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# ACTIVITIES OF DUKU (*Lansium domesticum* Corr.) BARK EXTRACT AGAINST *Aedes aegypti* EGG STAGE

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**ABSTRAK : AKTIVITAS EKSTRAK KULIT DUKU (*Lansium domesticum Corr.*) TERHADAP STADIUM TELUR *Aedes aegypti***

Latar Belakang: Strategi pengendalian dari segi vektor masih penting dan efektif dalam mengendalikan kasus dengue. Penggunaan insektisida kimiawi menjadi metode pengendalian vektor dengue dengan cepat di daerah outbreak kasus, namun dapat menimbulkan resistensi terhadap vektor nyamuk dengue. Penggunaan insektisida biologi menjadi alternatif dalam mengatasinya. *Lansium domesticum* Corr. atau duku merupakan tanaman yang tumbuh di wilayah tropis dan terbukti mengandung senyawa metabolit sekunder yang berpotensi sebagai insektisida. Stadium telur merupakan stadium ketahanan nyamuk dalam kondisi iklim yang tidak memungkinkan untuk berkembang biak. Pengendalian vektor dilakukan dengan memotong siklus hidup nyamuk lebih awal dengan pemberantasan dimulai dari stadium telur maka penyebaran nyamuk *Aedes aegypti* menjadi lebih sedikit dan menurunkan penyebaran virus dengue.

Tujuan : Tujuan penelitian ini adalah mengetahui aktivitas ekstrak kulit duku (Lansium domesticum Corr.) terhadap telur *Aedes aegypti*.

Metode : Jenis penelitian adalah penelitian eksperimental dengan pendekatan true experiment. Rancangan penelitian adalah Rancang Acak Lengkap (RAL), terdiri dari 7 konsentrasi perlakuan dan pengulangan 4 kali. Waktu penelitian pada bulan Oktober 2022. Penelitian dibagi menjadi 2 yaitu tahap ekstraksi dan tahap bioassay. Sample penelitian adalah telur nyamuk *Ae. aegypti* hasil rearing Badan Penelitian dan Pengembangan Kesehatan Baturaja, Sumatera Selatan. Tehnik pengambilan sample menggunakan purposive sampling, dengan kriteria pemilihan telur berdasarkan morfologi telur *Ae. aegypti* yang fertil.

Hasil penelitian : Berdasarkan pengamatan 24 jam, rerata telur yang tidak menetas tertinggi pada perlakuan ekstrak kulit duku terdapat pada konsentrasi 500 ppm (95%) sedangkan terendah pada konsentrasi 4000 ppm (20%), dan pada perlakuan kontrol tidak ada telur yang menetas. Hasil analisis perbedaan rerata telur nyamuk *Ae. aegypti* yang tidak menetas pada aktivitas ekstrak kulit duku, selama pengamatan 24 jam didapatkan hasil paling tidak, terdapat perbedaan rerata telur yang tidak menetas pada 2 konsentrasi pada data pengamatan 24 jam (p = 0,006). Pengamatan 48 jam rerata telur tidak menetas pada aktivitas ekstrak kulit duku tertinggi terdapat konsentrasi 500 ppm (66%) sedangkan terendah pada konsentrasi 2000 ppm (11%) pada perlakuan kontrol (99%). Tidak ada perbedaan rerata telur nyamuk *Ae. aegypti* yang tidak menetas pada konsentrasi aktivitas ekstrak kulit duku, selama pengamatan 48 jam (p = 0,14). Pada pengamatan 72 jam rerata telur yang tidak menetas tertinggi diperoleh pada konsentrasi 500 (63%) sedangkan terendah pada konsentrasi 2000 ppm (9%) dan perlakuan kontrol (97%). Analisis perbedaan rerata telur nyamuk *Ae. aegypti* yang tidak menetas pada aktivitas ekstrak kulit duku, selama pengamatan 72 jam menunjukkan paling tidak, terdapat perbedaan rerata telur yang tidak menetas pada 2 konsentrasi pada data pengamatan 72 jam ( p= 0,000).

Kesimpulan : Diketahui ekstrak kulit duku (Lansium domesticum Corr.) memiliki aktivitas yang berpengaruh terhadap penetasan telur *Aedes aegypti* sebagai pemacu penetasan telur lebih cepat. Ekstrak kulit duku (L. domesticum Corr.) yang digunakan dalam penelitian ini mengandung senyawa flavonoid dan tanin. Pada perlakuan konsentrasi 500 ppm ekstrak kulit duku (L. domesticum Corr.) memiliki daya tetas yang rendah dibanding konsentrasi lain.

Saran : Perlu dilakukan penelitian lebih lanjut tentang faktor lain yang mempengaruhi daya tetas telur seperti pH, suhu, kelembaban, cahaya, kandungan oksigen, dan bahan organik lain. Serta studi lebih lanjut yang membandingkan ekstrak kulit duku sebagai ovisida dan atraktan (zat penarik) yang dapat diaplikasikan pada produk ovitrap.

Kata kunci : *Lancium domesticum* Corr., Ekstrak kulit duku, Telur *Aedes aegypti*

## ABSTRACT

Background: Vector control strategies remain crucial and effective in managing dengue cases.The use of chemical insecticides still serves as a rapid method for controlling dengue vectors in areas experiencing outbreaks, However, it can cause resistance to the dengue mosquito vector. The use of biological insecticides is an alternative to overcome this. Lansium domesticum Corr. or duku is a plant that grows in tropical regions and has been proven to contain secondary metabolite compounds that have the potential to act as insecticides. The egg stage is the resistance stage for mosquitoes in climatic conditions that do not allow them to reproduce. Implementing vector control measures to interrupt the mosquito life cycle at the egg stage can mitigate the proliferation of *Aedes aegypti* mosquitoes and reduce the transmission of the dengue virus

Purpose: The purpose of research to to investigate the efficacy of duku bark extract against *Aedes aegypti* eggs.

Methods: This research constitutes experimental research employing a true experiment approach. The research design adopted was a Completely Randomized Design (CRD), comprising 7 treatment concentrations and each treatment was replicated 4 times. The research was conducted in October 2022 and comprised two stages: the extraction stage and the bioassay stage. The research samples consisted of *Ae. aegypti* larvae obtained from the Agency for Health Research and Development, Baturaja in South Sumatra. The purposive sampling technique was employed, selecting eggs based on the morphology of *Aedes aegypti* to ensure fertility.

Results: Based on 24 hour observations, the highest average of eggs that did not hatch in the duku bark extract treatment was at a concentration of 500 ppm (95%) while the lowest was at a concentration of 4000 ppm (20%), and in the control treatment no eggs hatched. The results of the analysis of differences in the mean eggs of *Ae. aegypti* that did not hatch in the activity of duku bark extract, during 24 hour observation the results showed that there was at least a difference in the mean eggs that did not hatch at 2 concentrations in the 24 hour observation data (p = 0.006). The 48 hour observation that the average egg did not hatch was in the highest concentration of duku bark extract at a concentration of 500 ppm (66%) while the lowest was at a concentration of 2000 ppm (11%) in the control treatment (99%). There was no difference in the average of *Ae. aegypti* mosquito eggs. that did not hatch at the activity concentration of duku bark extract, during 48 hours of observation (p = 0.14). In the 72 hour observation, the highest average of unhatched eggs was obtained at a concentration of 500 (63%) while the lowest was at a concentration of 2000 ppm (9%) and control treatment (97%). Analysis of differences in mean mosquito eggs of *Ae. aegypti* that did not hatch in the activity of duku bark extract, during 72 hours of observation showed that at least there was a difference in the mean eggs that did not hatch at 2 concentrations in the 72 hour observation data (p= 0.000).

Conclusion: Based on the research findings, it was concluded that duku (*Lansium domesticum* Corr.) bark extract possesses activity that accelerates the hatching of *Ae. aegypti* eggs. The duku bark extract used in this research contains flavonoid and tannin compounds. Notably, at treatment concentrations of 500 ppm, duku (*Lansium domesticum* Corr.) bark extract exhibited lower hatchability compared to other concentrations.

Suggestion : Further research is warranted to explore additional factors influencing egg hatchability, such as pH, temperature, humidity, light, oxygen content, and other organic materials. Moreover, future research should investigate the potential of duku bark extract as an ovicide and attractant for ovitrap products.


Keywords : *Lancium domesticum* Corr., Duku bark extract, *Aedes aegypti* eggs

## INTRODUCTION

Dengue fever (DF) and dengue hemorrhagic fever (DHF) are infectious diseases caused by the dengue virus. The dengue virus originates from the Arbovirus B group, namely arthropod-borne viruses or viruses spread by arthropods. This virus belongs to the Flavivirus genus of the Flaviviridae family. Transmission of dengue virus infection occurs through the bite of female Aedes mosquitoes, especially *Aedes aegypti* and *Aedes albopictus* (Putri, Triwahyuni, and Saragih, 2021). The first case of dengue fever in Indonesia was reported in Surabaya in 1968. Since its initial discovery, the incidence of dengue fever has continued to rise annually. The Ministry of Health of the Republic of Indonesia (Kemenkes RI) and the World Health Organization (WHO) Country Office Indonesia launched the National Strategic Plan (NSP) Dengue Fever Control Program (2021-2025). The national target for 2025 is a percentage of 90% of regencies/municipalities with a population incidence rate (IR) below 49/100,000 and a case fatality rate

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(CFR) of 0.5% (WHO, 2021). To achieve this target, vector control strategies remain crucial and effective in managing dengue cases (Putri, et al. 2024).

Dengue vector control in Indonesia is regulated by the Indonesian Ministry of Health through the implementation of Integrated Vector Management (IVM). IVM is an integrated program that utilizes all available techniques for vector control, incorporating environmental management, biological methods, physical methods, and chemical methods. The use of chemical insecticides still serves as a rapid method for controlling dengue vectors in areas experiencing outbreaks (Putri, et al., 2023). However, the chemicals present in these insecticide products pose significant risks to human health and can contaminate the environment and food chain (Lauren et al., 2021). Additionally, the use of chemical insecticides may contribute to mosquito resistance, as their residues are not easily broken down and can enter the food chain. Therefore, there is a need for procedures that can effectively contribute to vector control using natural ingredients. The utilization of biological insecticides presents an alternative system for addressing the spread of dengue vectors.

*Lansium domesticum* Corr., commonly known as duku, is a plant native to tropical regions. A review analysis of research conducted over the past decade has revealed that the extraction of various parts of the *L. domesticum* Corr. plant shows promising potential as a larvicide against the larval stage of Aedes aegypti mosquitoes (Ni'mah et.al., 2015; Saputra, 2017; Mirnawaty, Supriyadi, and Jaya, 2012). *L. domesticum* Corr. has been shown to contain secondary metabolite compounds with insecticidal properties (Nandita et.al., 2019; Ni'mah et.al., 2015; Nopitasari, 2014). Phytochemical tests have identified chemical compounds in the *L. domesticum* Corr. plant, including alkaloids, flavonoids, tannins, triterpenoids, steroids, and saponins (Konda et al., 2020). Plants rich in flavonoids, alkaloids, terpenoids, saponins, tannins, and essential oils are known to possess the ability to inhibit and damage egg membranes (Madona et al., 2020). However, there remains a paucity of research reports investigating the efficacy of *L. domesticum* Corr. against Aedes aegypti eggs, warranting further research.

Female *Aedes aegypti* mosquitoes typically deposit their eggs in water containers, both artificial and natural, where the eggs can endure desiccation for weeks to months before hatching upon submersion in water (Halstead, 2008). Eggs generally hatch and develop into larvae within two days or longer, depending on the water conditions in the breeding environment. Eggs can remain viable for extended periods, up to more than a year, if stored in a dry location at temperatures ranging from -2°C to 42°C. This ability of eggs to withstand desiccation aids in the species' survival during adverse climatic conditions (WHO, 2003; Triwahyuni, Lestari, and Putri, 2020). Implementing vector control measures to interrupt the mosquito life cycle at the egg stage can mitigate the proliferation of *Aedes aegypti* mosquitoes and reduce the transmission of the dengue virus (Lauren et al., 2021).

Given this background, researchers are motivated to investigate the efficacy of duku bark extract against *Aedes aegypti* eggs. Utilizing waste from duku bark as an intervention holds potential in reducing the incidence of dengue fever.

## RESEARCH METHODS

This research constitutes experimental research employing a true experiment approach. The research design adopted was a Completely Randomized Design (CRD), comprising 7 treatment concentrations: 500 ppm, 1000 ppm, 2000 ppm, 4000 ppm, 6000 ppm, 8000 ppm, 10000 ppm, and one control. Each treatment was replicated 4 times to assess the impact of varying concentrations of duku (*L. domesticum* Corr.) bark extract. The research was conducted in October 2022 and comprised two stages: the extraction stage and the bioassay stage. The extraction stage took place at the Medical Chemistry Laboratory of Universitas Malahayati and the Laboratory of Politeknik Negeri Lampung (Polinela), while the bioassay stage took place at the Entomology Laboratory of the Agency for Health Research and Development (Balitbangkes) in Baturaja.

The research samples consisted of *Aedes aegypti* larvae obtained from the Agency for Health Research and Development, Baturaja in South Sumatra. The purposive sampling technique was employed, selecting eggs based on the morphology of *Aedes aegypti* to ensure fertility (Figure 1). Only eggs displaying perfect round or oval shapes under microscopic examination were included, while imperfect eggs (hollow, non-oval, or damaged) were excluded from the research sample.

The extraction stage involved transforming dried duku bark into powder, followed by maceration for 3x24 hours with 96% ethanol. Subsequently, the duku bark macerate was taken to the Laboratory of Polinela in Bandar Lampung for evaporation using a Vacuum Rotary Evaporator until an extract was obtained. The subsequent stage involved a bioassay test, wherein eggs were placed into plastic cups at a quantity of 25 eggs per cup. The test solution

prepared was poured into each cup according to the designated treatment concentration, with the control treatment receiving only distilled water. Primary data consisted of the direct observation of the number of eggs that failed to hatch within 24 hours, 48 hours, and 72 hours at each concentration of duku (*L. domesticum* Corr.) bark extract, recorded in tabular form.

Statistical testing involved conducting a normality test using Kolmogorov-Smirnov. If the data were normally distributed, One-Way ANOVA was employed; otherwise, the data were tested using Kruskal-Wallis. Ethical approval for this research was obtained from the Research Ethics Commission of Universitas Malahayati under the reference number 3321/EC/KEP-UNMAL/III/2023.

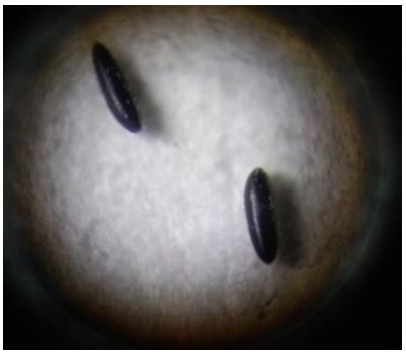

**Figure 1. *Aedes aegypti* Eggs as research samples (microscopic)**

## RESEARCH RESULTS

**Table 1**
**Percentage and Analysis of Differences in Average *Aedes aegypti* Eggs that Failed to Hatch upon Treatment with Duku Bark Extract during 24-Hour Observation**

| Concentration (ppm) | Average *Aedes aegypti* Eggs that Failed to Hatch | Percentage (%) | Minimum - Maximum | p |
|---|---|---|---|---|
| 500 | 23 | 95 | (22-25) | 0.006* |
| 1000 | 13 | 53 | (4-25) | |
| 2000 | 11 | 45 | (0-19) | |
| 4000 | 5 | 20 | (3-8) | |
| 6000 | 13 | 51 | (8-17) | |
| 8000 | 20 | 78 | (13-25) | |
| 10000 | 20 | 80 | (7-25) | |
| 0 | 25 | 100 | (25-25) | |

*Kruskal Wallis Test

Based on Table 1, it was observed that the highest percentage of unhatched eggs occurred at a concentration of 0 ppm (control), reaching 100%, while the lowest percentage of unhatched eggs occurred at a concentration of 4000 ppm (20%). The results of the normality test using Kolmogorov-Smirnov indicated non-normal distribution of the 24-hour observation data (p-value: 0.046). Consequently, the Kruskal-Wallis test was conducted, yielding a p-value of 0.006. This suggests that there is at least one significant difference in the average number of unhatched eggs between two concentrations during the 24-hour observation period.

**Table 2**
**Percentage and Analysis of Differences in Average *Aedes aegypti* Eggs that Failed to Hatch upon Treatment with Duku Bark Extract during 48-Hour Observation**

| Concentration (ppm) | Average *Aedes aegypti* Eggs that Failed to Hatch | Percentage (%) | Minimum - Maximum | p |
|---|---|---|---|---|
| 500 | 22 | 66% | (4-23) | 0.014* |
| 1000 | 4 | 17% | (2-7) | |
| 2000 | 3 | 11% | (0-6) | |

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| | | | |
|---|---|---|---|
| 4000 | 4 | 17% | (1-8) |
| 6000 | 8 | 33% | (1-13) |
| 8000 | 10 | 41% | (4-13) |
| 10000 | 6 | 24% | (1-14) |
| 0 | 25 | 99% | (24-25) |

*Kruskal Wallis Test

Based on Table 2, it was observed that the highest percentage of unhatched eggs occurred at a concentration of 0 ppm (control), accounting for 99%, while the lowest percentage of unhatched eggs occurred at a concentration of 2000 ppm (11%). The normality test results indicated non-normal distribution of the 48-hour observation data (p-value: 0.029), and the interpretation of the Kruskal-Wallis test also indicated a significant difference in the average number of unhatched eggs between the two concentrations during the 48-hour observation period (p-value: 0.14).

**Table 3**
**Percentage and Analysis of Differences in Average *Aedes aegypti* Eggs that Failed to Hatch upon Treatment with Duku Bark Extract during 72-Hour Observation**

| Concentration (ppm) | Average *Aedes aegypti* Eggs that Failed to Hatch | Percentage (%) | Minimum - Maximum | p |
|---|---|---|---|---|
| 500 | 16 | 63% | (2-23) | 0,000* |
| 1000 | 4 | 13% | (0-7) | |
| 2000 | 2 | 9% | (0-5) | |
| 4000 | 4 | 15% | (1-8) | |
| 6000 | 8 | 33% | (1-13) | |
| 8000 | 10 | 40% | (4-13) | |
| 10000 | 4 | 16% | (1-6) | |
| 0 | 24 | 97% | (23-25) | |

*One way Anova test

Based on Table 3, it was observed that the highest percentage of unhatched eggs occurred at a concentration of 0 ppm (control), accounting for 97%, while the lowest percentage of unhatched eggs occurred at a concentration of 2000 ppm (9%). The normality test conducted on the 72-hour observation revealed normally distributed data (p-value: 0.096), thus enabling the continuation of the One-Way ANOVA test. The test results indicated a significant difference in the average number of unhatched eggs between the two concentrations during the 72-hour observation period (p-value: 0.000).

**Table 4**
**Phytochemical Test Results of Duku (*Lansium domesticum* Corr.) Bark Extract**

| Phytochemical test | Results | Information |
|---|---|---|
| Alkaloids | - | Absence of sediment |
| Flavonoids | + | Presence of yellow coloration |
| Steroids | - | Absence of blue coloration |
| Tannins | + | Presence of blackish-brown coloration |
| Saponins | - | Absence of foam |

Phytochemical tests were conducted on duku (*Lansium domesticum* Corr.) bark extract to identify the compounds present in the bark extract (Table 4). The results indicate that duku bark extract contains flavonoids and tannins.

**DISCUSSIONS**

*Aedes aegypti* belongs to the insect class and the Culicidae family. It undergoes four stages of development in its life cycle: egg, larvae, pupa, and adult. The embryonic development period before the egg stage occurs lasts for 48 hours in warm and humid environments. Following complete embryonic development, the eggs hatch and develop into larvae

within two days or longer, depending on the water conditions in the breeding environment. It's noteworthy that eggs submerged in water may not hatch simultaneously (Purnama, 2017).

Based on 24-hour observation, the lowest average number of unhatched eggs in the duku bark extract treatment was observed at a concentration of 4000 ppm, with 5 unhatched eggs, while no eggs hatched in the control treatment. This occurrence suggests that the eggs in the control treatment might not have been submerged in water for a sufficient duration. Based on 48-hour observation, the lowest average number of unhatched eggs in the duku bark extract treatment was observed at a concentration of 2000 ppm, with 3 unhatched eggs, while in the control treatment, 24 eggs failed to hatch. Although some eggs began to hatch in the control treatment, those treated with duku (*Lansium domesticum* Corr.) bark extract hatched more rapidly. Whereas, based on 72-hour observation, the lowest average number of unhatched eggs in the duku bark extract treatment was observed at a concentration of 2000 ppm, with 2 unhatched eggs, while in the control treatment, 24 eggs failed to hatch.

According to theory, *Aedes aegypti* eggs typically hatch into larvae after approximately 2 days of submersion in water. However, in the control treatment, only 3 eggs hatched after 72 hours of observation. The *Aedes aegypti* eggs used in this research were fertile or fertilized eggs, implying that prolonged submersion in water should lead to their hatching into larvae. Consequently, after 72 hours of observation, all eggs in the control treatment were dissected to confirm the presence of *Aedes aegypti* embryos within, indicating their fertility.

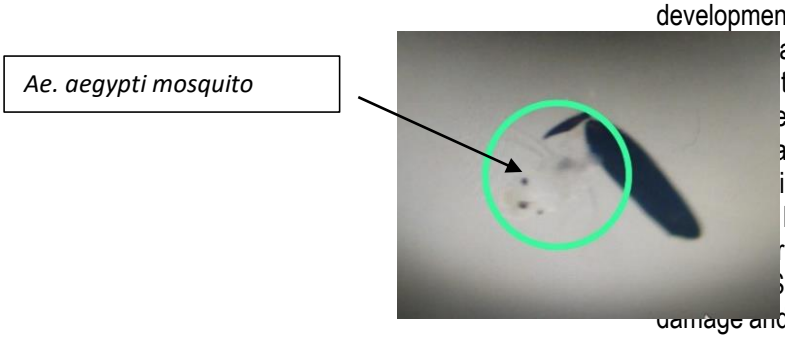


**Figure 2. Dissection of control treated *Aedes aegypti* eggs after 72 hours**

The few eggs that hatched in the control treatment were likely influenced by environmental factors, as indicated by Suparyati & Himam (2021), which reported that the hatching of *Aedes aegypti* mosquito eggs is affected by various factors such as pH, temperature, humidity, light, and oxygen content. Eggs that failed to hatch were carefully pierced and dissected using a fine needle to confirm the presence of embryos and to compare the condition of the eggs before and after exposure to duku extract. Figure 2 illustrates that eggs treated with duku extract underwent a notable physical transformation from their typical oval shape and swollen appearance, indicative of embryo presence, to a deflated state emitting a thick liquid with hyphae. The thick liquid with hyphae represents the embryo, which is presumed to be incapable of developing into larvae. Additionally, intact embryos were observed in some unhatched eggs, further confirming the fertility of all eggs selected for the control treatment.

Duku extract is presumed to act as an ovicide, inhibiting egg hatching. This is attributed to the presence of secondary metabolite compounds in the duku plant, which possess potential as botanical insecticides against Aedes aegypti. Thin-layer chromatography tests have revealed that the ethanol extract of duku fruit peel contains flavonoids and saponins (Fidiana, Mifbakhuddin, & Nurullita, 2013). Duku fruit peel is known to contain a significant amount of seco-onoceranoids, a type of triterpenoid in the form of lansic acid and lanxiolic acid, both of which are toxic. Lansic acid in duku fruit peel is toxic and can be utilized as arrow poison (Salim, 2016). Phytochemical tests conducted on duku (*Lansium domesticum* Corr.) bark utilized in this research have revealed the presence of flavonoid and tannin compounds. However, unlike previous sources, the duku bark used in this research did not contain saponin and terpenoid compounds. Similar research conducted by Saputra (2017) has indicated that saponin acts as an entomotoxin, inhibiting the development of eggs into larvae by damaging the ane, allowing other active compounds to the egg and induce developmental s in *Aedes aegypti* eggs. Triterpenoids a crucial role in preventing eggs from into larvae, as they belong to the class of Furthermore, other compounds with rmone activity include triterpenoids and aponin, as an entomotoxin, can cause damage and death to eggs, reproductive disorders in female insects, and fertility issues. It works by interacting with the cuticle membrane of *Aedes aegypti* eggs, ultimately altering the structure of the cell membrane and leading to membrane damage, which may result in egg death (Oktafiana, 2018).

These compounds were expected to inhibit egg hatching. However, the research results obtained revealed that the duku bark extract used was unable to inhibit egg hatching. Conversely, the

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treatment group given duku bark extract resulted in more rapid egg hatching compared to eggs in the control treatment. Across each treatment, variations were observed in the average egg hatching rate for each observation period. Concentrations of 1000 ppm, 2000 ppm, and 4000 ppm exhibited the highest egg hatching rates, while concentrations of 500 ppm and 8000 ppm exhibited the lowest *Aedes aegypti* egg hatching rates. This discrepancy may be attributed to the presence of compounds or organic materials conducive to egg development, as described by Agustin et al. (2017), who explained that *Aedes aegypti* mosquitoes prefer to lay their eggs in a medium rich in organic material to support the survival and growth of subsequent offspring. This assertion aligns with the findings of Pineda-Cortel et al. (2019), who noted that various factors contribute to variations in the insecticidal activity of plant extracts, including plant species, plant parts utilized, age of plant parts (young, mature, or old), target vector species, solvent polarity of the extract, and composition of extract compounds. Additionally, there are suggestions that the duku bark extract produced may not be sufficiently thick and concentrated, as described by Rusmiati (2010), who explained that ideal conditions for duku extract should be in a thick, paste-like consistency. Although the extract in this research met the criteria for a satisfactory yield value, i.e., exceeding 10% (Badriyah & Farihah, 2022), a limitation of this research lies in the post-evaporation extract, which still contains a residual amount of liquid. Consequently, the extract, which was expected to inhibit egg hatching, exhibited the opposite effect.

## CONCLUSIONS

Based on the research findings, it was concluded that duku (*Lansium domesticum* Corr.) bark extract possesses activity that accelerates the hatching of *Aedes aegypti* eggs. The duku bark extract used in this research contains flavonoid and tannin compounds. Notably, at treatment concentrations of 500 ppm, duku (*Lansium domesticum* Corr.) bark extract exhibited lower hatchability compared to other concentrations.

## SUGGESTION

Further research is warranted to explore additional factors influencing egg hatchability, such as pH, temperature, humidity, light, oxygen content, and other organic materials. Moreover, future research should investigate the potential of duku bark extract as an ovicide and attractant for ovitrap products.

## REFERENCES

Agustin, I., Tarwotjo, U., & Rahadian, R. (2017). Perilaku Bertelur dan Siklus Hidup *Aedes aegypti* Pada Berbagai Media Air. Jurnal Biologi, 6(4), 71–81.

Badriyah, L., & Farihah, D. A. (2022). Analisis ekstraksi kulit bawang merah (Allium cepa L.) menggunakan metode maserasi. Jurnal Sintesis, 2022(1), 30–37.

Fidiana, F.D., Mifbakhuddin and Nurullita, U. (2013) 'Daya Bunuh Ekstrak Kulit Duku (*Lansium Domesticum* Corr) Terhadap Kematian Larva Aedes aegypti', Jurnal kesehatan masyarakat indonesia, 8(2), p. 2013.

Halstead, S. B. (2008). Dengue. Tropical Medicine : Science and Practice (Vol. 5). London: Imperial College Press.

Kemenkes RI. (2022) Profil Kesehatan Indonesia Tahun 2021.

Kemenkes RI (2017). Pedoman Pencegahan dan Pengendalian Demam Berdarah Dengue di Indonesia. Jakarta. Available at: https://www.kesehatanlingkungan.com/2019/02/buku-pedoman-pencegahan-dan.html.

Konda, J. P., Siampa, J. P., Tallei, T. E., Kepel, B. J., & Fatimawali, F. (2020). Aktivitas Antioksidan Ekstrak Metanol Biji Langsat (*Lansium domesticum* var. pubescens) dan Duku (*Lansium domesticum* var. domesticum) dengan Metode DPPH. Jurnal Ilmiah Sains, 20(2), 113–121. https://doi.org/10.35799/jis.20.2.2020.28835

Lauren, M., Wydiamala, E., & Hayatie, L. (2021). Uji Aktivitas Ekstrak Etanol Buah Belimbing Wuluh (Averrhoa bilimbi L.) Sebagai Ovisida Dan Insect Growth Regulator Terhadap Nyamuk Aedes aegypti. Homeostasis, 4(2), 319–326.

Madona, M., Setyaningrum, E., Pratami, G. D., & Kanedi, M. (2020). Efektivitas Ekstrak Daun Tomat (Solanum lycopersicum L.) Sebagai Ovisida Nyamuk Aedes aegypti. Jurnal Ilmu Kedokteran Dan Kesehatan, 7(1), 368.

Mirnawaty M, Supriadi S, Jaya B. (2012). Uji Efektivitas Ekstrak Kulit Langsat (Lansium Domesticum) Sebagai Anti Nyamuk Elektrik Terhadap Nyamuk Aedes Aegypti (A Test Onthe Effectiveness Of Lansium Peel Extract (Lansium Domesticum) As Mosquito Electric Repellent Against Aedes Aegypti Mosquitoes). Jurnal Akademika Kimia.Nov;1(4). Available From : Http://Jurnal.Untad.Ac.Id/Jurnal/Index.Php/Jak/Article/View/1564

Nandita PN, Astuti NM, Wirasuta IG, Sari PM. (2019). Kasus Kematian Akibat Dichlorvos Dan Phenthoat. Indonesian Journal of Legal and Forensic Sciences (IJLFS);9(1):51.https://doi.org/10.24843/IJLFS.2019.v09.i01.p05

Natadisastra, D. and Agoes, R. (2014) Parasitologi Kedokteran Ditunjau dari Organ Tubuh yang Diserang. Jakarta: Penerbit Buku Kedokteran EGC.

Ni'mah, T. et al. (2015) 'Potensi Ekstrak Biji Duku (*Lansium domesticum* Corr) terhadap *Aedes aegypti*', Buletin Penelitian Kesehatan, 43(2), pp. 131–136. doi:10.22435/bpk.v43i2.4147.131-136.

Nopitasari N. (2014). Uji Aktivitas Ekstrak N-heksana Biji Langsat (*Lansium Domesticum* Cor.) Sebagai Larvasida Aedes Aegypti (Thesis). Padang : Universitas Tanjungpura.

Oktafiana (2018) 'Efektivitas Ekstrak Daun Bunga Pukul Empat (Mirabilis jalapa) Sebagai Ovisida Nyamuk Aedes aegypti', Skripsi, pp. 1–125.

Pineda-Cortel, M. R. B., Cabantog, R. J. R., Caasi, P. M., Ching, C. A. D., Perez, J. B. S., Godisan, P. G. M., et al. (2019). Larvicidal and ovicidal activities of Artocarpus blancoi extracts against Aedes aegypti. Pharmaceutical Biology, 57(1), 120–124. https://doi.org/10.1080/13880209.2018.1561727

Purnama, S.G. (2017) 'Diktat Pengendalian Vektor', Prodi IKM FK Universitas Udayana, pp. 4–50.

Putranta, N.R. and Wijaya, S.M. (2017) 'Efektifitas Ekstrak Kulit Duku (*Lansium domesticum* Corr.) sebagai Larvasida Aedes aegypti', Jurnal Medula, 7(5), pp. 165–170.

Putri, D. F., Triwahyuni, T., & Saragih, J. M. (2021). Pengetahuan dan perilaku masyarakat terhadap keberadaan jentik nyamuk Aedes aegypti: Vektor penyakit demam berdarah dengue. Holistik Jurnal Kesehatan, 15(1), 56-63.

Putri, D. F., Husna, I., Kurniati, M., & Primadiamanti, A. (2023). Activity of enzyme Esterase, Glutathione S Transferase and Inorganic Substance of Dengue vector Aedes aegypti larvae against *Lansium domesticum* leave extract and fractionation. Bali Medical Journal, 12(2), 1163-1170.

Putri, D. F., Triwahyuni, T., Rahmadhany, T. D., & Nusri, T. M. (2024). Knowledge, Community Behavior, And Environmental Factors In Relation To The Incidence Of Dengue Hemorrhagic Fever. JKM (Jurnal Kebidanan Malahayati), 10(1), 51-60.

Rusmiati (2016) 'Pengaruh metode ekstraksi terhadap aktivitas antimikroba ekstrak metanol daun Mimba (Azadirachta indica Juss)', Skripsi . Fakultas Ilmu Kesehatan UIN Alauddin Makasar, p. 26.

Salim, M. (2016) 'Karakterisasi Simplisia dan Ekstrak Kulit Buah Duku (*Lansium domesticum* Corr) dari Provinsi Sumatera Selatan dan Jambi Characterization of Simplicia and The Peel Extract of Duku (*Lansium domesticum* Corr) from South Sumatera and Jambi Province', Jurnal Kefarmasian Indonesia, 6(2), pp. 117–128. Available at: http://ejournal.litbang.kemkes.go.id/index.php/jki/article/viewFile/6226/4774.

Saputra, C. (2017) 'Efektifitas Kulit dan Biji Duku (Lancium domesticum Corr.) Sebagai Ovisida Terhadap Nyamuk Aedes aegypti (Sebagai Sumber Belajar Biologi Submateri Pencemaran Lingkungan pada Peserta Didik SMA Kelas X Semester Ganjil)', Skripsi, pp. 1–10.

Suparyati, T., & Himam, M. D. (2021). Daya Tetas Telur Nyamuk Aedes aegypti Pada Tiga Jenis Air Perindukan Di Kelurahan Medono Kota Pekalongan. PENA , 35(1), 61–68.

Susanto, I. et al. (2013) Parasitologi Kedokteran. edisi 4. Jakarta: Badan Penerbit Fakultas Kedokteran Universitas Indonesia.

Triwahyuni, T., Lestari, S. M. P., & Putri, D. F. (2020). Pengaruh Penularan Transvenereal Virus Dengue Serotipe-3 Terhadap Viabilitas Telur Aedes aegypti Berdasarkan Variasi Lama Penyimpanan. Biospecies, 13(2), 32-39.

Widoyono (2011) Penyakit Tropis ; Epidemiologi, Penularan, Pencegahan, dan Pemberantasannya. edisi kedua. Edited by R. Astikawati. Jakarta: Penerbit Erlangga.

World Health Organization (WHO). (2003). Pencegahan dan Penanggulangan Penyakit Demam Dengue dan Demam Berdarah Dengue. Jakarta: WHO & Departement Kesehatan RI.

World Health Organization (WHO).(2021).Ending the burden of dengue infection: Indonesia launched the 2021-2025 National Strategic Plan for Dengue Control Programme (Internet). South East Asia Indonesia: World Health Organization. (update 2021 Nov 15; cited 2022 Feb 8). Available from : https://www.who.int/indonesia/news/detail/15-11-2021-ending-the-burden-of-dengue-infection-indonesia-launched-the-2021-2025-

national-strategic-plan-for-dengue-control-programme.