



UNIVERSITI PUTRA MALAYSIA

***THE EFFECTS OF DIFFERENCE TEMPERATURE ON ACUTE
AMMONIA TOXICITY IN JUVENILE HYBRID GROUPE***

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**THE EFFECTS OF DIFFERENCE TEMPERATURE ON ACUTE AMMONIA
TOXICITY IN JUVENILE HYBRID GROUPE**

ABDUL KARIM ZAIDAN BIN AB AZIZ

A project submitted to the

Faculty of Veterinary Medicine, Universiti Putra Malaysia

In partial fulfillment of the requirement for the

DEGREE OF DOCTOR OF VETERINARY MEDICINE

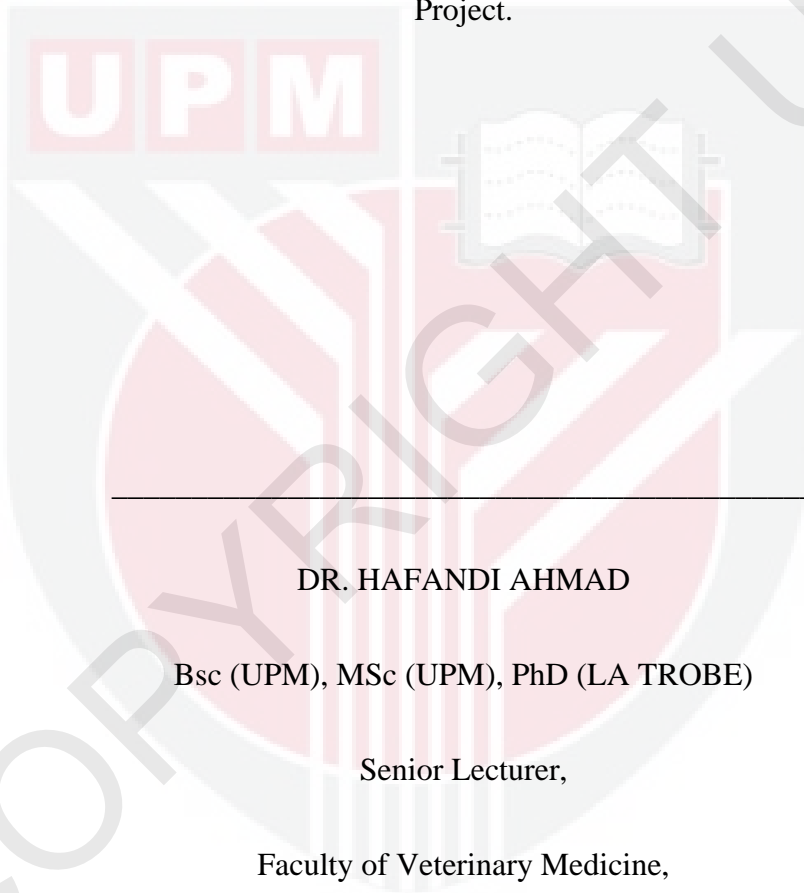
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It is hereby certified that we have read this project paper entitled “The effects of difference temperature on acute ammonia toxicity in juvenile hybrid grouper”, by Abdul Karim Zaidan bin Ab Aziz and in our opinion it is satisfactory in term of scope, quality, and presentation as partial fulfillment of the requirement for the course VPD 4999 –

Project.



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DEDICATION

I dedicate this thesis to:

My dearest parent:

Ab Aziz bin Ab Rahman

Noor Hafizah Tan binti Abdullah

My supervisor:

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Alhamdulillah.

To a long journey come near. It was a fun, exciting, hilarious, enjoyable moments to finish this final year project. It also fill with stress, couple of sleepless night, and headache along the way but after all it just a small process of learning things.

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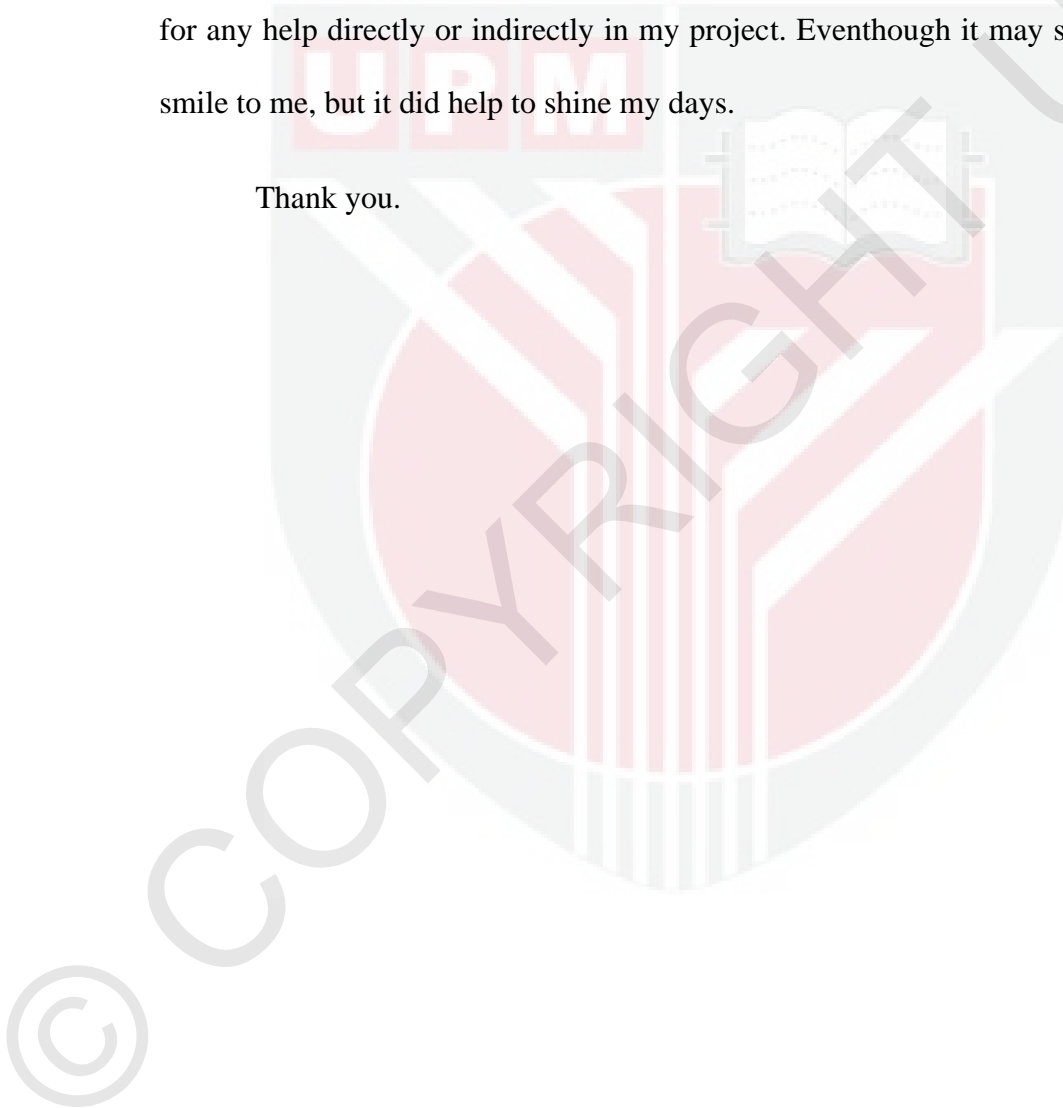
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ABSTRAK

Abstrak daripada kertas kerja yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada kursus VPD 4999 –Projek.

Kesan perbezaan suhu kepada ketoksikan ammonia secara akut terhadap anak ikan kerapu hibrid

Oleh

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2018

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Ammonia adalah toksik kepada semua haiwan vertebrata termasuklah ikan dan ini telah mendapat perhatian yang besar di dalam industri perikanan akuakultur. Ammonia apabila di dalam larutan cecair terbahagi kepada ammonia yang tidak diionkan dan ammonia yang telah diionkan. Perkadaran ammonia yang tidak diionkan dan yang telah diionkan di dalam air bergantung kepada suhu dan pH air itu tersendiri. Di Malaysia, suhu naik dan turun sepanjang tahun disebabkan keadaan cuaca yang panas dan lembab. Oleh itu, objektif kajian ini adalah untuk mengetahui kesan perbezaan suhu kepada ketoksikan ammonia secara akut terhadap anak ikan kerapu hibrid. Lapan puluh ekor anak ikan kerapu hibrid (TGGG) bersaiz lingkungan 28.3g dengan jumlah kepanjangan 11.9cm telah digunakan untuk menilai kemampuan mereka terhadap pelbagai tahap ammonia dan suhu yang berbeza. Kesemua ikan dibahagikan kepada 8 kumpulan; Kumpulan A1 (1.5mg/L NH₃-N at 29°C), Kumpulan A2

(2.5mg/L NH₃-N at 29°C), Kumpulan A3 (3.5mg/L NH₃-N at 29°C), Kumpulan B1 (1.5mg/L NH₃-N at 25°C), Kumpulan B2 (2.5mg/L NH₃-N at 25°C), Kumpulan B3 (3.5mg/L NH₃-N at 25°C). Kumpulan kawalan negative dibahagikan pada suhu 25°C dan 29°C dengan tiada penambahan ammonia. Hasil keputusan menunjukkan jumlah ammonia di dalam air bertambah mengikut dengan masa, tetapi perkadaran ammonia yang tidak diionkan menurun mengikut dengan masa di kesemua kumpulan. Tambahan pula, tiada kematian didapati di kesemua kumpulan pada suhu 25°C dan 29°C dengan tahap ammonia yang berbeza. Hal ini disebabkan keupayaan ikan mengatasi dan bertahan dengan peningkatan tahap ammonia di dalam air. Di samping itu, fisiologi ikan itu sendiri dipercayai mampu menukarkan ketinggian tahap ammonia di dalam air kepada bahan yang kurang toksik, seperti glutamin dan urea. Kesimpulannya, metabolisme anak ikan kerapu hybrid mempunyai keupayaan untuk bertahan dengan peningkatan tahap ammonia di dalam air pada suhu yang berbeza.

Kata kunci: Perbezaan suhu, Ammonia, Kerapu hybrid

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfillment of the course VPD 4999 –Project.

The effects of difference temperature on acute ammonia toxicity in juvenile hybrid grouper.

By

ABDUL KARIM ZAIDAN AB AZIZ

2018

Supervisor: Dr. Hafandi Ahmad

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Ammonia is a toxic to all vertebrae including fish and can caused a major concerned in aquaculture industries. Ammonia expressed as unionized ammonia and ionized ammonia when in aqueous form. The proportion of unionized and ionized ammonia level in the water are depends on the temperature and pH of the water. In Malaysia, the temperature was rise and fall through all the year due to the hot and cold climate. Therefore, the objective of this study is to determine the different temperature on acute ammonia level in the juvenile hybrid grouper. Eighty juvenile hybrid grouper (TGGG) size around 28.3g with total length of 11.9cm were used to assess their capabilities to respond towards ammonia level and different temperature. All fish were divided into 8 groups; Group A1 (1.5mg/L NH₃-N at 29°C), Group A2 (2.5mg/L NH₃-N at 29°C), Group A3 (3.5mg/L NH₃-N at 29°C), Group B1 (1.5mg/L NH₃-N at 25°C), Group B2 (2.5mg/L NH₃-N at 25°C), Group B3 (3.5mg/L NH₃-

N at 25°C). The negative control group was assigned at temperature 25°C and 29°C with no ammonia added. The result showed that the amount of total ammonia increasing by times, but the proportion of the unionized ammonia reducing following times in all treatment groups. In addition, the result also showed that no mortality were observed in temperature group 25°C and 29°C with different level of ammonia. This was due to the ability of the fish in respond and tolerant to the elevated ammonia level in the water. Moreover, the physiological of the fish is believed in converting the higher level of ammonia to less toxic substances, such as glutamine and urea. In conclusion, the metabolism of juvenile hybrid grouper had the ability to tolerate with elevated ammonia level in the water at different temperature.

Keyword: different temperature, ammonia, hybrid grouper

1.0 Introduction

According to FAO, aquaculture in Malaysia had developed since 1920's and become an important activity currently. Fishery industries had moving from capture fished practice to aquaculture practice. According to Shariff, (2009), aquaculture industries in Malaysia up grow from 6% of total fish production in 1991 to 74.7%. Moreover, grouper species covered 1% of total Malaysia aquaculture product in 2010. The number will continuing growing by times. In 2006, The Borneo Marine Institute (IPMB) of Universiti Malaysia Sabah reared a new group of hybrid grouper called as TGGG. The TGGG is cross bred between the eggs of Tiger Grouper (*Epinephelus fuscoguttatus*) with the sperm of Giant Grouper (*Epinephelus lanceolatus*) via external fertilization. It is widely raised in aquaculture industry of Peninsular Malaysia and covered 70% of Malaysia grouper production.

In aquaculture industry, ammonia is one of the major threats to the survival of the fish. Ammonia is one of the nitrogenous wastes from the fish and was excrete from the gill. Another fish nitrogenous waste was urea. Ammonia is toxic to all vertebrate. According to United State Environmental Protection Agency report in 1984 and 1989, the average mean acute ammonia toxicity for 17 seawater species was ay 1.86 mg NH₃-N/L. Ammonia in aqueous solution express in two form either unionized ammonia (NH₃) or ionized ammonia (NH₄⁺). Unionized ammonia is the more toxic of the two forms, as it diffuses through the epithelial membranes of aquatic animals more readily than the ionized ammonia (United State Environmental Protection Agency (USEPA), 1999)

The proportion of unionized and ionized ammonia was determined by the water temperature and pH. As the water increase is the pH or temperature, the unionized ammonia increases in the percentage. According to Økelsrud & Pearson (2007), the ratio of unionized

to ionized ammonia increased 10 fold per pH unit rise and approximately 2 fold for each 10 rise in the 0-30°C range. The research establish that unionized ammonia species of total aqueous ammonia is relatively more toxic than the ionized ammonia (Thurston & Emerson, 1979). Thus, the total ammonia toxicity upon fish will be increased with the pH and temperature. The water temperature in Malaysia was rise and fall throughout the year due to the monsoon and hot humid climate. The water temperature influences the fish body temperature as the fish body temperature was according to the surrounding water temperature. From Morvanet *al.*,(1997), fish have a body temperature that is essentially the temperature of the surrounding water (Fry, 1967) so that their entire physiology, including immune functions, is influenced by environmental temperature. From the unpublished data by Fish Research Institute TanjungDemong, the range of water temperature in the fish farms from East Peninsular of Malaysia was at 22°C to 30°C in year 2017. For TGGG hybrid grouper, it was exhibited relatively better growth form and condition at 26°C and 30°C (Moumitaet *al*, 2016).

1.1 Justifications

According to United State Environmental Protection Agency (USEPA) report in 1984 and 1989, the average mean acute ammonia toxicity for 17 seawater species was at 1.86 mg NH₃-N/L, but Grouper (*Epinephelus sp.*) wasnot included in this report. Furthermore, juvenile hybrid grouper TGGG is a new type of grouper that being introduced to the industry. In addition, Malaysia is tropical country which the temperature was rise and fall throughout along the year due to the changed seasons from hot climate to cold monsoon weather. Thus, we would like to examine the acute lethal effects of different temperature on ammonia toxicity in juvenile hybrid grouper.

1.2 Objective

We would like to examine the acute lethal effect of different temperature on ammonia toxicity in juvenile hybrid grouper.

1.3 Hypotheses

1. H₀: There is no significant different on the acute ammonia toxicity in juvenile hybrid grouper at different temperature.
2. H_A: There is significant different on the acute ammonia toxicity in juvenile hybrid grouper at different temperature.

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