takes approximately 10 days. Adult head lice can live for 27 days. Whereas head lice can survive for 1-2 days if they are not on human hair or scalp and could survive for 48 hours if they do not suck blood and are not on human scalp or hair. As for the eggs stage, they can only last 1 week if they are not located on the hair or scalp.

The clinical symptoms of Pediculosis capitis are most dominant in the form of itching, especially in the occiput and temporal region and can extend to the entire head (Natadisastra, 2009). The poison enters through contact with the skin or enters through the exoskeleton (hard skeleton on the outside of the organism) into the insect body by intermediary tarsus (toes) at rest on surfaces containing insecticide residues (Safar, 2010). Scratching the scalp due to itching can cause erosion, excoriation and also secondary infections in the form of pus and leprosy, while in a severe infections, plicapolonica can occur due to the large amount of pus and crusts which is clot so that they can be overgrown with fungi (Djuanda, 2007).

In school children, chronic infestation of *Pediculus capitis* causes anemia which will make children lethargic, sleepy, which could effect learning performance and cognitive function.

Head lice control can be done in two ways, namely mechanically and chemically. Mechanically can be done by maintaining head hygiene, while chemically can be done by using pediculicides such as Permethrin 5%, Lindane 1%, and Pyrethrin (Sembel, 2009). However, the use of pediculicides continuously and without following the recommended dosage rules could cause insects to become resistant (Zulkon, 2010).

The prevalence and incidence of *Pediculus capitis* worldwide is quiet high, with an estimated hundreds of millions of people infected each year and most commonly in children. Rassami and Soonwera (2012) stated that the infestation ratio of *Pediculus humanus capitis* in school children in Bangkok, Thailand ranged from 12.26%-29.76% (Hardiyanti, 2016). In general, the distribution in Indonesia is still unknown because there has been no research on the incidence and distribution patterns (Sinaga, 2013). *Pediculus capitis* patients in public elementary schools (SDN) in Tanah Datar Regency, West Sumatra and SDN in Jatinangor, Sumedang were 51.92% and 55.3%, respectively (Karimah, 2016).

Insecticides don't have to be chemical. There are also natural ingredients which could be utilized. One of the natural ingredients which has been known whit its benefit as an insecticide is cucumber. Cucumber can grow and adapt to almost all types of soil (Sumpena, 2001). All parts of cucumber have many benefits and properties (Nugraheni, 2016). According to Surtiningsih (2005) cucumber can be used as a beauty product, for example to reduce puffy eyes, smooth and tighten the skin, reduce blemishes on the face, can neutralize oily skin, prevent wrinkles on the face and inhibit aging of the skin. Cucumber has some health benefit, one of which is to lower blood pressure (Rukmana, 1995). In addition to beauty and health in cucumber fruit contains active compounds which could kill insects, one of which is flavonoids, alkaloids, saponins. The results of this study were expected to make an important contribution to the development of more effective and sustainable head lice control strategies in the future using cucumber fruit.

Research Methods

The type of research used is Quasi Experiment with the aim to determine the effectiveness of cucumber juice on head lice mortality (*Pediculus humanus capitis*). The parameter of this study is the number of *Pediculus humanus capitis* that die within 1 hour after being given cucumber juice.

This research was conducted in March-April 2023 at the Campus Laboratory of Politeknik Piksi Ganesha Bandung.

The population in this study was *Pediculus humanus capitis* obtained from students of SDN 02 Pagi Jakarta, East Jakarta City who suffered from *Pediculus capitis*. The samples used in this study were adult stage *Pediculus humanus capitis* taken randomly. The number of samples used in this study was 5 *Pediculus humanus capitis* for each treatment. So, the *Pediculus humanus capitis* used was 5 *Pediculus humanus capitis* x 4 treatments x 2 repetitions = 40 *Pediculus humanus capitis*.

Tools and Materials

Blender (Miyako BL-101 PL), Beaker glass (Pyrex), Funnel (Pyrex), Measuring cup (Herma), Comb, Gauze (Onemed), Petri dish (Pyrex), Filter paper (Whatman), Spray bottle, stationery, Timer (JS-11B), Label (T&J), Aquadest (1 liter), Cucumber (5 pieces), Head lice (*Pediculus humanus capitis*) (40).

The sample preparation procedure that could be done is to ensure the movement of lice before examination, after which randomizing the collected samples on a petri dish by placing as many as 5 *Pediculus humanus capitis*.

Variations in the concentration of cucumber juice were obtained from preliminary tests, where cucumber juice that is effective against *Pediculus humanus capitis* mortality is in the concentration range of 40% - 80%. The concentration variations carried out in preliminary tests were 40%, 60% and 80% concentrations.

This study was conducted by spraying cucumber juice in various concentrations on 5 live ticks placed in a Petri dish, then observed with a time limit of 1 hour of observation. Spraying was done twice with the second spraying done after 10 minutes from the first spraying. *Pediculus humanus capitis* is said to die when there is no movement/response.

The data analysis technique used in this study is quantitative analysis taken from primary data, namely by observing the mortality of head lice (*Pediculus humanus variant capitis*) that has been treated by calculating the percentage of death of head lice (*Pediculus humanus variant capitis*) at each concentration and test and statistical test SPSS version 22 using the Shapiro-Wilk normality test obtained that the data is not normally distributed and continued with the Kruskal Wallis test.

Results and Discussion

Table 1. Observation results

| Replication | Number <i>Pediculus Humanus Capitis</i> Having Mortality | | | | | | | | | | | |
|-----------------|--|----|----|--------|----|----|--------|----|----|--------|----|----|
| | Concentration of water form <u>squeezed</u> cucumber | | | | | | | | | | | |
| | K 0 | | | K 1 | | | K 2 | | | K 3 | | |
| | Po | Hi | Mo | Po | Hi | Mo | Po | Hi | Mo | Po | Hi | Mo |
| 1 | 5 | 5 | 0 | 5 | 3 | 2 | 5 | 2 | 3 | 5 | 0 | 5 |
| 2 | 5 | 5 | 0 | 5 | 3 | 2 | 5 | 2 | 3 | 5 | 1 | 4 |
| Σ THi(%) | 10(100%) | | | 6(60%) | | | 4(40%) | | | 1(10%) | | |
| Σ TMo(%) | 0(0%) | | | 2(40%) | | | 3(60%) | | | 9(90%) | | |

Source: Processed by the author (2023)

It can be seen that in the control no head lice were found to be dead. At a concentration of 40%, there were 4 head lice that died (40%), then at a concentration of 60%, there were 6 head lice that died (60%), then at a concentration of 80%, there were 9 head lice that died (90%).

Table 2. Normality Test

| Tests of Normality | | | | |
|--------------------|---------------|-----------|----|------|
| | Concentration | Statistic | Df | Sig. |
| Mortality | K0 | .729 | 2 | .024 |
| | K1 | .729 | 2 | .024 |
| | K2 | .729 | 2 | .024 |
| | K3 | .911 | 2 | .488 |

Source: Processed by the author (2023)

The normality test was carried out using the SPSS application. Based on the results of the Shapiro-Wilk test above, a significant value of 0 or <0.05 was obtained. This indicates that the sample data comes from a population that is not normally distributed so that to see differences between groups, the Kruskal-Wallis nonparametric test is carried out.

Table 3. Hypothesis Test

| | Mortality |
|-------------------------|------------------|
| Kruskal-Wallis H | 10,389 |
| Df | 3 |
| Asymp. Sig. | ,016 |

Source: Processed by the author (2023)

Based on table 3.3 using the Kruskal-Wallis test on SPSS, the Asymp.Sig <0.05 result is 0.016, which means H₀ is rejected and H₁ is accepted. Thus there is a significant difference between the three concentrations of cucumber juice on head lice mortality. It can be concluded that cucumber juice is effective against *Pediculus humanus capitis* mortality.

During the observation process, in the K₀ (Control) treatment with 2 replications, all head lice tested with a total of 5 heads remained alive until 1 hour of the experimental period. The effectiveness test of cucumber juice on head lice mortality found that the higher the concentration of cucumber juice applied, the higher the mortality rate of head lice. At the concentration of death in head lice is thought to be due to the compounds Flavonoids, Alkaloids, and Saponins contained in cucumber. Meanwhile, the low mortality rate of head lice is thought to be caused by the ability to withstand Flavonoids, Alkaloids, and Saponins compounds in cucumber juice that enter the body, or as stated by Aisyah (2020).

Agatemor et al., (2018) suggested that the alkaloid content in cucumber fruit was 2.22 ± 0.96 mg/g, flavonoids were 2.14 ± 0.56 mg/g, saponins were 2.01 ± 0.08 mg/g. From the levels of secondary metabolite content in cucumber, the most important role in killing head lice is an alkaloid compound whose content is higher than flavonoids and saponins. Cucumber juice could kill head lice because of the mechanism of active compounds that can kill insects, one of which is flavonoids. When flavonoids enter the insect's mouth, it can cause weakness in the nerves and in the spiracles so that the insect cannot breathe and eventually dies. There are alkaloid compounds that are toxins and have a bitter taste. The toxin has a more complex and dangerous effect on insects, which can interfere with tyrosine, which is an essential enzyme for hardening insect cuticles. In addition to containing flavonoids and alkaloids, this cucumber fruit contains saponins. Saponins are toxic to cold-blooded animals, the properties of saponins are also blood hemolysis, cholesterol binding and toxins to insects. It can also irritate the gastrointestinal mucosa and can reduce insect appetite.

Based on research that has been conducted, the reason researchers use the shapiro-wilk statistical test is due to the use of the number of head lice samples to be tested were less than 50 samples with a description of the results of abnormal distribution. The research continued with the Kruskal-Wallis test which is a nonparametric statistical test to measure the validity of the hypothesis. Statistical tests through the Kruskal Wallis test showed a significant effect of increasing the concentration of cucumber juice on the mortality of *Pediculus humanus capitis*.

Conclusion

1. From the results of research and discussion, it can be concluded that cucumber fruit juice (*Cucumis sativus* L.) affects the mortality of *Pediculus humanus capitis*. The higher the concentration of cucumber fruit juice, the higher the mortality of *Pediculus humanus capitis*.
2. The 40% concentration of cucumber juice has an effectiveness of 50% within 1 hour of observation. Cucumber juice with a concentration of 60% has an effectiveness of 60% within 1 hour of observation. While the 80% concentration of cucumber juice has an effectiveness of 90% within 1 hour of observation.
3. Statistical tests through the Kruskal- wallis test showed a significant effect of increasing the concentration of cucumber juice on the mortality of *Pediculus humanus capitis*.

Suggestion

Based on the above conclusions, school students at Jatinangor. AMJ.3(2):254–8. DOI: 10.15850/amj.v3n2.787 the researcher provides suggestions for conducting further and in-depth research on the effect of cucumber on head lice mortality to the extraction stage or making formulas for ready-to-use products that are easy to apply and more effective.

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