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The Effect of Noni Fruit (*Morinda citrofolia*) on Controlling *Argulus* sp. in Common Carp (*Cyprinus carpio*)

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ABSTRACT

Argulus sp. is one of the ectoparasites that commonly infects common carp (*Cyprinus common carpio*) and can reduce fish health and productivity. One environmentally friendly control method is the use of natural ingredients such as noni fruit (*Morinda citrofolia*) which contains bioactive compounds that have antiparasitic properties. This study aimed to analyze the effect of noni fruit extract on the control of *Argulus* sp. in common carp and to determine the effective dosage for controlling the parasite. The study used an experimental method with a Completely Randomized Design (CRD) consisting of four treatments of noni fruit extract concentration: P1 (1%), P2 (2%), P3 (3%), and P4 (4%) with five replications. The observed parameters included fish survival rate, *Argulus* sp. mortality time, parasite mortality, prevalence, and intensity of parasite infestation. The result showed that the administration of noni fruit extract had a significant effect on mortality, prevalence and intensity of *Argulus* sp. infestation. The best treatment was obtained at a concentration of 2% (P2), with a fish survival rate of 100%, *Argulus* sp. mortality of 98,67%, prevalence of 4 %, and infestation intensity of 0.2 parasites each fish.

INTRODUCTION

Common carp (*Cyprinus carpio*) is one type of fish that has high economic value and is widely cultivated due to its high adaptability to environmental conditions and ease of breeding. In addition, common carp are classified as fish that are resistant to diseases, omnivorous, and have rapid growth (Supriatna, 2014). One of the problems often encountered in the cultivation of common carp (*Cyprinus carpio*) is ectoparasitic diseases that can attack fish.

Parasites are organisms that live on or inside the body of another organism (host) and can cause harm to the host. One type of parasite that can attack common carp is *Argulus* sp. *Argulus* sp. is one of the parasites frequently found by fish farmers that can attack freshwater fish. The losses caused by this parasitic infection are indeed not as high as those caused by other infections such as viruses and bacteria; however, fish affected by ectoparasites still require special treatment, as this condition can trigger secondary infections by more

dangerous pathogens (Kurniawan & Aryana, 2015). Therefore, in common carp aquaculture activities, it is necessary to carry out proper handling of *Argulus* sp. infestations.

The presence of parasites has the potential to reduce fish quality and decrease growth and production, which can ultimately lead to economic losses. The presence of parasites has the potential to cause a decline in fish quality, as well as a decrease in growth and production, which ultimately leads to economic losses that are interrelated, starting from seed supply to fish marketing. Parts of the fish body that are often found to be infected by parasites include the gills, skin, and muscle tissue, which can cause irritation and weight loss (Misgnaw & Getu, 2016). In this study, a solution offered to overcome this problem is the use of noni fruit (*Morinda citrifolia*) extract.

One of the handling techniques that can be applied to overcome *Argulus* sp. infestation is the use of noni fruit extract. The utilization of noni fruit in addressing ectoparasite problems, particularly *Argulus* sp., has been previously studied. Based on the results of research by Putriningtias *et al*. (2022), noni fruit at an optimal dose of 4.5 ml can influence the detachment of *Argulus* sp. in comet fish. Similar results were also reported by Rahmatullah *et al*. (2012), showing that noni at a 4% dose is capable of removing ectoparasites such as Lernaea in goldfish (*Carassius auratus*).

Noni is one of the medicinal plants that is widely consumed by the community. Noni fruit is used for the prevention and treatment of various diseases. Several studies have reported the benefits of noni fruit, including its effects as chemotherapeutic effects (Karamcheti *et al*., 2014), antidepressant activity, hepatoprotective activity, antioxidant properties (Saminathan *et al*., 2018), antimicrobial effects, and immunomodulatory activity have also been reported.

Noni fruit contains flavonoids that can act as anti-Argulus agents in fish. This is because flavonoid compounds in noni possess antioxidant properties that can enhance the immune system in fish, as leukocytes (which function as antigen-consuming cells) are produced more rapidly and the lymphoid system is activated more quickly. In addition to flavonoid content, noni fruit is also capable of maintaining environmental conditions such as water quality. Noni fruit extract can help reduce bacterial populations and disease-causing pathogens in water. Flavonoid compounds in noni work by improving water conditions from poor quality to better quality. This occurs because flavonoids are able to eliminate disease-causing pathogens in the water, thereby making Argulus feel uncomfortable or creating an environment that is not ideal for its survival, causing it to detach from the host body (Amrianto *et al*., 2017). Therefore, it is important to conduct this study using a soaking method with noni fruit extract at different dosages against *Argulus* sp. that attach to the body of common carp (*Cyprinus carpio*).

METHODS

Time and Place

This research carried out with acclimatization for 3 days and treatment testing for 3 days, starting from August 27, 2025 to September 2, 2025. Located in the Fish Production and Reproduction Laboratory, Aquaculture Study Program, University of Mataram.

Tools and Materials

In this research, the equipment used included an aerator, DO meter, camera, pH meter, thermometer, ruler, plastic bucket, bottle, jar, and aquarium. The materials used were noni fruit (*Morinda citrofolia*), common carp (*Cyprinus carpio*) measuring 6-8 cm.

Research Design

This research employed an experimental method using a Completely Randomized Design (CRD). The experimental design was based on the LC_{50} test result, which indicated a concentration of 4.6%. The experiment consisted of four treatments with five replications for each treatment. The treatment were different concentrations of noni fruit (*Morinda citrofolia*) extract used to control *Argulus* sp. infestation in common carp (*Cyprinus carpio*). The treatments applied in this research were as follows:

P1: Treatment with 1% noni fruit extract
P2: Treatment with 2% noni fruit extract
P3: Treatment with 3% noni fruit extract
P4: Treatment with 4% noni fruit extract

Research Procedures

- **Preparation of Noni Fruit Extract**

Ripe noni fruit were selected, characterized by a yellowish-brown color. Approximately 60 fruits were washed and filtered using a clean cloth to obtain the extract extract. The extracted liquid was then collected and stored in clean bottles for further use.

- **Preparation of Rearing Containers**

A total of 20 containers (25 L capacity) were prepared and washed using antiseptic soap, then rinsed thoroughly with water. The containers were left for 24 hour to eliminate residual odor. Each container was filed with 15 liter of water and equipped with an aeration system. Contai ners were labeled according to treatment groups.

- **Lethal Concentration 50 Test (LC_{50})**

A preliminary LC_{50} test was conducted to extract against *Argulus* sp. Different concentrations (10%, 20%, 30%, and 40%) were tasted. A total of 40 *Argulus* sp. Individual were acclimatized for 24 hours, then distributed into treatment containers. Observations of mortality were conducted for 24 hours to determine the median lethal concentration.

- **Preparation of Experimental Fish**

Common carp (*Cyprinus carpio*) with a size of 6-8 cm were used as test organisms. A total of 100 fish were acclimatized for 2-3 days prior to experiment. Fish were maintened under controlled conditions with proper aeration.

- **Infection with *Argulus* sp.**

Each fish wash artificially infected by placing it in small transparent container 3 *Argulus* sp. individuals for approximately 5 minutes until attachment occurred. Infected fish were then transferred into the experimental containers.

- **Treatment Apllication**

After infection, noni fruit extract was added to each container according to the assigned treatment concentration. The fish were then exposed to the treatment for the duration of the experiment. Observation was conducted periodically during the experiment for 3 days.

Research Parameters

- **Time of Detachment of *Argulus* sp.**

This parameter measured the time required for *Argulus* sp. to detach from the host fish after treatment application. Observations were conducted at regular intervals and recorded in minutes.

- **Mortality Time of *Argulus* sp.**

The time required for *Argulus* sp. to die after exposure to noni fruit extract was recorded. Dead parasites were identified by the absence of movement.

- **Mortality Rate of *Argulus* sp.**

The mortality rate of Argulus sp. was calculated using the following formula (Lester, 1984):

$$\textbf{Mortality Rate (\%)} = \frac{\textbf{Number of dead parasites}}{\textbf{Total number of parasites}} \textbf{ x } 100\%$$

- **Fish Survival Rate**

The survival rate of fish during the experiment was calculated as follows (Mahasri, 2015):

$$\textbf{SR (\%)} = \frac{\textbf{Number of surviving fish}}{\textbf{Total number of fish}} \textbf{ x } 100\%$$

- **Prevalence of Infection**

Prevalence indicates the percentage of fish infected by *Argulus* sp. and was calculated using the formula (Zhang, 2025):

$$\textbf{Prevalence (\%)} = \frac{\textbf{Number of infected fish}}{\textbf{Total number of observed fish}} \textbf{ x } 100\%$$

- **Intensity of Infection**

Prevalence indicates the percentage of fish infected by *Argulus* sp. and was calculated using the formula (Hamzah et al., 2017):

$$\textbf{Intensity (\%)} = \frac{\textbf{Total Number of ectoparasit found}}{\textbf{Number of infected fish samples}}$$

- **Water Quality**

Water quality is one of the key factors supporting the growth and development of aquatic organisms. These organisms require an optimal environment for proper growth, and thus, water quality significantly affects cultured species. The data collected includes several important parameters, such as dissolved oxygen (DO), pH, and temperature. The data collected includes several important parameters, such as dissolved oxygen (DO), pH, and temperature. The water quality parameters are presented in table 1.

Table 1. Water Quality Parameters

No.	Parameters	Unit	Equipment Test
1	Temperature	°C	Thermometer
2	pH	-	pH meter
3	DO	mg/L	DO meter

Data Analysis

The data obtained from the research were statistically analyzed using Analysis of Variance (ANOVA). The experimental design used was a Completely Randomized Design (CRD). ANOVA was performed with a 95% confidence interval to determine whether there were significant differences among the treatments. If a significant difference was found, the analysis was followed by Duncan's Multiple Range Test (DMRT) for further comparison.

RESULTS

Survival Rate (SR)

The results showed that the application of noni fruit (*Morinda citrofolia*) extract significantly affected the detachment time of *Argulus* sp. The higher concentration of the extract, the faster parasites detached from the host fish. The fastest detachment time was observed in treatment P4 (4%), while the longest time was recorded in treatment P1 (1%), as shown in Figure 1.

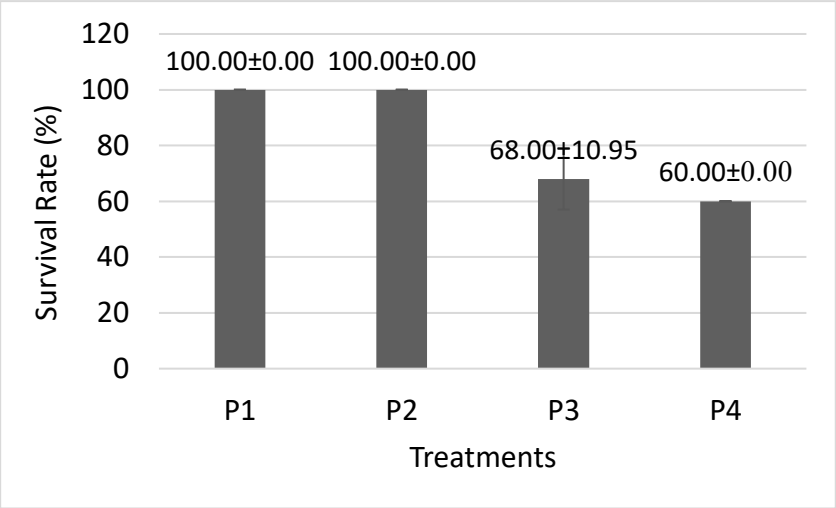

Figure 1. Survival Rate

Mortality Time of *Argulus* sp.

Observation over 72 hour showed that higher concentrations of noni extract eccelerated the mortality of *Argulus* sp. The initial mortality occurred at 13 hour in P1, 9 hour in P2 and as early as 3 hour in both P3 and P4. The highest number of deats occurred at 7 hour (P4), 9 hour (P3), 12 hour (P2), 15 hour (P1). The final mortality was recorded at 59 hour P1, 51 hour p2, 49 hour P3 and 33 hour P4. These results indicate that higher doses reduced the time required to eliminate the parasites, as shown in table 2.

Table 2. Mortality Time of *Argulus* sp.

No	Parameter	P1	P2	P3	P4
1	Initial Time of Mortality	At the 13 hour	At the 9 hour	At the 3 hour	At the 3 hour
2.	Peak Mortality	At the hour- 15 (5 Argulus)	At the hour-12 (6 Argulus)	At the hour-7 (7 Argulus)	At the hour- 9 (9 Argulus)
3.	Final time of Mortality	At the 59 hour	At the 51 hour	At the 49 hour	At the 33 hour

Mortality Rate of *Argulus* sp.

The observation results showed that the highest mortality of *Argulus* sp. was found in P3 wit h a value of 100%, followed by P2 at 98.67%, then P4 at 94.67%, and the lowest in P1 at 73.33%. This indicates that increasing the dosage up to P3 was able to eliminate the entire population of *Argulus* sp., although in P4 there was a slight decrease in the mortality percentage, as shown in Figure 2.

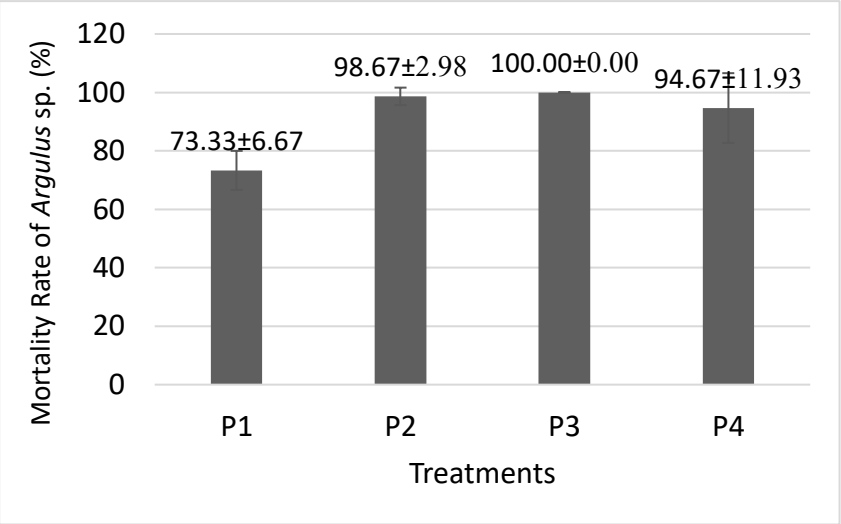

Figure 2. Mortality Rate of *Argulus* sp.

Prevalence of *Argulus* sp. Infestation

Observational results show that the highest prevalence of *Argulus* sp. infestation occurred in P1 at 72%, followed by P4 at 8%, P2 at 4%, and the lowest in P3 with a value of 0%. This indicates that increasing the dosage up to P3 was able to suppress the prevalence until no infected fish were found, although the prevalence increased again in P4, it remained within the low category, as shown in Figure 3.

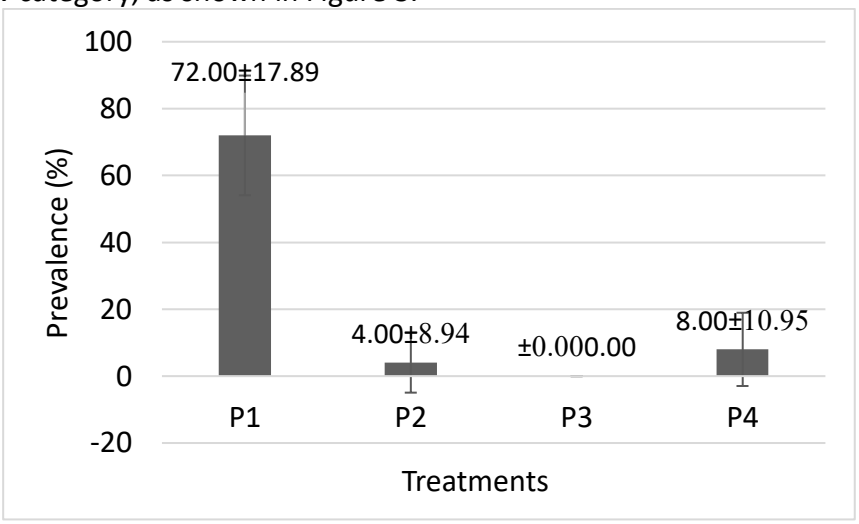

Figure 3. Prevalence

Attack Intensity of *Argulus* sp.

Observational results indicate that the highest attack intensity of *Argulus* sp. was found in P1 at 1.63 parasites/fish, followed by P4 at 0.40 parasites/fish, P2 at 0.20 parasites/fish, and the lowest in P3 with a value of 0 parasites/fish. This suggests that the higher the dosage of noni fruit (*Morinda citrifolia*) extract provided, the lower the attack intensity of *Argulus* sp. on common carp, as shown in Figure 4.

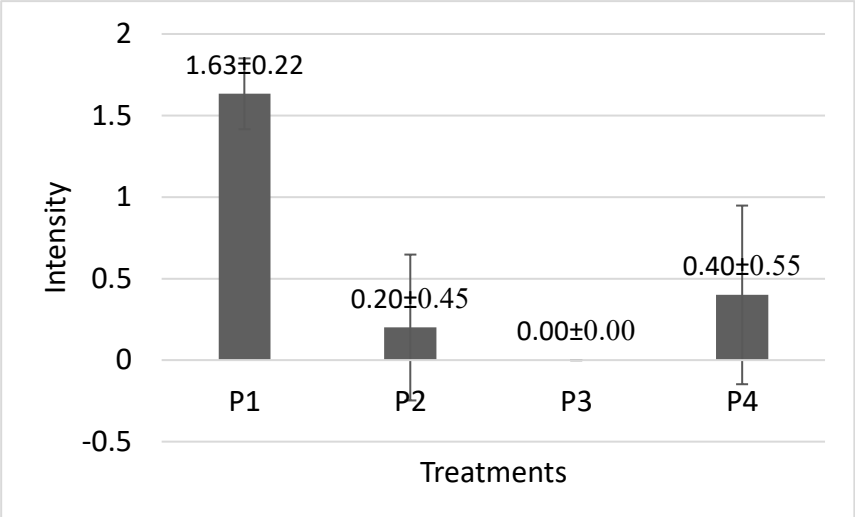

Figure 4. Intensity

Water Quality

Water quality measurements during the study included parameters such as temperature, acidity (pH), and dissolved oxygen (DO). These measurements were conducted to ensure that environmental conditions remained within a range that supports the life of common carp. The water quality data are presented in the following table.

Table 3. Water Quality

Parameters	Observed Range	Optimal Range	Reference
Temperature (°C)	27.02- 27.1	25-30	Gurdi (2016)
pH	6.9-7	6.5-8	Wihardi et al. (2014)
DO (mg/L)	6.34-6.38	>4	Wihardi et al. (2014)

DISCUSSION

Survival Rate of Common Carp

Survival Rate is the percentage of fish that survive during the rearing period. The results showed that the treatment of noni fruit extract at dosages of 1% and 2% (P1 and P2) resulted in a 100% survival rate, while at dosages of 3% and 4% (P3 and P4), there was a decrease in survival rate to 68% and 60%, respectively. The decrease in survival rate at high dosages is suspected to be caused by the toxicity of bioactive compounds in noni fruit, which began to endanger the fish.

Noni fruit contains various bioactive compounds such as flavonoids, saponins, alkaloids, and phenolic compounds (Saminathan *et al*., 2014). Saponins are known as compounds that are toxic to cold-blooded animals, including fish, if used in high doses. Indrawati (2014) states that saponins can cause hemolysis (the bursting of red blood cells) in cold blooded animals. This explains why fish mortality occurred at dosages of 3% and 4%, as the saponin compounds contained in the noni fruit extract at high concentrations began to be toxic to common carp.

Several previous research on the use of noni fruit (*Morinda citrifolia*) for parasite control in fish have shown varying dosage ranges. A study by Kismiyati *et al*. (2012) on comet goldfish infected with *Argulus* sp. utilized noni fruit extract at dosages of 2.5%, 3%, 3.5%, and 4%. The results indicated that the optimal treatment was the 3.5% dosage, which was capable of removing parasites within a 15-minute immersion period without causing fish mortality.

Meanwhile, research by Putriningtias *et al*. (2022) utilized noni fruit extract at a dosage of 4.5 ml/L for control of *Argulus* sp. in comet goldfish and resulted in significant parasite detachment. Compared to those previous studies, the effective dosage found in this study (2%) is relatively lower, yet it still achieved a parasite mortality rate of 98.67% with a 100% fish survival rate. This indicates that the 2% dosage in this study is already excellent and more efficient, as it utilizes a lower concentration while remaining effective in controlling parasites without endangering the fish

Mortality Time of *Argulus* sp.

The mortality time of *Argulus* sp. indicates the speed of action of noni fruit extract in killing the parasites. The research results demonstrate that the higher the dosage of noni fruit extract, the faster the time required to kill *Argulus* sp. tends to be.

The fastest mortality times occurred in treatments P3 and P4, indicating that dosages of 3% and 4% have higher effectiveness in accelerating parasite death. This is consistent with toxicological principles stating that an increase in the concentration of active substances will accelerate the occurrence of death in an organism. Amrianto *et al*. (2017) state that flavonoids in noni fruit are capable of altering aquatic environmental conditions, making them disruptive to the life of *Argulus* sp. This non-ideal condition is characterized by the disruption of the parasite's physiological balance due to bioactive compounds that are toxic or irritating; consequently, the parasite immediately detaches from the host and faces mortality. Compared to the study by Kismiyati *et al*. (2012), which identified a 3.5% dosage as the best treatment, this study shows that dosages of 3% and 4% were able to accelerate the mortality time of the parasites thus, a higher dosage indeed results in a faster mortality time

Number of *Argulus* sp. Mortality

The highest mortality of *Argulus* sp. was achieved in treatment P2, with a 100% mortality rate, followed by other treatments with mortality rates of 98.67% and 100%. This proves that noni fruit extract is effective in killing *Argulus* sp. Flavonoid compounds in noni fruit possess antiparasitic properties by disrupting the nervous and physiological systems of *Argulus* sp. (Indrawati, 2014). Furthermore, the saponin content is toxic to cold-blooded animals, including crustaceans such as *Argulus* sp. Saponins work by damaging the parasite's cell membranes, thereby causing mortality.

Amrianto *et al*. (2017) state that flavonoids in noni fruit are capable of altering aquatic environmental conditions, making them non-ideal for the life of *Argulus* sp. This non-ideal condition is characterized by the disruption of the parasite's physiological balance due to bioactive compounds that are toxic or irritating consequently, the parasite immediately detaches from the host and faces mortality. The alizarin and acubin content in noni fruit also plays a negative role in the growth and survival of pathogenic organisms (Wicaksono, 2013). At a 4% dosage, mortality slightly decreased to 94.67%. This could be caused by a very high toxic effect, causing the parasites to detach quickly from the fish and die at the bottom of the container; however, some parasites might be protected by fish mucus or be located in corners of the container that are less exposed. Nevertheless, statistically, the mortality in P2, P3, and P4 did not differ significantly, showing that a 2% dosage is already effective enough to achieve a mortality rate above 98%.

Prevalence of *Argulus* sp.

The prevalence of *Argulus* sp. infestation decreased drastically along with the increase in noni fruit extract dosage. At P1, the prevalence remained high at 72%, but it decreased at P2 and reached 0% at P3. This decrease indicates that noni fruit extract is capable of eliminating parasites from the fish population.

Flavonoid and saponin compounds in noni fruit work by creating aquatic environmental conditions that are uncomfortable for *Argulus* sp., causing the parasites to detach themselves from the fish's body (Amrianto *et al*., 2017). If the parasites remain in waters containing noni extract, bioactive compounds will enter the parasite's body through diffusion or while the parasite is moving, subsequently disrupting its metabolic and nervous systems, leading to mortality.

These results are in line with the research by Rahmatullah *et al*. (2012), which found that a 4% dosage of noni fruit extract was able to detach the ectoparasite Lernaea from goldfish (*Carassius auratus*). Research by Putriningtias *et al*. (2022) also stated that the best dosage of fruit extract of noni to influence the detachment of *Argulus* sp. in fish is 4.5 ml/L. In this study, a 2% dosage was already sufficient to suppress the prevalence to 4%, while the 3% dosage reached 0%.

Intensity of *Argulus* sp.

The intensity of infestation reflects the number of parasites per infected fish. At P1, the intensity reached 1.63 parasites/fish, whereas at P2 it decreased to 0.20 parasites/fish, and at P3 it reached 0. This indicates that besides reducing the number of infected fish, noni fruit extract is also capable of reducing the parasite load on the fish that remain infected.

The alkaloid content in noni fruit plays a crucial role as an antiparasitic. Alkaloids function by disrupting the nervous and physiological functions of *Argulus* sp., causing the parasites to become weak and detach themselves from the host (Indrawati, 2014). Phenolic compounds in noni also contribute as antimicrobials and antiparasitics that strengthen the control effect against *Argulus* sp. (Yuharmen *et al*., 2018).

The low intensity at dosages of 2% and above indicates that noni fruit extract not only repels but also kills the parasites, resulting in a drastic reduction in the parasite population. At P3, no parasites were found at all, demonstrating total effectiveness. However, it should be noted that at the 3% dosage, there was a decrease in fish survival rate; therefore, the 2% dosage becomes the preferred choice because it is capable of suppressing the intensity to 0.20 parasites/fish without endangering the fish.

Water Quality

Water quality is an important factor that supports the survival and health of fish during the study. Measured water quality parameters include temperature, pH, and dissolved oxygen (DO). Measurement results show that the water quality conditions during the study were within a range suitable for common carp maintenance.

Water temperature during the study ranged between 26.80–27.25°C, with an average of 27.02–27.10°C across all treatments. This temperature range is still within the optimal range for common carp life. According to Gurdi (2016), a good temperature for common carp cultivation ranges between 25–30°C. Stable temperature during the research supports the fishs metabolic processes and did not become a limiting factor affecting the research results.

The pH values during the study ranged between 6.85–7.10, with an average of 6.90–7.00. This pH range is classified as neutral and suitable for common carp maintenance. Wihardi *et al*. (2014) states that a good pH value for maintaining common carp ranges from 6.5–8.5. The stable pH during the study indicates that the addition of noni fruit extract did not significantly change the water acidity levels in a way that could harm the fish.

Dissolved oxygen content during the study ranged between 6.20–6.55 mg/L, with an average of 6.34–6.38 mg/L. This dissolved oxygen level is considered high and sufficient for the needs of common carp. Wihardi *et al*. (2014) states that a good dissolved oxygen level for

common carp growth is >4 mg/L. These high DO values were supported by the use of aeration in each aquarium throughout the study.

Overall, the water quality parameters during the study were within ranges that support the life of common carp. This indicates that the fish mortality occurring in treatments P3 and P4 was more likely caused by the effects of the toxic effects of high-dose noni fruit extract, rather than poor environmental conditions. Matondang *et al*. (2022) emphasized that good water quality is essential for the growth and survival of aquatic organisms, and in this study, those conditions were met. Based on all observed parameters, treatment P2 (2% dose) showed the most optimal results. At this dose, fish survival remained at 100% (safe for the fish), *Argulus* sp. mortality reached 98.67% (highly effective at killing parasites), prevalence dropped to 4%, and intensity was only 0.2 individuals per fish. Although at P3 (3%) mortality reached 100% and prevalence was 0%, there was a decrease in fish survival to 68%, indicating toxic effects on the fish. Therefore, a 2% dose of noni fruit extract is recommended as the effective dose for controlling *Argulus* sp. in fish.

CONCLUSION

Based on the results of the research findings regarding the effect of noni fruit (*Morinda citrifolia*) extract on the control of *Argulus* sp. in common carp (*Cyprinus carpio*). The result of the tests conducted, it can be concluded that the best dosage is 2% for treatment. At this 2% dosage can be an alternative because it is able of killing 73% of Argulus within 48 hours and the use of noni fruit extract does not change water quality.

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REFERENCES

Amrianto, A., Mahasri, G., & Subekti, S. (2017). Potensi Perasan Buah Mengkudu (*Morinda citrifolia*) dalam Upaya Penanggulangan Infestasi *Lernaea* pada Ikan Mas Koki (*Carassius auratus*). *Journal of Aquaculture and Fish Health*, 6(1), 33–40.

Gurdi, R. (2016). Manajemen Kualitas Air dalam Budidaya Ikan. Bandung: Alfabeta. https://scholar.google.com/

Hamzah, Y. (2017). Identifikasi Infeksi Ektoparasit pada Ikan Mas (*Cyprinus carpio L*) di Perairan Waduk Darma Kabupaten Kuningan Provinsi Jawa Barat. *Jurnal Peyuluhan Perikanan dan Kelautan*, 11(2), 63-78. https://doi.org/10.31851/jipbp.v13i2.2434

Indrawati, D. (2014). Senyawa Saponin dan Efek Toksisitas pada Organisme Air. Surabaya: Airlangga University Press. https://scholar.google.com/

Karamcheti, S., Satyavati, D., Subramanian, N. S., Pradeep Kumar, C., & Sri Prashanthi, G. (2014). Chemoprotective Effect of Ethanolic Extract of *Morinda citrifolia* Against Cisplatin Induced Nephrotoxicity. *The Pharma Innovation Journal*, 3(1), 84–91.

Kismiyati, K., Ghazali, I., & Mahasri, G. (2012). Pemberian Perasan Buah Mengkudu (*Morinda citrifolia*) untuk Pengendalian Argulus pada Ikan Mas Komet (*Carassius auratus*). *Jurnal Ilmiah Perikanan dan Kelautan*, 4(1), 45–48. https://doi.org/10.20473/jipk.v4i1.11582

Kurniawan, B., & Aryana, W. F. (2015). Binahong (*Cassia alata* L.) as Inhibitor *Escherichia coli* Growth. *J Majority*, 4(4), 100–104. https://scholar.google.com/

Lester, R. (1984). A Review of Methods For Estimating Mortality Due to Parasites in Wild Fish Populations. Helgolander Meeresuntershucungen, 37, 53-64. https://doi.org/10. 1007/BF01989295

Mahasri, G. (2015). Prevalence and Survival Rate of Goldfish (*Cyprinus carpio*) Infected by Myxobolus Koi. *Jurnal Ilmiah Perikanan dan Kelautan*, 7(1), 61-66. https://doi.org/10. 20473/jipk.v7i1.11235

Matondang, M., Z, A., Irawan, H., & Yunanto, T. (2022). Analisis Kualitas Air pada Pemeliharaan Ikan dengan Sistem Resirkulasi. *Jurnal Ilmu Perikanan dan Kelautan*, 8(1), 45–53.. https://scholar.google.com/

Misganaw, K., & Getu, A. (2016). Review on Major Parasitic Crustacean in Fish. *Fisheries and Aquaculture Journal*, 7(3), 13–17. https://doi.org/10.4172/2150-3508.1000175

Putriningtias, A., Siregar, Y. A., & Komariyah, S. (2022). Pengaruh pemberian perasan buah mengkudu (*Morinda citrifolia*) untuk pengendalian *Argulus* sp. Pada Media Hidup Ikan Komet. Saintek Perikanan, 18(1), 7–12. https://doi.org/10.14710/ijfst.18.1.7-12

Rahmatullah, A., Mahasri, G., & Subekti, S. (2012). Potensi Perasan Buah Mengkudu (*Morinda citrifolia*) dalam Upaya Penanggulangan Infestasi *Lernaea* pada Ikan Mas Koki (*Carassius auratus*). *Journal of Aquaculture and Fish Health*, 1(2), 33–40. https://doi.org/10.20473/jipk.v4i1.11582

Saminathan, M., Rai, R. B., Dhama, K., Jangir, B. L., Suresh, S., Ranganath, G. J., Sophia, I., Karuppanasamy, K., Barathiraj, S., & Gopalakrishnan, A. (2018). Effect of *Morinda citrifolia* (Noni) Fruit Juice on Antioxidant, Hematological and Biochemical Parameters in N-Methyl-N-Nitrosourea (NMU) Induced Mammary Carcinogenesis in Sprague-Dawley Rats. *International Journal of Pharmacology*, 10(2), 109–119. https://doi.org/10.3923/ijp.2014.109.119

Setyaningsih, E., Kismiyati, & Subekti, S. (2019). The Effect of Noni Fruits (*Morinda citrifolia*) on Blood Profile of Fish Infected by Argulus. IOP Conference Series: Earth and Environmental Science, 236(1). https://doi.org/10.1088/1755-1315/236/1/012083

Supriatna, I. (2014). Budidaya Ikan Mas (*Cyprinus carpio*). Jakarta: Penebar Swadaya. https://scholar.google.com/

Wicaksono, A. (2013). *Daya Hambat Ekstrak Buah Mengkudu (Morinda citrofolia L.) Terhadap Pertumbuhan Bakteri Porphyromonas Gingivalis* (Skripsi), Universitas Airlangga. https ://repository. unair. ac. id/19005/

Wihardi, Y., Yusanti, I. A., & Haris, R. B. K. (2014). Feminisasi pada Ikan Mas (*Cyprinus carpio*) dengan Perendaman Ekstrak Daun-Tangkai Buah Terung Cepoka (*Solanum torvum*) Pada Lama Waktu Perendaman Berbeda. *Jurnal Ilmu-Ilmu Perikanan dan Budidaya Perairan*, 9(1), 23–28. http://dx .doi.org/10.31851/jibp.v9i1.338.

Yuharmen, Y., Eryati, R., & Nery, S. (2018). Senyawa Antimikroba dari Tanaman Obat untuk Pengendalian Penyakit Ikan. *Jurnal Perikanan dan Kelautan*, 23(1), 15–24. https://scholar.google.com/

Zhang, X. (2025). Prevalence of Foodborne Parasitic Infections in Aquatic Products in Shanghai (2022-2024). BMC Infectious Diseases. https://doi.org/10.1186/s12879.02511203