

EFFECT OF *Spirulina* ON THE COLOUR ENHANCEMENT AND
GROWTH RATE OF GOLDFISH (*Carrasius auratus*)

LAW CHOON LOON

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
TERENGGANU

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ACKNOWLEDGEMENT

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BY

LAW CHOON LOON

This project is submitted in partial fulfillment of
the requirements for the Degree of
Bachelor of Fisheries Science

Faculty of Applied Science and Technology
UNIVERSITI PUTRA MALAYSIA TERENGGANU

2000

1100024221

ACKNOWLEDGEMENT

I would like to take this opportunity to express my greatest appreciation and gratitude to my supervisor, Dr. Abol Munafi Ambok Bolong for his faithful guidance, concern, patience, advice and supervision throughout this project.

My deepest gratitude goes to my family for giving me all the supports and undivided care especially my mother for her endless love and always been there during my depression. Her guidance won't be forgotten.

Beside, I am in indebted thanks to Mr. Cheah Wan Leong, Technofish Sdn. Bhd. Farm owner for supplying the brood stocks, grateful advices and suggestions in this project. Not forgetting Mrs. Kartini and Mr. Johari for helping me taking the photographs during this project.

I also wish to extend my special thanks to all my friends especially Shareza, Jalal, Hii Yii Siang, Liew Soon Lai, Sim Teong Aik, Leong Kok Meng, Khoo Guan Hong, Poon Wai Kam, Tan Chai Hoon, Kong Shu Lang, Gan Chuen Mooi, Yuen Yeong Shyan and Oi Pei Choo for their tremendous contribution in the project. All their supports, suggestions, concern and comments had lead to completion of this project.

Again, the invaluable contributions are very much appreciated and shall I cherish with me always. May God bless you all!

ABSTRACT

Diets supplemented with *Spirulina* were fed to juveniles of goldfish (*Carrasius auratus*) at different concentration or with the same concentration at different timing for the larvae, for six weeks. These experiment were done to determine the effect of *Spirulina* on the colour enhancement and growth rate at different concentration and timing of feeding.

Concentration of 5%, 10%, 15%, 20% and 30% *Spirulina* were fed to the juveniles while diet 20% *Spirulina* were fed to the larvae for the feeding timing. Growth rates were measured once every week for juveniles (weight) and larvae (length) once in every two weeks. The flesh analysis was done at the end of the study by spectrophotometric method and photographs were taken for the observation of the pigment distribution.

Carotenoid concentrations in flesh of goldfish were higher in all diet compare with the control. D4 (20%) exhibited the highest concentration (4.147 ± 0.0139 mg/l). There was no significant difference ($P > 0.05$) of growth rate among all dietary groups.

Goldfish larvae fed with *Spirulina* showed that larvae fed with *Spirulina* had better colouration. T2 (day 10) had the highest accumulation of carotenoid (2.804 ± 0.2066 mg/l) compare to all other groups except T1 (day 3) where the differences were not significant. The pigmentation of the larvae was begun between the second to the third week after free swimming. There was also no significant difference in growth rate ($P > 0.05$) between each timing feeding.

ABSTRAK

Correlation was absent between final flesh and diet carotenoids for the different concentration *Spirulina* supplemental diet study ($P>0.05$). However, accepted correlation ($R^2=0.685$) was observed between weight gained and flesh carotenoid levels for the juveniles. A higher correlation ($R^2=0.8568$) was observed between length gained and flesh concentration levels for the larvae.

In conclusion, diet with additional *Spirulina* would enhance the colouration of goldfish. However, fish treatment earlier with *Spirulina* would also have the same result. A proper dose and timing of feeding would enhance the colouration. Hence, additional *Spirulina* also enhanced growth rate.

ABSTRAK

Makanan rumusan yang ditambahkan dengan *Spirulina* dibekalkan kepada juvenil ikan emas (*Carrasius auratus*) pada kepekatan yang berlainan atau dengan kepekatan yang sama pada masa rawatan yang berlainan kepada larva, selama enam minggu. Eksperimen ini bertujuan untuk menentukan kesan *Spirulina* ke atas pewarnaan dan tumbesaran pada kepekatan dan masa rawatan yang berlainan.

Kepekatan 5%, 10%, 15%, 20% dan 30% *Spirulina* diberikan kepada juvenil ikan manakala makanan rumusan 20% *Spirulina* diberikan kepada larva untuk penentuan masa rawatan. Kadar tumbesaran diukur selang setiap seminggu untuk juvenil (berat) manakala selang dua minggu sekali untuk larva (panjang). Analisa tisu ikan dijalankan dengan kaedah spektrofotometrik manakala gambar diambil untuk pemerhatian taburan pigmen.

Kepekatan karotenoid adalah lebih tinggi dalam makanan tambahan *Spirulina* dibanding dengan kawalan. D4 (20%) menunjukkan kepekatan tertinggi (4.147 ± 0.0139 mg/l). Tiada perbezaan yang ketara ($P > 0.05$) ke atas kadar tumbesaran di antara setiap kumpulan makanan.

Larva ikan emas yang dibekalkan dengan makanan tambahan *Spirulina* dengan lebih awal memberikan pewarnaan yang lebih ketara. T2 (Hari ke-10) mempunyai pengumpulan karotenoid yang tertinggi (2.804 ± 0.2066 mg/l) kecuali dengan T1 (Hari ke-1) di mana perbezaan adalah tidak ketara. Pigmentasi pada larva

adalah bermula antara minggu kedua hingga minggu ketiga selepas larva berenang bebas. Tiada perbezaan ketara bagi tumbesaran ($P>0.05$) bagi setiap masa rawatan.

Korelasi didapati tidak hadir bagi kepekatan karotenoid antara tisu dengan makanan rumusan untuk kajian kepekatan ($P>0.05$). Walaubagaimanapun, terdapat korelasi ($R^2=0.685$) antara berat didapati dengan paras kepekatan karotenoid. Terdapat korelasi yang lebih tinggi ($R^2=0.8568$) antara panjang didapati dengan paras kepekatan tisu untuk larva.

Sebagai kesimpulannya, makanan yang ditambahkan dengan *Spirulina* akan meningkatkan pewarnaan ikan emas. Namun, ikan yang dirawat lebih lama juga memberikan keputusan yang sama. Dos dan masa yang sesuai dalam diet akan meningkatkan pewarnaan. Selain itu, penambahan *Spirulina* juga dapat merangsang tumbesaran.