
THE EFFECTIVENESS OF KIRINYUH LEAF (*Chromolaena odorata*) SQUEEZE TO FLEA (*Pediculus humanus capitis*) MORTALITY

Andini Kusdiantini, Nur Fitri

D-III Health Analyst, Politeknik Piksi Ganesha

Abstract

Pediculosis capitis is a frequent infection in school-age children caused by *Pediculus humanus capitis*. Pediculosis capitis affects 6-12 million children between the ages of 3-11 worldwide each year. Chemical treatment can be done with synthetic insecticides such as DDT and Lindane, but excessive use can cause adverse effects on health and the environment. The purpose of this study was to determine how the effect of kirinyuh leaf juice (*Chromolaena odorata*) on the mortality of head lice (*Pediculus humanus capitis*) and determine the concentration of kirinyuh leaf juice that is most effective against head lice mortality. The type of research used is Quasi Experiment with quantitative research design. The number of samples used was 40 samples, using the Kruskal-Wallis test. Within 1 hour of observation, giving kirinyuh leaf juice can kill *Pediculus humanus capitis* ticks with effectiveness values of 70%, 80%, and 100% for each concentration of 20%, 40%, and 60%. The results of the Kruskal-Wallis with the p value = 0,018 statistical test showed a significant difference in each concentration. Thus, an increase in the concentration of kirinyuh leaf juice can increase the effectiveness against mortality of *Pediculus humanus capitis*. The results of this study are expected to make an important contribution in the development of kirinyuh leaf juice as a safe and effective head lice insecticide.

Keywords: kirinyuh leaf, insecticide, Pediculosis, *Pediculus humanus capitis*, infection

Introduction

Pediculosis capitis is infections that often school Children had. It is scalp infections caused by *Pediculus humanus capitis* (Riestiani, 2021). Noersyamsidar and Suprihartini (2022) revealed that Pediculosis capitis can affect 6-12 million children aged between 3-11 years worldwide each year.

Because of Indonesia is tropical country, infection disease can arise, one of which is parasitic infection (Mandal, 2008). Although most Indonesian people are exposed to parasitic infectious diseases (*Pediculus humanus capitis*), but there is no clear statistical data related to that infection. There are several studies that regarding this one of them is the research of Noersyamsidar and Suprihartini (2022) about the number of children who had this infectious disease.

Pediculus humanus capitis known as flea (hair lice) is extroparasite that lives on the human head and can survive for 10 days at 5 0C without food (Global Health, 2017). Generally, flea (hair lice) very disturbing human activity, such as causing itching on the head, redness and severe infection. The treatment for the flea can use mechanical and chemical. The mechanical way like always keep hair clean. The chemical way is using flea medication. (Putra and Sawu, 2022)

According to Burges (2004), the flea medication had chemical ingredients that classified as an insecticide such as DDT, Lindane, Malation and Permethrin. That ingredients can effectively exterminate the fleas but can distemper if overuse it. Based on WHO (World Health Organization) data, around 44.000-2.000.000 peoples every year get poisoned because of use it. (Pritacindy et al., 2017). Furthermore, uncontrolled use of these drugs will cause head lice to become resistant (Rahayu, 2016).

A lot of research was done in looking for natural insecticide alternative to exterminate fleas / hair lice, like used extracts several natural ingredients. It can be Soursop leaf extract (Sulis dkk, 2017), duku skin extract (Darmadi dkk, 2018), garlic extract (Ardhita & Agung, 2017), combination of lime juice and Noni fruit (Fitria dkk, 2020), or citronella and coconut oil formulation (Yuni & Widyoningsih, 2016). Kirinyuh plant. (*Chromolaena odorata*)

known as Kirinyuh leaf, a plant in the Asteraceae family. Riawati (2020) said that Kirinyuh leaf (*Chromolaena odorata*) can be used as traditional medicine for sore throat, cough, malaria, antimicrobial, headache, antidiarrheal, astringent, antispasmodic, antihypertensive, anti-inflammatory, diuretic and insecticide.

Kirinyuh leaf as a natural insecticide, because it contains flavonoid and saponin compounds. Besides that, Kirinyuh leaf has tannin, phenol, steroid, α -pinene, camphor, limonene, β -caryophyllene and camphor isomer compounds. In Wijaya et al (2018), flavonoid is a compound that acts as a respiratory inhibitor. Saponin is a toxin for insects. In Riawati's research, she used Kirinyuh leaf extract as a natural insecticide with a concentration of 6%, showing the optimal head lice mortality rate. However, that extract used maceration method with 70% alcohol. Alcohol is an organic compound that is usually used as an antiseptic and toxic. Therefore, in this research, to get Kirinyuh leaf extract only use Aquades.

Method

This research used Quasi experimental, with the aim to determine the effectiveness of Kirinyuh leaf (*Chromolaena odorata*) juice in eradicating Fleas – hair lice (*Pediculus humanus capitis*). Location at Health Faculty's Laboratory Piksi Ganesha Polytechnic in March 2023. Samples used 40 hair lice from children aged 3-11 years in Cikawing Village, Terisi District, Indramayu Regency who suffered from Pediculosis capitis.

The hair lice (*Pediculus humanus capitis*) were taken using a Serit comb, and chosen adult lice/ fleas with the same size. They were put in a container and tested in the laboratory.

Materials : Airlux blender, Glass rod, Serit Comb, Beaker glass, Measuring glass 100 mL, Glass funnel 75 mm, Petri dish 90mm, Spray bottle, label, stationery, stopwatch, Flea/ Hair lice (*Pediculus humanus capitis*), Kirinyuh (*Chromolaena odorata*), and Aquades. Kirinyuh leaves were washed and drained, and then blended until like juice. Take the filtrate after filtration. Kirinyuh leaf filtrate has a concentration of 100%. It was diluted and made into 3 concentrations, for a 20% concentration measure 20 mL of Kirinyuh leaf juice and add 80 mL of distilled water, for a 40% concentration measure 40 mL of Kirinyuh leaf juice and add 60 mL of distilled water, and for a 60% concentration measure 60 mL of leaf juice left and added 40 mL of distilled water, put into a spray bottle and labeled.

The steps to check the mortality of head lice are carried out by: first prepared 4 petri dishes that have been filled with 5 head lice per petri dish, then spraying on each petri dish using Kirinyuh leaf juice of various concentrations of 20%, 40%, 60% and also control, spraying 2 times with a distance of 15 minutes from the first spraying, Then look at the motion response of the tick and determine the number of ticks that die after 60 minutes.

The data analysis technique in this study is quantitative analysis using statistics. How to analyze data on the normality test using the Shapiro Wilk Test because the number of samples used is less than 50, namely to determine whether the squeezing of Kirinyuh leaves with various concentrations is normally distributed or not against head lice mortality. The data was analyzed using IBM SPSS 25. Then the Kruskal- Wallis test was analyzed using IBM SPSS 25, the Kruskal-Wallis test is a non-parametric test to find out whether Kirinyuh leaf juice with different concentrations has a significant difference in killing head lice or not.

Results and Discussion

A. Result

Research on the effectiveness of Kirinyuh leaf juice (*Chromolaena odorata*) on the mortality of head lice (*Pediculus humanus capitis*) was conducted at the Piksi Ganesha Polytechnic Laboratory Bandung in March 2023.

Table 3.1. Number Mortality in 60 minutes

Replication	number of head lice deaths in 60 minutes											
	Concentration of kirinyuh leaf juice											
	K0			K1			K2			K3		
	P0	Hi	Mo	P0	Hi	Mo	P0	Hi	Mo	P0	Hi	Mo
1	5	5	0	5	2	3	5	1	4	5	0	5
2	5	5	0	5	2	3	5	1	4	5	0	5
STH1(%)	10 (10%)			3 (30%)			2 (20%)			0 (0%)		
STMo (%)	0 (0%)			7 (70%)			8(80%)			10(100%)		

Source: Data processed by the author (2023)

Based on table 3.1 can be seen the difference in the number of deaths of head lice (*Pediculus humanus capitis*) at each concentration of kirinyuh leaf juice (*Chromolaena odorata*). On control of the absence of death of head lice. At a concentration of 20% found head lice that experienced death as many as 7 heads (70%), at a concentration of 40% found head lice that experienced death as many as 8 heads (80%) and at a concentration of 60% found head lice that experienced death as many as 10 heads (100%).

Test of Normality

Tabel 3.2 Shapiro wilk Test

	Konsentrasi	Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Mortalitas	K0	.	2	.	.	2	.
	K1	.441	2	.	.630	2	.001
	K2	.307	2	.	.729	2	.024
	K3	.307	2	.	.729	2	.024

a. Lilliefors Significance Correction

Source: Data processed by the author (2023)

Based on the table above, the normality test using the Shapiro-Wilk method was carried out using the IBM SPSS 25 application and has a decision basis, namely if the significance value > 0.05, then the data is normally distributed and if the significance value is < 0.05, then the data is abnormally distributed. The data obtained on K0 has a significant price of 0, on K1 has a significant price of 0.001, on K2 has a significant price of 0.024 and on K3 has a significant price of 0.024. So this shows that the significance value < 0.05 which means that the data sample comes from an abnormally distributed population.

Hypothesis test

Table 3.3 Kruskal-Wallis

Kruskal-Wallis H	10.018
df	3
Asymp. Sig.	.018

Source : Data processed by the author (2023)

Based on table 3.3 of the kruskal-wallis test on IBM SPSS 25, a significance result of < 0.05 is 0.018 which means H0 is rejected and Ha is accepted. Which means there is a significant difference of three concentrations of kirinyuh leaf juice on head lice mortality.

B. Discuss

This research was carried out for the first time, namely by making kirinyuh leaf juice with a concentration of 100% kirinyuh leaf juice. Then the squeeze of kirinyuh leaves is diluted into various concentrations, namely 20%, 40% and 60%, then tested for the mortality of head lice.

At the time of observation, in the K0 treatment or in the control with two replications, all head lice tested with the number of 5 heads per / replication remained alive for up to 1 hour of observation, in the K1 treatment (20%) with two replications all lice tested for 1 hour died in the first replication of 3 dead head lice and in the second replication as many as 4 dead head lice, in the K2 treatment (40%) results were obtained in the first replication as many as 4 dead head lice and in the second replication as many as 4 dead head lice, in K3 (60%) results were obtained in the first replication as many as 5 dead head lice and in the second replication as many as 5 dead head lice.

Based on research that has been conducted, head lice that experience the most deaths are found in the concentration of kirinyuh leaf juice 60% with total mortality reaching 100%, while at the concentration of kirinyuh leaf juice 40%, the death of head lice reaches 80% and at the concentration of kirinyuh leaf juice 20% of dead head lice reaches 70%. Bioactive compounds such as flavonoids, tannins, and saponins in kirinyuh leaf juice contain flavonoid levels of $\geq 0.4\%$, these compounds can kill head lice through the restriction of the respiratory, nervous, and digestive systems of head lice. In addition, this compound can inhibit taste receptors in the mouth of fleas, causing lice not to receive taste stimuli, so they cannot recognize their food and fleas starve to death (Laksono et al., 2022).

The juice of kirinyuh leaves also contains alkaloids $\geq 1.0\%$. Alkaloid compounds are secondary metabolites that can disrupt the nervous system of ticks by inhibiting the work of the enzyme acetylcholinesterase (AChE). This results in a buildup of acetylcholine which causes a decrease in the immune delivery system to muscle cells, so that lice experience seizures and end in death (Laksono et al., 2022). Thus the water feeling leaves kirinyuh can kill head lice. Based on the bioinsecticide efficacy testing standard issued by the directorate and pesticides of the agricultural apartment, it is said that a bioinsecticidal formulation is effective if at least $(1/2 n + 1)$ times replication where n is the number of observations after application, the efficacy rate is more than or equal to 50% provided that the target pest population in the tested bioinsecticide treatment must be lower than the pest population in the control. Referring to the standard criteria for bioinsecticide efficacy testing, the results showed that the squeeze of kirinyuh leaves with concentrations of 20%, 40% and 60% was effective in killing head lice due to the death of test insects $>50\%$.

Concentrations in different kirinyuh leaf juices can cause the death of different head lice, this is because each concentration of kirinyuh leaf juice has a different content depending on the many concentrations of the kirinyuh leaf juice. The greater the concentration, the more head lice that die, as well as the less concentration of leaf juice, the fewer head lice that die.

Thus, kirinyuh leaf juice (60%) is the most effective concentration to kill head lice (100% effectiveness) within 1 hour because at a concentration of 60% the effect of giving kirinyuh leaf juice contains more active flavonoids and alkaloid compounds than concentrations of 20% and 40%.

Conclusion

The most effective concentration of Kirinyuh leaf filtrat in killing head lice is the concentration of kirinyuh juice 60% because it can kill head lice with an average of 100%.

Suggestion

This research can be developed or continued for further research on the effect of kirinyuh leaves on head lice mortality to the test of irritation to the skin or the manufacture of natural insecticide formulas that are ready to use and easier to apply.

Reference

- Alimins. 2006. Geografi dan Kependudukan. Armaika: Bandung
- Burges, If. 2004. Human Lice And Their Control. Annual Review Of Entomology 49: 457-481.
- Darmadi. (2018). Efektifitas Ekstrak Kulit Duku (*Lansium domesticum* corr) Terhadap Mortalitas Pedikulus humanus capitis Sebagai Penyebab Pedikulosis Pada Anak. Akademi Analis Kesehatan Yayasan Fajar Pekanbaru : Universitas Abdurrahman Pekanbaru
- Djuanda, Adhi, Hamzah M., Aisyah S. 2007. Ilmu Penyakit Kulit dan Kelamin. Fakultas Kedokteran Universitas Indonesia: Jakarta.
- Global Health, D. O. 2017. Pediculosis. Center For Disease Control And Prevention. <https://www.who.int/da ta/gho>. Diakses Pada 9 Maret 2023
- Irianto, K. 2009. Parasitologi Berbagai Penyakit Yang Mempengaruhi Kesehatan Manusia. Yrama Widya : Bandung.
- Mandal, Wilkins, & Dunbar, M. 2004. Penyakit Infeksi. Erlangga: Jakarta
- Maulina, R. 2022. Uji Toksisitas Beberapa Konsentrasi Ekstrak Daun Kirinyuh (*Chromolaena Odorata* L.) Untuk Mengendalikan Ulat
- Kubis (*Plutella Xylostella* L.) Secara In Vitro. Skripsi. Fakultas Pertanian Dan Peternakan Universitas Islam Negeri Sultan Syarif Kasim Riau. Pekanbaru.<http://repository.uinsuska.ac.id/58118/2/SKRIPSI%20RISYA%20MAULINA.pdf>. Diakses Pada 9 Maret 2023.
- Noersyamsidar, & Suprihartini. 2022. Gambaran Infeksi *Pediculus Humanus Capitis* Terhadap Anak-Anak Di Uptd Panti Sosial Perlindungan Anak Dharma. Borneo Journal Of Science And Mathematics Education. Vol. 2, No.3:54-61.<https://journal.uinsi.ac.id/index.php/bjsme/article/view/5972>. Diakses Pada 26 Januari 2023
- Pritacindy, A. P., Supriyadi, & Kurniawan, A. 2017. Uji Efektifitas Ekstrak Bawang Putih (*Allium Sativum*) Sebagai Insektisida Terhadap Kutu Rambut (*Pediculus Capitis*). Preventia : The Indonesian Journal of Public Health. Vol. 2, No. 1. doi: 10.17977/um044v2i1p1-9
- Putra, S. H., & Sawu, E. 2022. Mortalitas Kutu Rambut (*Pediculus Humanus*) Pasca Treatment Larutan Daun Kirinyuh (*Chromolaena Odorata*). Nusa Tenggara Timur: Jurnal Sains Dan Teknologi. Vol. 5, No.2: 442-449.<https://journal.ummat.ac.id/inx.php/juste k/article/view/11887/pdf>. Diakses Pada 26 Januari 2023
- Rahayu, Y. S. E., Widyoningsih. 2016. Efektifitas Formulasi Ekstrak Sereh Wangi Dan Minyak Kelapa Murni Sebagai Pembasmi Kutu Rambut. STIKES Al-Irsyad Al- Islamiyah Cilacap
- Riawati. 2021. Uji Efektivitas Dan Organoleptik Ekstrak Daun Kirinyuh (*Chromolaena Odorata*) Sebagai Insektisida Terhadap Mortalitas Kutu Rambut (*Pediculus Humanus Capitis*) Dengan Variasi Konsentrasi. Skripsi. Fakultas Tarbiyah Dan Keguruan Universitas Islam Negeri Mataram. <http://etheses.uinmataram.ac.id/91/>. Diakses Pada 26 Januari 2023
- Riestiani, V. 2021. Efektivitas Air Perasan Mentimun Terhadap Mortalitas *Pediculus Humanus Capitis*. Karya Tulis Ilmiah. Jurusan Teknologi Laboratorium Medis Politeknik Kesehatan Kemenkes Bandung. <https://repo.poltekkesbandung.ac.id/3251/>. Diakses Pada 28 Februari 2023
- Sayekti, F. D. J., Qurrohman, M. T., Priyandari, D. A., & Srikandini, C.. 2020 Pengaruh Kombinasi Buah Jeruk Nipis Dan Buah Mengkudu Terhadap Mortalitas *Pediculus Humanus Capitis*. At-Taqaddum. Vol. 12, No.1. 47-54. <https://journal.walisongo.ac.id/index.php/attaqaddum/article/view/5148>. Diakses Pada 26 Januari 2023
- Stone, S. P., Jonathan, N. G., & Rocky, E. 2012. Becelieri Scabies, Other Mites And Pediculosis. In : Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K eds. Fitzpatrick's Dermatology In General Medicine Eight Edition. New York : McGraw Hill. Pp. 2573-8

Wijaya, D. D. 2021. Gambaran Keberadaan Pediculus Humanus Capitis Pada Santri Di Pondok Pesantren Kiai Marogan Kota Palembang Tahun 2021. Skripsi. Jurusan Analisis Kesehatan Politeknik Kesehatan Palembang.<https://repository.poltekkespalembang.ac.id/items/show/3043>. Diakses Pada 26 Januari 2023

Wijaya, H., Novitasari, S. Jubaidah. 2018. Perbandingan Metode Ekstraksi Terhadap Rendemen Ekstrak Daun Rambai Laut (*Sonneratia Caseolaris* L. Engl). Akademi Farmasi Samarinda. Jurnal Ilmiah Manuntung. Vol. 4, No. 1 : 79-83