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THE EFFECT OF KETAPANG (*Terminalia catappa*) LEAF EXTRACT DOSAGE ON THE SURVIVAL RATE OF 5–7 CM STRIPED CATFISH (*Pangasius pangasius*) FINGERLINGS INFECTED WITH *Edwardsiella tarda*

Pengaruh Dosis Ekstrak Daun Ketapang (*Terminalia catappa*) Terhadap Tingkat Kelangsungan Hidup Benih Ikan Patin (*Pangasius pangasius*) Ukuran 5-7 cm yang Diinfeksi Bakteri *Edwardsiella tarda*

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ABSTRACT

Pangasius cultivation is an important aquaculture sector in Indonesia. However, intensification programs are often accompanied by increased vulnerability to disease. One disease that frequently occurs in pangasius cultivation is the systemic bacterial disease Motile Edwardsiella Septicemia (MES), also known as Edwardsiellosis. This disease is caused by infection with the bacterium *Edwardsiella tarda* and causes mortality of 5-7 cm pangasius fry ranging from 80-95% for 2-8 weeks. Treating fish diseases using chemicals can trigger new problems, such as antibiotic residues, bacterial resistance, and environmental pollution. A widely developed strategy utilizes herbal ingredients as immunostimulants and antibacterial agents, one of which is extract of ketapang (*Terminalia catappa*) leaves. This study aims to determine the effect of the dose of ketapang leaf extract on the survival rate of 5-7 cm pangasius fry infected with *Edwardsiella tarda* bacteria. This study used an experimental method with a Completely Randomized Design (CRD) consisting of 5 treatments and 5 replications. This study used different doses of ketapang leaf extract. Treatment A; Ketapang leaf extract dose of 100 mg/L, Treatment B; Ketapang leaf extract dose of 200 mg/L, Treatment C; Ketapang leaf extract dose of 300 mg/L, Treatment D; Ketapang leaf extract dose of 400 mg/L, Treatment E; Ketapang leaf extract dose of 500 mg/L. The test animals used catfish seeds measuring 5-7 cm with an average weight of 3.5 g/tail. The stocking density was 3 tails/L, the experimental media used fresh water with a volume of 3 L/container. The results showed that treatment C gave the best results on the survival rate of 5-7 cm catfish seeds of 93.33%.
Keywords: 5-7 cm Catfish Fry, Dosage, Ketapang Leaf Extract, Survival Rate

ABSTRAK

Budidaya ikan patin (*Pangasius pangasius*) merupakan salah satu sektor akuakultur yang penting di Indonesia. Namun, program intensifikasi seringkali diiringi dengan meningkatnya kerentanan terhadap serangan penyakit. Salah satu penyakit yang sering timbul dalam budidaya

ikan patin adalah penyakit bakterial sistemik *Motile Edwardsiella Septicemia* (MES) atau dikenal dengan *Edwardsiellosis*. Penyakit ini disebabkan oleh infeksi bakteri *Edwardsiella tarda* dan menyebabkan mortalitas benih ikan patin berukuran 5-7 cm berkisar 80-95% selama 2-8 minggu. Pengobatan penyakit ikan menggunakan bahan kimia dapat memicu masalah baru, misalnya residu antibiotik, resisten bakteri dan pencemaran lingkungan. Strategi yang banyak dikembangkan dengan cara memanfaatkan bahan herbal sebagai imunostimulan dan agen antibakteri, salah satunya ekstrak daun ketapang (*Terminalia catappa*). Penelitian ini bertujuan untuk mengetahui pengaruh dosis ekstrak daun ketapang terhadap tingkat kelangsungan hidup benih ikan patin ukuran 5-7 cm yang diinfeksi bakteri *Edwardsiella tarda*. Penelitian ini menggunakan metode eksperimental dengan Rancangan Acak Lengkap (RAL) terdiri 5 perlakuan dan 5 kali ulangan. Penelitian ini menggunakan perlakuan dosis ekstrak daun ketapang yang berbeda. Perlakuan A ; dosis ekstrak daun ketapang 100 mg/L, perlakuan B ; Dosis ekstrak daun ketapang 200 mg/L, perlakuan C ; Dosis ekstrak daun ketapang 300 mg/L, Perlakuan D ; Dosis ekstrak daun ketapang 400 mg/L, Perlakuan E ; Dosis ekstrak daun ketapang 500 mg/L. Hewan ujinya menggunakan benih ikan patin ukuran 5-7 cm dengan berat rata-rata 3,5 g/ekor. Jumlah padat tebar 3 ekor/L, media percobaan menggunakan air tawar dengan volume 3 L/wadah. Hasil penelitian menunjukkan perlakuan C memberikan hasil terbaik terhadap tingkat kelangsungan hidup benih ikan patin ukuran 5-7 cm sebesar 93,33 %.

Kata Kunci: Dosis, Estrak Daun Ketapang, Benih Ikan Patin Ukuran 5-7 cm, Tingkat Kelangsungan Hidup

INTRODUCTION

Pangasius pangasius is a freshwater fishery commodity with high economic value and is intensively farmed in Indonesia. As a protein source, pangasius offers several fundamental advantages: the protein content of fresh pangasius is reported to range from 15-18%. This protein is considered complete because it contains all the essential amino acids the body needs, with a balanced amino acid profile (Utami et al., 2019). Intensification of cultivation is often accompanied by increased susceptibility of fish to disease. One disease that frequently occurs in pangasius cultivation is the systemic bacterial disease Motile Edwardsiella Septicemia (MES), commonly known as Edwardsiellosis. MES is caused by an infection by the bacterium *Edwardsiella tarda* (Kartikaningsih et al., 2018).

Fish disease control generally still relies on the use of antibiotics. However, excessive and uncontrolled use of antibiotics can lead to resistance in pathogenic bacteria and antibiotic residues in the aquatic environment (Setyowati et al., 2014). Therefore, effective, safe, and environmentally friendly alternatives for controlling fish diseases are needed.

The use of natural plant ingredients as antibacterial and immunostimulant agents is one approach widely developed in sustainable aquaculture. Ketapang leaves (*Terminalia catappa*) are known to contain bioactive compounds such as flavonoids, tannins, saponins, and triterpenoids, which have antibacterial activity against various fish-pathogenic bacteria. Various ketapang plant extracts can be used as antibacterial, antifungal, anti-inflammatory, anticancer, and antioxidant agents (Herli & Wardaniati, 2019).

Research conducted by Maryani et al. (2021) demonstrated that ketapang leaf extract effectively inhibited the growth of *E. tarda* in vitro. These compounds not only work by directly inhibiting bacterial growth but also by enhancing the non-specific immune response in fish. Kartikaningsih et al. (2018) noted the advantage of ketapang leaf extract in that it does not cause stress and can be applied through immersion.

However, the effectiveness of ketapang leaf extract as a therapeutic agent is not linear, but is highly dependent on the concentration or dosage used. Therefore, determining the optimum dose of ketapang leaf extract is very important to obtain maximum protective effects

on the survival rate of 5-7 cm catfish (*Pangasius pangasius*) seeds infected with *Edwardsiella tarda* bacteria.

METHODS

Research Location and Time

This research was conducted at the Laboratory of the Animal, Fish, and Plant Quarantine Agency of East Java. The study was conducted over 15 days, from November 1, 2025, to November 15, 2025.

Equipment and Materials

The equipment used in this study included a 30x30x60cm aquarium, a 5L plastic jar, an aerator, a pH meter, a DO meter, a scoop, calico cloth, a blender, a hotplate, a beaker, a measuring cylinder, a scale, a test tube, a BSC, an incubator, a colony counter, an eyepiece needle, a Petri dish, a micropipette, a microtip, and an autoclave. Materials used in this study included 5-7cm catfish fingerlings, almond leaves, *Edwardiella tarda* bacteria, fresh water, TSA media, biochemical test media, physiological NaCl, Gram stain reagent, and distilled water.

Research Methods

This study employed an experimental method, employing a Completely Randomized Design (CRD) with 5 treatments and 5 replications. According to Putra et al. (2022), the following concentrations were used for the treatment:

a) Treatment A: Ketapang leaf extract dose of 100 mg/L
b) Treatment B: Ketapang leaf extract dose of 200 mg/L
c) Treatment C: Ketapang leaf extract dose of 300 mg/L
d) Treatment D: Ketapang leaf extract dose of 400 mg/L
e) Treatment E: Ketapang leaf extract dose of 500 mg/L

Research Procedures

Before the study began, all containers were washed with detergent, rinsed with fresh water, and dried. The containers were then filled with 3 liters of water and aerated. Test animals exposed to *Edwardsiella tarda* bacteria were transferred to all containers at a stocking density of 9 animals per jar. Ketapang leaf extract was dissolved in each research medium using the appropriate dosage for each treatment, with a 1-hour soaking time. After the soaking period, the water in the research container was 100% replaced with fresh water and the animals were maintained for 7 days. Clinical signs and mortality rates were observed throughout the study. Feeding was carried out four times daily. Water quality, including temperature, pH, and dissolved oxygen, was measured three times daily. At the end of the study, the number of surviving animals in each treatment and replication was counted and recorded.

Data Analysis

This study used a one-way analysis of variance (ANOVA) with the following conditions:

a) If the calculated F value is <5%, H0 is accepted; H1 is rejected, and the treatment is declared to have no significant effect, and no further LSD testing is performed.
b) If the F-value is 1% > F-value calculated > 5%, then H1 is accepted and H0 is rejected, indicating that the treatment has a significant effect.
c) If the F-value calculated > F-value calculated 1%, then H0 is rejected, while H1 is accepted, indicating that the treatment has a very significant effect.

If the analysis of variance (ANOVA) results indicate a significant or highly significant effect, a Least Significant Difference (LSD) or LSD (Least Significant Difference) test is performed.

Survival Rate

To calculate the survival rate of 5-7 cm catfish fry during the rearing period, the following formula is used (Effendi, 1997 in Gusrina, 2020):

$$SR = \frac{Nt}{No} x100\%$$

Where:
SR = Survival rate of test animals (%)
N_t = Number of test animals at the end of the study (fish)
N_0 = Number of test animals at the beginning of the study (fish)

RESULTS

Based on the results of a study on the effect of ketapang leaf extract (*Terminalia catappa*) doses on the survival rate of 5-7 cm catfish (Pangasius pangasius) fry infected with *Edwardsiella tarda* bacteria, the average survival rate varied between treatments, as shown in Table 1 below.

Table 1. Range, Average, and Standard Deviation of Survival Rate of 5-7 cm Catfish Fry Infected with *Edwardsiella tarda* Bacteria for Each Treatment

Treatment	Survival Rate Range for Catfish Seeds Measuring 5-7 cm (%)	Average (%)	Standard Deviation (sd)
A	22.22 – 33.33	26.67	6.09
B	33.33 – 44.44	37.78	6.09
C	88.89 – 100.00	93.33	6.09
D	55.56 – 66.67	60.00	6.09
E	44.44 – 55.56	48.89	6.09

Based on Table 1 above, treatment C showed the highest average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria. Treatments D and E, respectively, showed a decreasing average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria. Meanwhile, treatments B and A, respectively, showed the lowest average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria. Figure 1 below presents a graph of the average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria for each treatment.

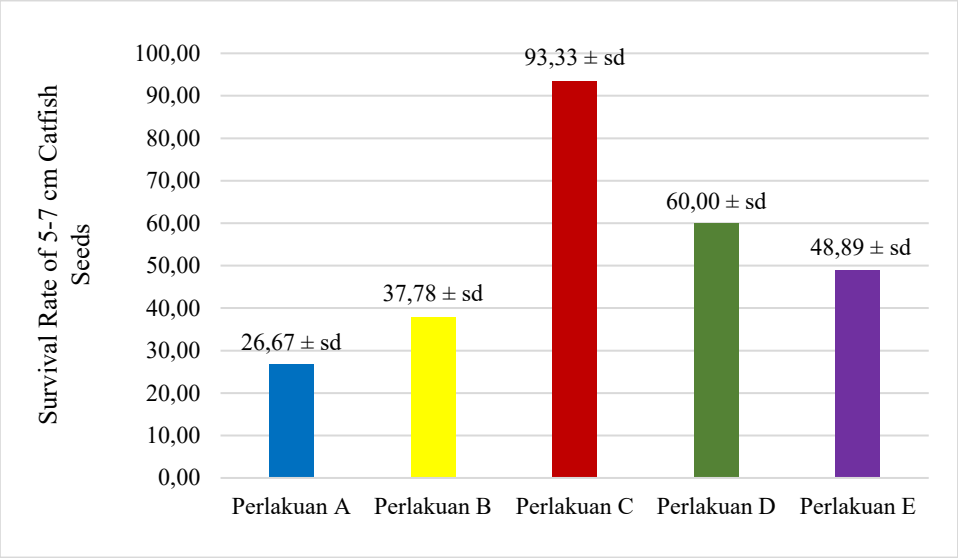

Figure 1. Graph of the Average Survival Rate for 5-7 cm Catfish Fry Infected with *Edwardsiella tarda* Bacteria for Each Treatment

To determine whether there were significant differences between treatments, a one-way ANOVA test was conducted, the results of which are shown in Table 2 below.

Table 2. One-way ANOVA Test of the Survival Rate of 5-7 cm Catfish Fry Infected with *Edwardsiella tarda* Bacteria

	Sum of squares	Df	Mean square	F	Sign.
Between Groups	13088.292	4	3272.073	88.332	0.001
Within Groups	740.859	20	37.043		
Total	13829.151	24			

Based on Table 2 above, it can be seen that the dose of ketapang leaf extract significantly affected the survival rate of 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria ($P < 0.05$). Furthermore, to determine the level of difference between each treatment on the survival rate of 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria, a 5% LSD test was conducted. The average and notation of the survival rate of 5-7 cm catfish fry infected with *Edwardsiella tarda* bacteria can be seen in Table 3 below.

Table 3. Average and Notation of the Survival Rate of 5-7 cm Catfish Fry Infected with *Edwardsiella tarda* Bacteria

Treatment	N	Subset for alpha = 0,05				
		1	2	3	4	5
A	5	26.66[a]				
B	5		37.77[b]			
E	5			48.89[c]		
D	5				60.00[d]	
C	5					93.33[e]

Based on Table 3 above, it can be explained that treatment A was significantly different from treatments B, E, D, and E. Furthermore, treatment B was significantly different from treatments E, D, and C. Meanwhile, treatment C was significantly different from treatments D and C, and likewise, treatment D was significantly different from treatment C.

Water quality data obtained showed water temperature ranging from 27.8 to 28.7^{0}C, acidity levels ranging from 6.9 to 7.8, and dissolved oxygen ranging from 6.29 to 6.69 ppm.

DISCUSSION

Treatment C provided the highest average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda*. Ketapang leaf extract in treatment C had the most optimal protective or therapeutic effect, resulting in antibacterial properties, increased immunostimulant activity in test animals without causing physiological stress, and acted as a natural chemotherapeutic agent. Ketapang leaf extract not only killed some *E. tarda* but also mobilized the host's defense system to effectively clear residual infection and ensure optimal recovery (Muahiddah & Sumsanto, 2023).

Compared to treatment C, treatments D and E showed a progressively lower average survival rate for 5-7 cm catfish fry infected with *Edwardsiella tarda*. The ketapang leaf extract in treatments D and E used excessive doses (overdose), making it toxic to test animals. According to Che Harun et al. (2022), excessive amounts of phenolic compounds and tannins can irritate the gills, disrupt ionic balance (Na^+, K^+, Cl^-), reduce respiratory efficiency, and increase toxicity. Furthermore, they can cause physiological stress, increase the activity of oxidative stress enzymes, and weaken the fish's immune system (Hidayat et al., 2021).

Compared to treatments C, D, and E, treatments B and A showed the lowest average decrease in survival rates of 5-7 cm catfish fry infected with *Edwardsiella tarda*. Ketapang leaf extract in treatments B and A used lower doses, thus not providing a significant therapeutic effect. The use of low doses of ketapang leaf extract resulted in insufficient active compounds such as flavonoids, phenolics, and tannins to reach the Minimum Inhibitory Concentration (MIC) against *E. tarda* bacteria. As a result, its antibacterial function is not optimal, allowing *E. tarda* bacteria to continue to multiply and cause systemic infections in the test animals' tissues. According to Murwantoko et al. (2019), if the dose of ketapang leaf extract is insufficient to suppress the bacterial population or does not sufficiently stimulate the fish's non-specific defense mechanisms, the infection will persist and the survival rate will remain low. Using low doses of ketapang leaf extract is ineffective at killing *E. tarda* bacteria, and the fish's immune system remains weakened (Suhartono & Budiarso, 2019).

Throughout the study, water quality remained relatively homogeneous and within the normal range tolerated by 5-7 cm catfish fry. Water temperature during the study ranged from 27.8 to 28.7°C, a range still within normal limits. The optimal temperature for the growth and survival of catfish fry is 27-30°C (National Standardization Agency, 2009).

The acidity level during the study ranged from 6.9 to 7.8, a range still within normal limits. According to Effendi (2004), the optimal pH range for the survival of catfish fry is between 6.5 and 8.0.

Dissolved oxygen levels during the study ranged from 6.29 to 6.69 ppm, a range still within normal limits. Kordi (2013) believes that the tolerable dissolved oxygen content for catfish fry is 2-7 ppm.

CONCLUSION

Administration of ketapang (*Terminalia catappa*) leaf extract significantly affected the survival rate of catfish fry infected with *Edwardsiella tarda*. The optimal dose in this study was 300 mg/L, which resulted in the highest survival rate. During the study, temperature, pH, and dissolved oxygen were within optimal ranges and homogeneous, thus not affecting the survival rate of 5-7 cm catfish fry infected with *Edwardsiella tarda*.

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REFERENCES

Austin, B., & Austin, D. A. (2016). *Bacterial fish pathogens: Disease of farmed and wild fish* (6th ed.). Springer.

Badan Standardisasi Nasional. (2009). *Produksi benih ikan patin siam (Pangasius hypophthalmus) kelas benih sebar*. Badan Standardisasi Nasional.

Che Harun, N. S., Zulkifli, S. Z., Ahmad, S. A., & Ariffin, M. M. (2022). Phenolic content of *Terminalia catappa* L. leaf and toxicity evaluation on red hybrid tilapia (*Oreochromis* sp.). *Toxicology Reports, 9*, 1742–1751.

Effendi, M. I. (2004). *Telaah kualitas air bagi pengelolaan sumber daya dan lingkungan perairan*. Kanisius.

Gusrina. (2020). *Budidaya ikan sistem bioflok*. Deepublish.

Herli, M. A., & Wardaniati, I. (2019). Skrining fitokimia ekstrak etanol dan fraksi daun ketapang yang tumbuh di sekitar Universitas Abdurrab, Pekanbaru. *Journal of Pharmacy and Science, 2*(2), 38–42.

Hidayat, R., Syahrul, F., & Ningsih, T. (2021). Pengaruh konsentrasi ekstrak tanaman obat terhadap respon fisiologis ikan air tawar. *Jurnal Akuakultur Indonesia, 20*(3), 145–156.

Kartikaningsih, H., Rosdiana, R., & Anggraeni, D. T. (2018). Analisis kelayakan finansial usaha pembesaran ikan patin (*Pangasius hypophthalmus*) di Desa Karanganyar Kabupaten Cirebon. *Jurnal Ilmiah Mahasiswa, 7*(2), 1–12.

Kementerian Kelautan dan Perikanan. (2014). *Keputusan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 19/Permen-KP/2014 tentang standar operasional prosedur pembenihan ikan patin (Pangasius sp.) yang baik*. Kementerian Kelautan dan Perikanan.

Kordi, M. G. H. (2013). *Panduan lengkap memelihara ikan air tawar di kolam terpal*. Lily Publisher.

Kurniawan, A., Sari, D. W., & Pratama, R. I. (2024). The impact of pH fluctuation on physiological stress and growth performance of striped catfish (*Pangasianodon hypophthalmus*) fingerlings. *Aquaculture Research, 20*(24), 1–9.

Kusriningrum. (2010). *Dasar rancangan percobaan dan rancangan acak lengkap*. Universitas Airlangga.

Maryani, S. S., Monalisa, & Panjaitan, R. S. (2020). Efektivitas ekstrak daun ketapang (*Terminalia catappa*) dalam menghambat pertumbuhan bakteri *Edwardsiella tarda* pada uji *in vitro*. *Jurnal Perikanan dan Kelautan, 10*(2), 196–208.

Muahiddah, N., & Sumsanto, B. (2023). Pemberian ekstrak daun ketapang untuk meningkatkan imun non-spesifik pada ikan. *Jurnal Penelitian Perikanan dan Kelautan, 7*(1), 12–21.

Murwantoko, M., Triyanto, T., Pratiwi, D., & Dewi, N. N. (2019). Isolation, characterization and pathogenicity of *Edwardsiella tarda* as a causative disease on freshwater fish in Yogyakarta. *Jurnal Perikanan Universitas Gadjah Mada, 21*(1), 33–40.

Nuryati, S. (2021). Efektivitas dosis ekstrak daun ketapang (*Terminalia catappa*) dalam menekan pertumbuhan bakteri *Vibrio harveyi* pada udang vaname (*Litopenaeus vannamei*). *Jurnal Riset Akuakultur, 16*(2), 89–100.

Ong, S. K., Ambak, M. A., Yong, A. S. K., & Hassan, M. D. (2021). Effect of *Terminalia catappa* methanol leaf extract on nonspecific innate immune responses and disease resistance of red hybrid tilapia (*Oreochromis* sp.) against *Streptococcus agalactiae* infection. *Journal of Applied Aquaculture, 33*(4), 351–365.

Pratiwi, N. M., & Santoso, L. (2024). Dissolved oxygen levels influence growth performance, feed efficiency, and intestinal health of striped catfish (*Pangasianodon hypophthalmus*) during nursery phase. *Journal of Aquaculture Science, 12*(1), 45–58.

Putra, R. A., Sari, D. W., & Pratama, R. I. (2022). Pengaruh dosis ekstrak daun ketapang (*Terminalia catappa*) yang berbeda terhadap hematologi dan respons imun ikan nila (*Oreochromis niloticus*) yang diinfeksi *Streptococcus agalactiae*. *Jurnal Ilmu Kelautan dan Perikanan, 12*(1), 45–56.

Putri, A. D., Widanarni, & Mulyani, Y. (2021). The negative impact of sublethal doses of phytochemicals on gill histology and respiratory response in Nile tilapia (*Oreochromis niloticus*). *Journal of Aquaculture and Fish Health, 10*(2), 145–156.

Rahman, M. A., Sarker, M. T., & Alam, M. J. (2008). Induced breeding of striped catfish (*Pangasianodon hypophthalmus*): Effects of Ovaprim hormone dosage and latency period on spawning success. *Bangladesh Journal of Fisheries Research, 12*(1), 55–62.

Setyowati, E., Prayitno, S. B., & Sarjito. (2014). Pengaruh perendaman ekstrak daun jambu biji (*Psidium guajava* L.) terhadap kelulushidupan dan histologi hati ikan patin (*Pangasius hypophthalmus*) yang diinfeksi bakteri *Edwardsiella tarda*. *Journal of Aquaculture Management and Technology, 3*(4), 174–182.

Suhartono, E., & Budiarso, T. (2019). Manfaat ekstrak daun ketapang (*Terminalia catappa*) untuk peningkatan kesehatan ikan budidaya. *Jurnal Akuakultur Indonesia, 18*(2), 118–125.

Utami, S., Pratiwi, R. H., & Santoso, J. (2019). Karakteristik protein ikan patin (*Pangasius hypophthalmus*) hasil fermentasi dengan *Lactobacillus plantarum*. *Jurnal Ilmu dan Teknologi Hasil Ternak, 14*(2), 123–130.