



Ain Shams University
Women College
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Experimental Studies on the Effect of Some Environmental Factors on Reproduction and Survival Rates of *Daphnia magna* (Crustacea: Branchiopoda)

Thesis

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دراسات تجريبية علي تأثير بعض العوامل البيئية علي معدلات تكاثر وإعاشة الدافنيا ماجنا (قشريات - خيشومية الأقدام)

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Abstract

From Probit analysis of acute tests of *Daphnia magna*, it was found that 48-LC50 was 4.37 for low pH, 10.66 for high pH, 3.8‰ for NaCl solution, 3.9 ‰ for synthetic sea water and 4.5‰ for natural sea water.

From sublethal concentrations, long-term experiments were undertaken to determine the effect of different levels of temperature, pH and salinity (NaCl, synthetic sea water and natural sea water) on *D. magna* to detect the most suitable conditions for their survival, growth and reproduction rates under laboratory conditions. It was concluded that these rates were high at temperatures range of 20-24°C with optimum at 22°C. It was observed that there is no number of progeny until the 21st day at temperatures ranged from 10-14°C. At investigated pH levels, it was detected that survival and growth rates decreased as pH decreased from 4.74 to 4.44 and by increasing pH from 10.13 to 10.55. It is clear that groups of daphnids reared at pH 8.33 (control) recorded the highest survival and growth rates. The maximum number of progeny per female were recorded for daphnids reared at acidic pH 4.66 corresponding to LC15 and alkaline pH; 10.13 (LC10). It is worth mentioning that great numbers of these neonates released weak, unhealthy and dead. However, control group recorded lower number of progeny per female comparing to those of acidic pH LC15 and alkaline pH LC10, but these neonates were in a healthy manner. Comparing the salinities studied it was found that, groups of *D. magna* reared in synthetic sea water at 0.44‰ (corresponding to LC10) showed the maximum length, specific growth rates and number of progeny per female. The biochemical composition was determined in the optimum conditions for *D. magna* at 22°C, pH

8.33 (control) and 0.44‰ synthetic sea water. Biochemical analysis revealed that *D. magna* contains 4.18 and 5.2 mg/100g wet weight protein and 1.09 and 1.15 g/100g wet weight Lipid, ash represented by 8.7 and 8.8%, moisture represented by 81 and 79% for groups reared in 0‰ (control) and 0.44‰ (LC10 synthetic sea water), respectively. Four essential amino acids were detected for *D. magna* reared in 0.44‰ synthetic sea water while for control group only two, lysine and phenylalanine. Fatty acids profile of *D. magna* showed four saturated fatty acids dominated by myristic acid (14:0). Moreover, nine unsaturated fatty acids (UFAs) were determined and the most abundant UFAs were in descending order; linoleic acid (18:2n-6), arachidonic acid (20:4n-6), palmitoleic acid (16:1n-7), oleic acid (18:1n-9), DHA (22:6n-3), myristolic acid (14:1n-6), EPA (20:5n-3), linolenic acid (18:3n-3) and erucic acid (22:1n-9). Total fatty acids were slightly higher for *D. magna* reared in concentration 0.44‰ S than those cultured in 0‰ S (control).

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LIST OF ABBREVIATIONS

16L	16 hour light
8D	8 hour dark
APS	Aminopropyl phase for the analysis of sugar
Cont.	Control
DEGS	Diethylene glycol succinate
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
EAA	Essential amino acid
FA	Fatty acid
LC50s	Half lethal concentrations
HPLC	High performance liquid chromatography
HUFA	Highly unsaturated fatty acid
LC	Lethal concentration
µmhos/cm	Micromhos per centimeter (Electric conductivity unit)
MUFAs	Monounsaturated fatty acids
Non-EAA	Non essential amino acid
ppt	Part per thousand
PUFA	Polyunsaturated fatty acid
PL	Postlarvae
PSU	Practical salinity units
S	Salinity
SFA	Saturated fatty acid
SGR	Specific growth rate
SD	Standard deviation
UV	Ultra violet
UFA	Unsaturated fatty acid

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