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THE EFFECT OF GUAVA LEAF, PAPAYA LEAF, NONI LEAF, AND BETEL LEAF EXTRACTS ON ECTOPARASITES IN STRIPED SNAKEHEAD *(Channa striata)*

Pengaruh Ekstrak Daun Jambu Biji, Daun Pepaya, Daun Mengkudu, dan Daun Sirih terhadap Ektoparasit pada Ikan Gabus *(Channa striata)*

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ABSTRACT

The striped snakehead (*Channa striata*) is one of the most widely distributed freshwater fish species in Indonesia and has high economic value. One of the main problems in its aquaculture is ectoparasite infestation. Ectoparasites are parasites that attach to the external surfaces of fish and often cause significant losses. This study aimed to determine the effect of immersion in guava leaf, papaya leaf, noni leaf, and betel leaf extracts on reducing ectoparasite infestations in *Channa striata*. The experiment was conducted using a completely randomized design (CRD) with four treatments and three replications. Fish were immersed for 20 days in extract solutions at a concentration of 1 g/L. Observations included survival rate, prevalence, and intensity levels. Ectoparasites were identified using the mucus scraping method and examined under a light microscope. Data were analyzed descriptively and tested using ANOVA. The results showed that the highest survival rate was recorded in the papaya leaf treatment (100%), while the lowest occurred in the guava and noni leaf treatments (86.6%). The only ectoparasite identified belonged to the genus *Trichodina* sp. The highest prevalence was found in the papaya leaf treatment (89%), whereas the lowest was in the betel leaf treatment (72%). Infection intensity ranged from 1.4 to 2 individuals per fish. Statistical analysis showed a significance value of 0.939 (>0.05), indicating that immersion with leaf extracts at this dosage did not significantly reduce the ectoparasite load in *Channa striata*.

Keywords: Leaf Extract, Ectoparasite, Striped Snakehead

ABSTRAK

Ikan gabus *(Channa striata)* merupakan salah satu ikan air tawar yang tersebar luas di seluruh wilayah Indonesia dan memiliki nilai ekonomi tinggi. Salah satu masalah utama dalam budidaya ikan gabus adalah serangan ektoparasit. Ektoparasit merupakan kelompok parasit yang menempel pada bagian luar tubuh Ikan dan seringkali menyebabkan kerugian signifikan. Penelitian ini bertujuan mengetahui pengaruh perendaman ekstrak daun jambu biji, daun pepaya, daun mengkudu, dan daun sirih terhadap pengurangan jumlah ektoparasit pada ikan gabus. Penelitian menggunakan desain rancangan acak lengkap (RAL) dengan empat perlakuan dan tiga kali pengulangan. Perendaman dilakukan selama 20 hari menggunakan dosis ekstrak sebanyak 1 g/L. Pengamatan meliputi tingkat kelangsungan hidup, tingkat prevalensi, tingkat intensitas. Identifikasi ektoparasit dilakukan melalui ulas lendir (*scraping metode*) yang diamati di bawah mikroskop cahaya. Data dianalisis secara deskriptif dan diuji menggunakan Anova. Hasil penelitian menunjukkan bahwa tingkat kelangsungan hidup tertinggi dicapai pada perlakuan daun pepaya (100%) dan terendah pada daun jambu biji serta mengkudu (86,6%). Ektoparasit yang ditemukan berasal dari genus *Trichodina* sp., prevalensi infeksi tertinggi terdapat pada perlakuan daun pepaya (89%), sedangkan terendah pada daun sirih (72%). Intensitas infeksi berkisar antara 1,4 sampai 2 individu/ekor. Hasil uji statistik menunjukkan nilai signifikansi 0,939 (>0,05), sehingga dapat disimpulkan bahwa pemberian ekstrak daun pada dosis tersebut tidak memberikan pengaruh yang signifikan terhadap penurunan jumlah ektoparasit pada ikan gabus.

Kata Kunci: Ekstrak Daun, Ektoparasit, Ikan Gabus

INTRODUCTION

Snakehead fish (*Channa striata*) is a freshwater fish commodity with high economic value in Indonesia. Increasing market demand has driven the development of snakehead fish farming, both on a household and commercial scale. However, cultivation practices often face challenges in the form of disease attacks, particularly ectoparasites. Ectoparasites are organisms that live and reproduce on the outside of a host's body, such as the skin, fins, and gills of fish, using these surfaces for attachment, food acquisition, and habitat (Maryani *et al*., 2022). Ectoparasitic infections can cause stress, inhibit growth, reduce fish quality, and even increase mortality.

Disease control in fish farming is generally carried out using synthetic chemicals. However, long-term use of chemicals carries the risk of developing resistance, hazardous residues, and environmental pollution (Hardhini *et al*., 2018). Therefore, safer and more sustainable control alternatives are needed. The use of plants as natural ingredients is increasingly being developed because they are known to contain bioactive compounds such as alkaloids, flavonoids, tannins, and saponins, which act as antibacterials, antifungals, and antiparasitics (Salma & Susanto, 2022).

Several studies have demonstrated the potential of plant extracts to suppress parasite development in fish. Wulandari *et al*. (2020) reported the effectiveness of papaya leaf extract against Argulus japonicus in carp. Another study by Suryaningtyas *et al*. (2021) showed that guava leaf infusion was able to reduce the prevalence and intensity of Trichodina sp. in catfish. Wardani *et al*. (2021) also found that noni leaf solution could control *Trichodina* sp. infestations in tilapia fry. Meanwhile, Hardhini *et al*. (2018) confirmed that guava, papaya, and betel leaf extracts were effective against ectoparasites in carp. These findings indicate that plant extracts have potential as an alternative parasite control in farmed fish, although their effectiveness in snakehead fish still requires further research.

Based on this, this study was conducted to analyze the effect of soaking guava leaf extract, papaya leaf, noni leaf, and betel leaf on reducing the number of ectoparasites in snakehead fish.

METHODS

The research was conducted in June 2025, at the researcher's home in Nagari Sungai Buluah Timur, Batang Anai District, Padang Pariaman and the LLDIKTI Region 10 Laboratory of West Sumatra. The method used was a quantitative experimental method, using a

Completely Randomized Design (CRD) design with 4 treatments and three replications. The selection of the RAL design was considered because of its ability to control random variability and is widely used in modern aquaculture research to compare several treatments simultaneously (Amelia *et al*., 2023). The treatments in this study included (P) 50 grams of guava leaf extract, (Q) 50 grams of papaya leaf extract, (R) 50 grams of noni leaf extract, and (S) 50 grams of betel leaf extract. The selection of these four types of plants was based on scientific evidence showing that medicinal plants such as guava can increase nonspecific immune responses and antiparasitic potential in freshwater fish (Woyessa & Feleke, 2023; Amelia *et al*., 2023). The duration of treatment or immersion was set at 20 days, following the practice of medicinal plant trials in fish farming which showed an adequate duration to observe changes in parasite prevalence, intensity and fish health parameters (Amelia *et al*., 2023).

Research Tools and Materials

Table 1. Research tools and materials

No	Tool	Material
1.	Tank/Pond (50×50×50 cm)	Guava leaves (50 g)
2.	Digital scale	Papaya leaves (50 g)
3.	Thermometer	Noni leaves (50 g)
4.	pH meter	Betel leaves (50 g)
5.	Light microscope	Snakehead fish (120 fish)
6.	Object glass	NaCl solution (1–2 drops)
7.	Cover glass	
8.	Petri dish	
9.	Scalpel	
10.	Forceps	
11.	Dropper pipette	
12.	Latex hand gloves	
13.	Plastic tube	
14.	Styrofoam	
15.	Camera	

Research Procedures

1. Preparation of Snakehead Fish Samples
   Snakehead fish taken from a farmed group in Padang Pariaman, selected as samples based on size, age, and ectoparasite infection, were acclimatized in an aquarium for 1 to 2 days. This acclimatization aims to reduce stress before treatment, ensuring the fish's physiological condition is stable during treatment.
2. Preparation of Leaf Extract
   The leaf extract powder was weighed at a rate of 1 gram per liter of water. For each treatment or pond with a volume of 50 liters of water, 50 grams of leaf extract powder was required. The powder was then dissolved in water, stirred, and then filtered to obtain an extract solution ready for application.

Parameters Measured

1. Survival rate

The number of live and dead fish in each treatment was recorded before and after the study to calculate the survival rate of snakehead fish during the treatment period. The data results were then calculated using the formula used by Tarigan (2014) as follows:

$$SR = \frac{Number\ of\ fish\ affected}{Number\ of\ samples\ examined}\ x\ 100\%$$

2. Prevalence Level

Before and after treatment, the number of snakehead fish infected with ectoparasites in each treatment was recorded to determine the prevalence of infection, which was then measured based on the method used by Yudhistira (2004) as follows:

$$Prevalence = \frac{Number\ of\ fish\ affected}{Number\ of\ samples\ examined}\ x\ 100\%$$

3. Intensity Level

The intensity level is measured based on the method used by Hadiroseyani (2006), as follows:

$$Intensity = \frac{number\ of\ invading\ parasites}{number\ of\ fish\ infected\ with\ parasites}$$

Data analysis was carried out using the help of SPSS software version 3.0 and Microsoft Excel to ensure that statistical calculations were carried out accurately and systematically.

Data Analysis Techniques

The data obtained in this study were analyzed descriptively and inferentially. Descriptive analysis was used to describe the number of ectoparasites, intensity, prevalence, and survival rate of snakehead fish in each treatment. The prevalence rate was calculated using the formula Prevalence = (number of infected fish : number of samples examined) x 100%, (Yudhistira, 2004). The intensity rate was calculated using the formula Intensity = (number of parasites attacking : number of fish infected with parasites) x 100% (Hadiroseyani, 2006).

Next, the data were analyzed inferentially using an analysis of variance (ANOVA) test to determine the effect of leaf extract treatment on the number of ectoparasites in snakehead fish. If the ANOVA results showed a significant difference at the 95% confidence level (α = 0.05), then a further Duncan test was conducted to determine which treatment had the most effective effect in reducing the number of ectoparasites. If the data did not meet the assumptions of normality and homogeneity, the analysis was continued with the non-parametric Kruskal-Wallis Test.

RESULTS

1. Survival Rate of Snakehead Fish

Table 3. Survival rate

Treatment	Beginning (fish)	final (fish)	Average	%
Guava leaf (P)	30	26	28	86,6
Papaya leaf (Q)	30	30	30	100
Noni leaf (R)	30	26	28	86,6
Betel leaf (S)	30	29	29,5	96,6

Source: Processed data (2025)

Based on Table 3, it is known that the average survival rate of snakehead fish showed the highest average in the Papaya Leaf (Q) treatment of 100%, followed by the Betel Leaf (S) treatment of 96.6%, Guava Leaf (P) 86.6%, and Noni Leaf (R) treatment of 86.6%.

2. Types of Ectoparasites that Infect Snakehead Fish (*Channa striata*)

Table 4. Types of ectoparasites that infect snakehead fish

Treatment	Type of Ectoparasite on Snakehead Fish
Guava leaf (P)	*Trichodina* sp.
Papaya leaf (Q)	*Trichodina* sp.
Noni leaf (R)	*Trichodina* sp.
Betel leaf (S)	*Trichodina* sp.

Source: Processed data (2025)

Based on Table 4, it is known that during the research period, the type of parasite found was Trichodina sp., in each treatment unit.

3. Prevalence and Intensity of Ectoparasites in Snakehead Fish

Table 5. Prevalence (individual/tail) of Ectoparasites Found Attacking Snakehead

Treatment	Number of Infected Fish	%
Guava leaf (P)	7	78
Papaya leaf (Q)	8	89
Noni leaf (R)	7.5	83
Betel leaf (S)	6.5	72

Source: Processed data (2025)

Based on the results presented in Table 5, the prevalence of the ectoparasite *Trichodina* sp. in snakehead fish showed the highest average in the papaya leaf (Q) treatment, with a percentage of 89%, followed by the noni leaf (R) treatment with 83%. The guava leaf (P) treatment showed a prevalence of 78%, while the betel leaf (S) treatment had the lowest prevalence at 72%.

Table 6. Intensity (individual/tail) of Ectoparasites Attacking Snakehead

Treatment	Number of Infected Fish	% (Intensity)
Guava leaf	12	1.7
Papaya leaf	15	1.8
Noni leaf	11	1.4
Betel leaf	13	2.0

Source: Processed data (2025)

Based on Table 6. The intensity of Trichodina sp. ectoparasites in snakehead fish, where the betel leaf treatment had the highest average intensity of 2 parasite individuals per fish. Next, the papaya leaf treatment (Q) had an average intensity of 1.8 parasite individuals per fish. The guava leaf treatment (P) had 1.7 parasite individuals per fish. And the lowest intensity was found in the noni leaf treatment with an average intensity of 1.4 parasite individuals per fish.

4. The Effect of Soaking Guava Leaf Extract, Papaya Leaf Extract, Noni Leaf Extract, and Betel Leaf Extract on Ectoparasites in Snakehead Fish

Table 7. Statistical Test Results

Test Statistics[a,b]	Test Results
Chi-Square	.939
df	3
Asymp. Sig.	.816
a. *Kruskal Wallis Test*	
b. Grouping Variable: perlakuan	

Source: Processed data (2025)

Based on Table 7, it can be seen that the significant value of the statistical test shows a p value of 0.939 > 0.05 so that it can be stated that there is no effect of soaking guava leaf extract, papaya leaf, noni leaf, and betel leaf on ectoparasites in snakehead fish (*Channa striata*).

5. Water Quality

The results of the study showed that the temperature in each treatment group was in the range of 25-300 C and the pH was in the range of 6.7-7.

Table 8. Water Temperature of Treatment Groups

No	Treatment	Unit	Beginning of research				End of research			
			P	Q	R	S	P	Q	R	S
1	Temperature	^{0}C	28,3	28,3	28,0	27,3	28,0	27,7	27,7	28,7
2	pH	-	6,7	7	6,8	6,9	6,8	6,8	6,9	6,9

The research results showed that the temperature in each treatment group was in the range of 25-300 C and the pH was in the range of 6.7-7.

DISCUSSION

1. Survival Rate of Snakehead Fish in Each Treatment

The high survival rate in the papaya leaf (Q) treatment is thought to be related to the content of the enzyme papain, the alkaloid carpaine, and flavonoids, which function as antiparasitics while enhancing the fish's immune response without causing tissue toxicity. These compounds are capable of damaging the parasite's protein structure, but have no significant negative effects on the fish. Hardhini *et al*. (2018) also showed that the use of papaya leaf extract effectively suppressed ectoparasites without reducing the viability of the test fish.

In contrast, the guava leaf and noni leaf treatments only achieved 86.6% survival. This is thought to be due to the tannin and saponin content, which at certain concentrations can affect gill respiration, thus causing stress in the fish (Ezraneti & Nurul, 2016). Achmad (2009) stated that the higher the concentration of plant extract administered, the greater the potential toxicity to fish. However, because this study used a moderate dose (1 g/L), the mortality rate was still relatively low and did not affect the survival of the test fish.

2. Types of Ectoparasites that Infect Snakehead Fish *(Channa striata)*

The research findings revealed that only one type of parasite was found during the research period, namely *Trichodina* sp., in each treatment. This may be caused by two main factors, namely the dominance of Trichodina sp. as a protozoan parasite commonly infecting freshwater fish, including snakehead fish, resulting in a very high prevalence in various aquatic habitats. The study conducted by Maryani (2023) also showed that the identification results of ectoparasites in local fish also found the presence of Trichodina sp. in local fish species, one of which was the snakehead fish. Meanwhile, in the study conducted by Yuliani (2023), it was also found that Trichodina sp. is one of the parasites causing a high level of infection that occurs in tilapia.

Furthermore, the limitation of the identification method lies in the fact that ectoparasite identification was only carried out using a light microscope on fish mucus smears (scraping). This method has limitations because it only allows direct observation of the preparation without considering the overall physical condition of the fish. Mitchell and Goodwin (2020) stated that the use of a stereomicroscope as an initial supporting tool facilitates the detection of physical abnormalities so that the samples taken are more representative. Physical symptoms such as wounds, spots, and changes on the surface of the fish's body can be observed more clearly, allowing the mucus smear to be taken more precisely from areas indicated with infection. This approach has the potential to increase the possibility of finding other types of parasites besides Trichodina sp., making the identification results more comprehensive. According to Kartika *et al*. (2023), the initial ectoparasite examination conducted with a stereomicroscope allows clearer observation of lesions on the skin, scales, and gills before continuing with detailed identification under a light microscope. A similar statement was also expressed by Azra (2022), who emphasized the importance of systematic external observation using a stereomicroscope before taking mucus smears, so that the sampling process becomes more targeted and increases the possibility of comprehensive parasite detection.

3. Pravelensi dan Intensitas Ektoparasit pada Ikan Gabus

The prevalence of ectoparasites in snakehead fish used as samples showed exposure to Trichodina sp. with varying numbers. The high prevalence of ectoparasites in the papaya leaf treatment can be explained by several biological and environmental factors. Papaya leaves are known to contain bioactive compounds such as the enzyme papain, alkaloid carpain, flavonoids, and saponins, which possess both antiparasitic and immunostimulatory properties. However, at the concentration used in this study (1 g/L), these compounds were not sufficiently effective in suppressing the development of Trichodina sp., resulting in a consistently high prevalence. This finding is consistent with the studies of Dadras *et al*., (2023) and Dar *et al*., (2023), which stated that the effectiveness of phytochemical compounds is highly dependent on the type of parasite, dosage, and duration of exposure; therefore, the responses produced are not always uniform.

Maulana *et al*., (2023) reported that the physiological condition of fish, such as size, weight, and body condition factor, has a close relationship with the number of ectoparasites. Fish with good body condition tend to have lower parasite loads compared to those in less optimal condition.

Environmental parameters such as salinity and media stability have also been reported to influence the development of Trichodina sp. Suitable environmental conditions can slow down the parasite's life cycle, whereas fluctuations in water quality may accelerate the development and spread of the parasite (Rukmini *et al*., 2019). Thus, variations in these internal and external factors greatly determine the effectiveness of leaf extract treatments in reducing the level of ectoparasite infestation in snakehead fish.

The intensity of ectoparasites infecting snakehead fish showed the highest average in the betel leaf (S) treatment. The high intensity observed in the betel leaf treatment is presumably due to the presence of eugenol and hydroxychavicol, which, at certain concentrations, may induce physiological stress in fish. According to Diniatik *et al*., (2011), such stress conditions may actually decrease immune resistance, thereby increasing susceptibility to parasitic infestation. This is in line with the statement of Mahardika *et al*., (2018) that both environmental and chemical stressors can exacerbate ectoparasite infections even at relatively low treatment doses.

In general, the intensity of ectoparasites found in this study was still classified as low (<5 individuals/fish), thus not causing severe clinical symptoms. According to Mahardika *et al*., (2018), ectoparasitic infections with low intensity do not yet have a serious impact on fish health but have the potential to increase if the aquatic environmental conditions are not properly managed. Therefore, these results indicate that the administration of leaf extracts at a concentration of 1 g/L was able to suppress infection to a low level, although no significant differences were observed among treatments.

4. The Effect of Guava Leaf, Papaya Leaf, Noni Leaf, and Betel Leaf Extract Immersion on Ectoparasites in Snakehead Fish

The research results indicated that there was no significant effect of guava leaf, papaya leaf, noni leaf, and betel leaf extract immersion on ectoparasites in snakehead fish. In this study, the absence of a significant effect was likely due to the number of samples used. Santoso (2019) also stated that the significance of research results is influenced by many factors, one of which is sample size. In addition, the extract concentration used (1 g/L) may not have been high enough to produce a pronounced antiparasitic effect, as demonstrated by other studies showing that the effectiveness of phytochemicals often depends on dosage and duration of exposure (Dadras *et al*., 2023). Furthermore, the dominant parasite detected in this study was *Trichodina* sp., which is known to possess a relatively high adaptive capacity to environmental changes, thereby requiring a stronger concentration or combination of bioactive compounds to inhibit its development (Dar *et al*., 2023).

Hardhini (2018) also stated that the effect of guava leaf (*Psidium guajava*), papaya leaf (*Carica papaya*), and betel leaf (*Piper betle*) extracts on ectoparasites in common carp (Cyprinus carpio) showed that guava leaf and betel leaf extracts had no significant effect on the prevalence and intensity of ectoparasites infecting common carp (*Cyprinus carpio*). Dar *et al*., (2023) reinforced that many traditional medicinal plants have not been comprehensively tested in the context of fish ectoparasites, thus their effectiveness in field applications remains limited. Similarly, Dadras *et al*., (2023) emphasized that the antiparasitic effectiveness of plant-based compounds is highly dependent on parasite species and application methods, and therefore not all plants exhibit optimal activity.

5. Water Quality

From the experiment on the four treatment groups, the results showed that the average water temperature was within the normal range, ideal for fish life. The water temperature in the four groups of fish ranged from 27.3–28.7°C, which is an optimal temperature range for many fish species. According to the Indonesian National Standard (SNI 7550:2009) on freshwater fish culture, the ideal temperature range for fish maintenance is 25–35°C; thus, the temperature values in this study have met the water quality standards for aquaculture activities (Parulian *et al*., 2023). These results indicate that the environmental conditions in the experiment were sufficiently good and supported fish life. With normal water temperature, fish can grow and develop well while maintaining balanced metabolism. Indiarti (2022) stated that water quality management in Nile tilapia hatchery, in terms of temperature level, is at 28°C. A study by Andriani *et al*., (2023) also reported that in the snakehead fish booster culture system, the ideal maintenance temperature ranges between 25.6–29.8°C.

From the experiment on the four treatment groups, the results showed that the average water pH was within the normal range, ideal for fish life. The water pH in the four groups of fish ranged from 6.5–8.5, which is the optimal pH range for many freshwater fish species according to the Indonesian National Standard (SNI 7550:2009). The optimal pH range for freshwater aquaculture is 6.5–8.5, and values outside this range may disrupt metabolism and reduce fish productivity (Parulian *et al*., 2023).

Research by Hakim *et al*., (2020) also stated that Channa striata is able to adapt well to waters with a pH range of 5–9, with an optimum range of 6.5–8.5 that supports growth and balanced physiological functions. Under normal pH conditions, fish metabolism operates optimally, feed efficiency increases, and environmental stress risk decreases.

Thus, the pH measurements in this study indicate that the environmental conditions during the experiment were within the ideal range and did not serve as limiting factors for fish life.

CONCLUSION

The treatment administered using leaf extract at a concentration of 1 g/L is categorized as moderate and remains below the reported toxicity threshold. The research results showed that this dosage did not significantly affect the survival rate of snakehead fish. The type of parasite found in the snakehead fish samples was Trichodina sp. The prevalence and intensity of Trichodina sp. ectoparasites in snakehead fish before treatment indicated that all test groups were already infested with varying levels of occurrence. Among the four types of treatments, only guava leaf, papaya leaf, and noni leaf were effective in reducing ectoparasite infestation in fish, while in the betel leaf treatment group, no reduction in the number of ectoparasites was observed. Based on the statistical test results, there was no significant effect of guava leaf, papaya leaf, noni leaf, and betel leaf extract immersion on ectoparasites in snakehead fish, with a p-value of $0.939 > 0.05$.

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