Fisheries Journal, 15 (3), 1069-1076 (2025)
http://doi.org/10.29303/jp.v15i3.1393

THE EFFECT OF NONI FRUIT (*MORINDA CITRIFOLIA L.*) TO REDUCE *LERNAEA* SP. ECTOPARASITES IN KOI FISH (*CYPRINUS CARPIO* KOI)

Pengaruh Perasan Buah Mengkudu (*Morinda citrofolia L.*) Untuk Menurunkan Ektoparasit *Lernaea* Sp. Pada Ikan Koi (*Cyprinus carpio* Koi)

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(Received January 26th 2025; Accepted May 20th 2025)

ABSTRACT

One of the challenges of growing Koi Fich is the attack, and the disease that usually attacks koi fish is anchor worm disease. This study aims to determine the effects and optimal doses of Lernaea and the optimal dose of noni fruit juice to release the Lernaea parasite that infects koi fish. The experimental method used a completely randomized design (CRD) with six treatment groups and four replications, namely A (0%) as a control. The main parameter observed was the release of Lernaea bound to koi fish after soaking the noni fruit juice. Data analysis Using ANOVA. The results showed the number of Lernaea released from treatment (0%) and B (1%) 0% (not released), C (2%) and D (3%) 6.25% (one loose learning) is E (4%) 12.5% (two loose learning AEA) and F (5%). Lerneaea from koi fish. The conclusion of this study was given treatment F (5%), or the optimal dose. Based on the research results, it is recommended that further tests be conducted to determine the optimal concentration (correct dosage) and soaking time of noni fruit to overcome Lernaea in koi fish.

Keywords: Cyprinus carpio koi, Lernaea, Morinda citrifolia

ABSTRAK

Salah satu tantangan budidaya ikan Koi adalah serangan, dan penyakit yang biasanya menyerang ikan koi adalah penyakit cacing jangkar. Penelitian ini bertujuan mengetahui efek dan dosis optimal *Lernaea* dan dosis optimal perasan buah mengkudu untuk melepaskan parasit *Lernaea* yang menginfeksi ikan koi. Metode percobaan menggunakan desain acak lengkap (RAL) dengan enam kelompok perlakuan dan empat ulangan, yaitu A (0%) sebagai kontrol. Parameter utama yang diamati adalah pelepasan *Lernaea* yang terikat pada ikan koi setelah merendam perasan buah mengkudu. Analisis data Menggunakan ANOVA. Hasil menunjukkan

jumlah *Lernaea* lepas perlakuan (0%) dan B (1%) 0% (tidak lepas), C (2%) dan D (3%) 6,25%(satu pembelajaran longgar) adalah E (4%) 12,5%(dua pembelajaran longgar AEA) dan F (5%). *Lerneaea* dari ikan koi. Kesimpulan dari penelitian ini diberikan pengobatan F (5%), atau dosis optimal. Berdasarkan hasil penelitian, disarankan agar tes lebih lanjut dilakukan untuk menentukan konsentrasi (dosis yang benar) dan dan lama waktu perendaman yang optimal buah mengkudu untuk menanggulangi *Lernaea* pada ikan koi.

Kata Kunci: *Cyprinus carpio koi, Lernaea, Morinda citrifolia*

INTRODUCTION

Koi fish (Cyprinus carpio koi) is a type of freshwater ornamental fish with high economic value both domestically and internationally. According to the Ministry of Maritime Affairs and Fisheries (2012), the export value of freshwater ornamental fish reached USD 58 million, equivalent to 19 million or IDR 178 billion. The high demand for koi fish (C. carpio) encourages farmers to increase their koi fishery breeding operations. In the cultivation process, larvae are the most important thing for the sustainability of existing cultivation, proper treatment is needed because they are vulnerable to food and the environment in koi fish larvae.

One of the obstacles to koi fish cultivation is the attack of a type of anchor worm parasite called Lernaea, This parasite is very easy to see with the eye, and is often outside the body of the koi fish or its gills. This parasite absorbs the fish's body until it makes it weak and thin and then causes death, this parasite grows rapidly. If koi fish are attacked and not treated immediately, it will cause other fish in the pond to be affected as well. (Setyani, 2022).

So far, the way to deal with fish parasites has been using formalin and CuSO4 chemicals. Excessive use causes side effects on fish and their environment (Afifah et al., 2014). Accumulation of chemicals in fish causes resistance to pathogens and pollutes the environment (Indriani et al., 2014). Therefore, alternative materials are needed to overcome this problem by interfering with natural content such as the use of plants. Some of the benefits of using plants as medicinal products are relatively safe, easy to store, cheap, no tolerance and relatively harmless (Rusmawan, 2010).

Therefore, the development of alternative medicines with minimal negative impacts is very much needed, an example of which is the noni fruit (Morinda citrifolia L.). Noni fruit, also known as Morinda citrifolia L., has long been used in traditional medicine thanks to its nutritional and therapeutic benefits. Noni fruit has the potential to modulate the immune response and relieve inflammatory reactions indicating its possible role in supporting immune system function and reducing inflammatory conditions (Januar, 2023). Chemical and nutritional studies have shown the presence of more than 200 phytochemical compounds in noni fruit, including tannins, flavonoids, and phenolic compounds known for their various bioactive activities (Almeida, 2019). Research on phytochemicals in noni juice has successfully identified and quantified tannins such as scoporetin, rutin, and quercetin which show significant relationships with health benefits. Noni also contains alkaloids which are a group of organic compounds, can be very toxic and some can be used as medicine and as botanical insecticides (Asiseh, 2020). In addition, testing the antioxidant and antibacterial potential of

various types of fruit after undergoing biotransformation induced by tannins, shows how important tannins are in various fruits and the possible health benefits they produce.

The purpose of this study was to identify the effectiveness of noni fruit extract to control fish parasitic infections. Ectoparasite Learnea sp koi Objects infected with koi fish (Cyprinus carpio Koi). The results of this study are expected to provide information on the dosage used to reduce the value of parasite infection and the content of active connections that play a role.

METHODS

Place and Time

This research was conducted from June 1 to June 30, 2024 at the Fish Quarantine Center Laboratory for Quality Control and Quality Safety in Surabaya.

Tools and Material

This study utilized devices such as four aquariums with dimensions of 60x40x50 cm3, a 500ml beaker, a 50ml measuring instrument, a ruler, an aerator, a scoop, and instruments to check water quality (thermometer, DO kit, pH paper) and a filter cloth. On the other hand, the materials used included 25 ripe mengkudu fruits, 24 koi fish measuring between 9-11 cm in length and infected with the Lernaea parasite, and fish feed.

Method

The method used is an experimental method, which according to Sugiyono (2017) is a method used to find the effect of certain treatments on others under controlled conditions. In this case, the experimental method used was a completely randomized experimental design (CRD) with 4 treatments. Treatment A without mengkudu juice (0%) As a control, B used mengkudu juice with a concentration of 1%, C used mengkudu juice with a concentration of 2%, D used mengkudu juice with a concentration of 3%, E used mengkudu juice with a concentration of 4% and F used mengkudu juice with a concentration of 5%, The placement of each experimental unit was determined randomly in 24 research containers. The determination of the concentration was based on previous research conducted by Rohmatullah, 2012.

Research Procedures

The aquarium and aeration that will be used for the study were cleaned first and then the aquarium was aired for half a day with the aim of killing any germs that might still be attached from previous activities. The test animals used were koi fish (Cyprinus carpio koi) weighing around 9-11 g/tail obtained from koi fish breeders in the city of Blitar with complete organ conditions and infested with Lernaea parasites. Koi fish (Cyprinus carpio koi) were accustomed to the container that was previously prepared through a ventilation process and adapted one day before treatment was carried out.

The juice from the noni fruit was made by selecting ripe fruit (which was whitish green, soft, and aromatic). The fruit was then grated and wrapped in a clean filter cloth, after which it was squeezed and the juice was collected in a clean glass bottle. The juice from the noni fruit with a concentration of 100% must be diluted according to the desired concentration, by multiplying the desired concentration (%) by the amount of initial juice (ml). Koi fish infected

with Lernaea were soaked in a solution of noni fruit juice with different concentrations of 0% (control), 1%, 2%, 3%, 4% and 5% in 3000ml of water. Observation of the release of Lernaea was carried out for 60 minutes.

Research parameters

Water quality is one of the most important factors that must be considered during research, and is the main factor for fish survival. In this study, the water quality observed included Temperature, Dissolved Oxygen (DO) and acidity (pH). If the temperature in the media is unstable, it will cause stress to the fish and cause fish death (Ridwantara, 2019). According to Sa'adah, (2023) the acidity in waters can be an indicator to state the good or bad quality of waters. The most optimal dissolved oxygen value of water for the growth and development of farmed fish is 2-6 ppm (Padli, 2021). Water quality measurements were carried out before and after the study.

Data Analysis

Analysis of variation (ANOVA) was conducted to determine whether the administration of noni fruit juice with different concentrations had a significant effect on the release of Lernaea from koi fish, so the Kruskal-Wallis test was conducted because the test data was not normally distributed. Continue the Duncan test on each treatment by comparing F with the calculated F.

RESULT

Observation results on the Effect of Noni Juice to Reduce Ectoparasites Lernaea sp on Koi Fish (Cyprinus carpio koi), by calculating a large number of Lernaea. After receiving data on the number of Lernaea, an ANOVA test was run. Based on the results of the ANOVA test and further tests from Duncan, we show that there are things that affect the use of different doses of noni juice on the number of parasites released on koi fish. The number of Lernaea released is shown in Graph 1 and the results of the Duncan test are presented in Table 1.

Table 1. Average number of Lernaea releases

Treatment	Range of Number of Lernaea Releases (tail)	Average Number of Releases of Lernaea (tail)	Standard Deviation (sd)
A : 0%	0	0	0
B : 1 %	0	0	0
C : 2%	0-1	0,25000	0,50000
D : 3%	0-1	0,25000	0,50000
E : 4%	0-2	0,50000	0,57735
F : 5%	0-3	0,7500	0,50000

Figure 1. Graph of the number of Lernaea releases

Table 2. Results of the Kruskal-Wallis test

	Number of Parasites released
Kruskal-wallis H	7.924
Df	5
Asymp. Sig	0.160

Based on the results of the Kruskal-Wallis test, F count > 0.05, it can be concluded that there is an effect of using different doses on the number of parasites released in koi fish. Because the results of F count > F table, further testing is needed, namely multiple comparisons with the Duncan test.

Table 3. Duncan test results

Treatment	N	Subset for alpha = 0.05	
		1	2
Dose A	4	0.0000	
Dose B	4	0.0000	
Dose C	4	0.2500	0.2500
Dose D	4	0.2500	0.2500
Dose E	4	0.5000	0.5000
Dose F	4		0.7500
Sig.		0.150	0.143

DISCUSSION

Treatment A without giving noni fruit juice resulted in the release of 0 Lernaea, as well as treatment B with a dose of 1% noni fruit juice did not result in the release of Lernaea. Treatment C with a dose of 2% noni fruit juice resulted in the release of 1 Lernaea from the total number of Lernaea attached to the koi fish or 6.25%. Likewise, treatment D with a dose

of 3% noni fruit juice also resulted in the release of 1 Lernaea from the total number of Lernaea attached to the koi fish or 6.25%. While treatment E with a dose of 4% noni fruit juice resulted in a greater effect on the release of Lernaea compared to treatments B, C and D, namely 2 from the total number of Lernaea attached to the koi fish or 12.5%. And treatment F with a dose of 5% noni fruit juice gave an effect on the release of 3 Lernaea from the total number of Lernaea attached to the koi fish or 18.75%. Thus it can be explained that treatment F with a dose of 5% gave the highest effect on the release of Lernaea on koi fish compared to treatments A, B, C, D and E.

The higher the dose of fruit, the higher the effect will develop on koi fish. This is based on the iridoid substance proxeronine, and xeronine is one of the most important alkaloids found in noni. Alkaloids contain toxins that protect plants from insects and herbivores as well as growth factors in some cases are antibacterial substances (Ghazali, 2011). The toxic effects caused by this alkaloid mainly attack the respiratory system. One of the important alkaloids in fruit is xeronine but contains a lot of precursors (precursors) of xeronine aka proxeronine in large quantities (Bangun and Sarwono, 2002). In addition, flavonoids are also able to inhibit the cell growth process by damaging the nucleus of parasitic cells and are able to interfere with transport in cell membranes, increase permeability and damage membrane potential, and interfere with ATP production so that parasitic cells cannot develop properly (Ningsih and Advinda, 2023).

Based on the results of research on koi fish, there is an effect of treatments A, B, C, D, E and F with different concentrations of noni fruit juice. This section explains that giving noni fruit juice at concentrations of 0%, 1%, 2%, and 3% is less effective for (releasing) Lernaea with a soaking time of 60 minutes, because 6.25% of Lernaea is released from the fish's body. While the concentration of 4% in treatment E and 5% in treatment F showed good results for making the alkaloid and xeronine content react at a soaking time of 60 minutes and can release Lernaea up to 18.75%.

In this study, ripe noni fruit was used with the characteristics of white or yellowish white fruit with a hard fruit flesh texture. This is because the scopoletin content in noni fruit increases with increasing ripeness. This means that the riper the fruit, the higher the scopoletin content..

Scopoletin itself is a chemical compound found in noni fruit (Morinda citrifolia) which functions to inhibit smooth muscle and nerve function, in this case inhibiting the function of Lernaea and koi nerves. However, to avoid fish death, the optimal soaking time for releasing Lernaea from koi fish is 60 minutes, because the soaking time of more than 60 minutes in goldfish based on Rohmatullah's 2012 research causes goldfish to die. This research is the author's reference in this study because goldfish and koi fish are still in the same family. Scopoletin can also increase the activity of the peneal glands which can produce serotonin in the brain (Bijanti, 2003). Serotonin is one of the contents contained in platelet granules and acts as a neurotransmitter/nerve signal in the brain and a precursor to the hormone melatonin. In addition, serotonin is a chemical compound that inhibits nerve function so that it can cause vasoconstriction (narrowing of blood vessels) in the heart and brain membranes. Vasoconstriction caused by serotonin can inhibit Lernaea's nutrient intake in its host so that Lernaea will release its grip on its host.

Water quality is one of the important factors in the study. Water quality was measured before and after to determine the changes that occurred due to the addition of mengkudu juice. The parameters measured during the study were temperature, pH and DO. The administration of mengkudu juice was given in several mL and did not have a significant impact and still supported koi fish farming activities. In koi fish farming activities, good temperatures start from 15-25oC (Esther and Sipayung, 2010) while in the study the temperature value ranged from 26-28 oC. The recommended pH range for koi fish is usually 7.0 - 8.5 (Kumparan, 2023) while the results obtained an average pH value of 7. The concentration of dissolved oxygen that is good for koi fish is in the range of 5.9-6.9 mg / L (Sutiana et al, 2017) and in the study the results were 8-10 mg / L. The higher the dissolved oxygen content in the water, the better it is for cultivation purposes (Mas'ud, 2011).

CONCLUSION

Based on research on the impact of mengkudu (Morinda citrifolia L) in reducing ectoparasites Lernaea sp. on koi fish, it can be concluded that the use of different levels of mengkudu fruit extract affects the release of Lernaea sp. on koi fish. The most effective dose was found in treatment F with a concentration of 5% mengkudu fruit extract, which successfully released 3 individuals of Lernaea sp. The water quality during the study showed satisfactory results and was within the appropriate range for the life and growth of koi fish, with temperatures ranging from 26-28 degrees Celsius, pH around 7, and dissolved oxygen levels of 8-10 ppm.

ACKNOWLEDGEMENT

The author would also like to express his gratitude to the parents, head and team leader at the Surabaya Quarantine Center who provided permission and support for this research.

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