

EFFECTS OF CRUDE OIL ON
Macrobrachium rosenbergii (de Man)
EGG HATCHABILITY UNDER DIFFERENT pH LEVELS

WONG YIP HING

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
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BY

WONG YIP HING

This project report is submitted in partial fulfilment of
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FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
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“ A good deal of pollution research is concerned with measuring the toxicity substances which are added to the sea.”

R. B. Clark

*This thesis is specially dedicated to
Dad, Mom, brothers, sister and Cheng Cheng*

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ABSTRACT

The hatching rate of *Macrobrachium rosenbergii* eggs in various pH was studied by using an innovated flow through bioassay technique. This bioassay method relies on the fact that *M. rosenbergii* fertilized eggs when detached from the mother prawn were able to hatch artificially. The optimum pH recorded for incubating the eggs is pH 7.0. *M. rosenbergii* eggs can tolerate a very narrow range of pH. Deviation from the optimum pH will result in mortality of eggs. pH below and above optimum pH will cause 100% egg mortality. The water soluble fraction (WSF) of Malaysian crude oil had a pronounced effect on the hatching rate of *M. rosenbergii* eggs. In the control, the hatching rate was more than 90 %, however, it was reduced drastically with increasing concentration of WSF oil. The EC₅₀ value of WSF oil for egg hatchability of *M. rosenbergii* estimated by the probit method was 16.60 mg/L. The recommended safety level of WSF oil for *M. rosenbergii* eggs in Malaysian estuarine water is below 166 µg/L. The WSF oil also caused some detrimental effects on the hatching performance of the eggs such as delayed hatching, morphological abnormalities and reduced motility. pH did not produce deformed larvae even though under conditions where the pH is unfavourable for hatching. Eggs treated with WSF oil took a longer time to hatch compared to the control. Eggs in WSF oil hatched about 48 hours later after the control. pH and different duration of exposure to WSF oil did not show significant differences in hatching time. The incidence of deformed larvae in the WSF oil and degree of deformities were dose dependent. The higher the WSF oil concentration the higher percentage of deformed larvae and more severe degree of deformities were found. The larvae hatched in WSF oil

at various pH also showed morphological deformities and delayed time in hatching. Exposure of *M. rosenbergii* eggs to EC₅₀ WSF oil for only one hour was enough to cause deleterious effects on eggs. These effects included reduction in the hatching rate, morphological abnormalities and reduction of motility. With a proper control of pH level in the range between 6.8 to 7.2 in hatchery operation for *M. rosenbergii*, a higher the hatching rate will be achieved.

ABSTRAK

Kadar penetasan telur *Macrobrachium rosenbergii* dalam pelbagai pH telah dikaji dengan menggunakan teknik bioassai aliran terus. Kaedah bioassai adalah berdasarkan fakta bahawa telur *M. rosenbergii* yang telah disenyawakan apabila dipisahkan daripada induk berkeupayaan menetas secara tiruan. pH optima yang dicatat adalah pH 7.0. Telur *M. rosenbergii* hanya boleh bertahan pada perubahan julat pH yang kecil di mana nilai pH yang lebih atau rendah daripada nilai optima akan menyebabkan 100% kematian telur. 'Water soluble fraction'(WSF) minyak mentah menunjukkan kesan yang jelas pada kadar penetasan telur *M. rosenbergii*. Kadar penetasan telur melebihi 90 % dalam kawalan dan berkurangan secara mendadak dengan peningkatan kepekatan WSF minyak. Nilai EC₅₀ untuk WSF minyak dianggarkan dengan menggunakan kaedah probit adalah 16.60 mg/L. Tahap keselamatan yang dicadangkan untuk kawasan muara adalah di bawah 166 µg/L. WSF minyak juga menyebabkan kesan buruk seperti melambatkan masa menetas, kecacatan morfologi dan juga mengurangkan pergerakan. pH tidak menyebabkan kemunculan larva yang tidak normal walaupun nilai pH tidak sesuai. Telur yang dieramkan dengan WSF minyak mengambil masa yang lebih lama untuk menetas berbanding dengan kawalan. Larva dalam WSF minyak menetas pada 48 jam lebih lambat daripada kawalan. pH dan perbezaan masa pendedahan kepada WSF minyak tidak menunjukkan perbezaan yang jelas dalam masa menetas. Kejadian larva yang tidak normal dalam WSF minyak dan darjah kecacatan adalah bergantung kepada dos. Semakin tinggi kepekatan WSF minyak, maka semakin tinggi peratusan larva cacat dan darjah kecacatan yang lebih teruk dapat dijumpai. Larva yang menetas dalam WSF minyak pada pH yang berlainan juga terdapat

kecacatan morfologi dan melambatkan masa penetasan. Telur *M. rosenbergii* yang terdedah kepada EC₅₀WSF minyak untuk satu jam akan menyebabkan kesan-kesan buruk seperti pengurangan kadar penetasan, kecacatan morfologi dan pengurangan pergerakan. Dengan pengawalan yang baik untuk nilai pH yang berjulat daripada 6.8 hingga 7.2 dalam pengurusan hatcheri *M rosenbergii*, kadar penetasan yang lebih tinggi boleh dicapai.