

Original Article

# Study of the Effect of Algal Food and Light Intensity on the Reproduction of *Daphnia Magna*

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**Abstract** - The study was carried out on individuals of species *Daphnia magna* .which is an aim to culture as live food for larval fish and crustaceans in fish farms.

The first batch of these Crustaceans was collected from the nearest freshwater bodies of Lattakia. The individuals have been adapted to the laboratory conditions to prepare them for a series of Experiments. Then we were determined the effects of food algae (*Scenedesmus*) and light intensity (800 lux) in some reproductive characteristics as the time of sexual maturity, number of broods, number of individuals in each brood; the total number of individuals during the female life rate. With fixing other ecological factors. The results showed that the most suitable food algal for *D.magna* is *Scenedesmus*, which can be adopted as a suitable culture medium during experiments to culture *D. magna* in the future. And the optimal light intensity for the reproduction of *daphnia* was 800 lux; by comparing the effect of each of the factors studied, the lighting factor had the greatest impact on the reproductive characteristics of the studied type.

**Keywords** - Crustacea, Cladocera, *Daphnia magna*, Lighting, Algal food.

## I. INTRODUCTION

The members of the cladoceran generally feed on micro-organisms obtained from the environment through filtration, such as green algae and blue-green algae (Cyanobacteria)[1] [2], and detritus [3 ], Protozoa and bacteria [4].

Algae are one of the primary products in the aquatic food chain[5]. They are suitable food for various types of aquatic invertebrates due to their high nutritional value chemical content [6]. Cladocera can filter different types of algae easily, including the genus (*Scenedesmus*) [7].

Algae have been used as food for freshwater fleas in many studies, such as using *Scenedesmus* to feed *Daphnia* individuals [8, 9, 10, 11, 12, 13]. The type and concentration of food are one of the most important factors regulating the

growth and productivity of branched crustaceans [14, 15] as the growth of *D. magna* individuals increases, and the live productivity increases when fed on green algae such as *Scenedesmus* and *Chlorella*, respectively[16].

Light is a light is a very necessary factor for the completion of vital processes and the exchange of materials in the freshwater flea, for example, the synthesis and formation of carotenoids that are included in the structure of the body and eggs and their colours, and the importance of this environmental factor appears in terms of clear impact Periods of darkness, illumination and light intensity in the growth, reproduction and migration of vertical and horizontal daily cladocera species in the environments in which they live [17]. And its effect on the vital activities of *Daphnia* such as filtration rate, heart rate, and its ability to perceive and sense the number of nutrients in the medium. Where this factor affects the life of the freshwater flea, its growth and reproduction, the time of sexual maturity, the average number of broods and the number of individuals produced by the female during her life, as well as the production and hatching of dormant eggs [18-20]. The shift from Parthenogenetic mode to the sexual mode of reproduction [21-23], rate of moults, motility and speed of individuals.

Sevev several studies have indicated the importance of light intensity and the light periods and confirmed that the light intensity of 800 lux positively affected the growth and reproduction processes [24].

## II. MATERIALS AND METHODS

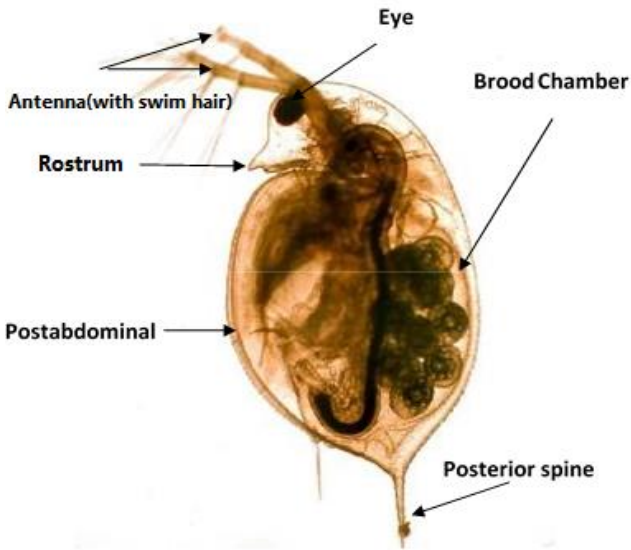
The experiments were conducted in scientific research laboratories in the college of science.

*D.magna* was taken from the nearest freshwater bodies of Lattakia, and the individuals were adapted to the laboratory conditions .Kept in aquarium ( 30×20×20cm) (12 litres), supplied by an air pump and fed with green algae(*Scenedesmus*), water temperature ranged from (22-24) °C, DO(7.5 mg/L), pH (7-8). The test organisms for all the experiments were obtained from controlled cultures, and all the individuals were measured at the beginning of the experiments. Individuals were placed on a glass slide and



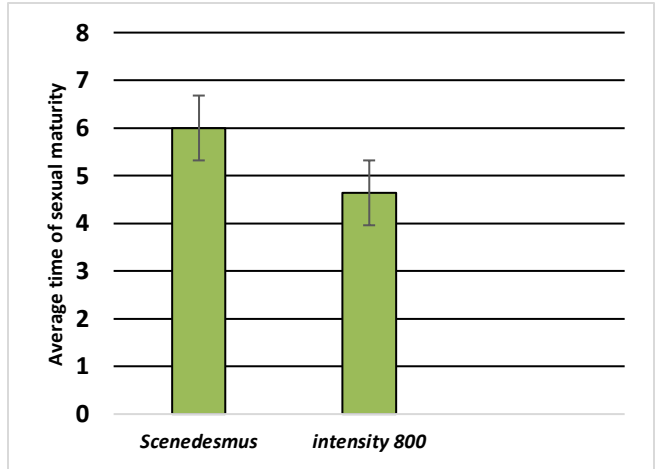
temporarily immobilised by eliminating the surrounding water with a micropipette; measures were immediately taken to assure accurate readings and minimum stress or damage to the organisms. Healthy neonates (about 24 h) were taken and put in 14 glass beakers (50 ml), each one have one Daphnia. The beakers were maintained at constant temperature conditions ( $23 \pm 1$  °C), under cool white light, humidity  $5\pm 70\%$  and 14:10 h light/dark cycle, with continuous ventilation according to typical conditions in a laboratory incubator. Daphnis was fed daily with 1–2 mL green algae (*Scenedesmus*). Size measurements of animals were performed using a microscope. The Daphnia were examined daily and were transferred to a new beaker of water and food. The effects of light intensity were studied and determined 800 lux by the Lux Meter scale to study the effect of light intensity on the reproduction of Daphnia. (the number of molts, the number of young, the number of broods, the number of partial and complete abortions, time required for sexual maturity) were recorded daily. The experiments continued until the last female death.

**III. RESULTS**



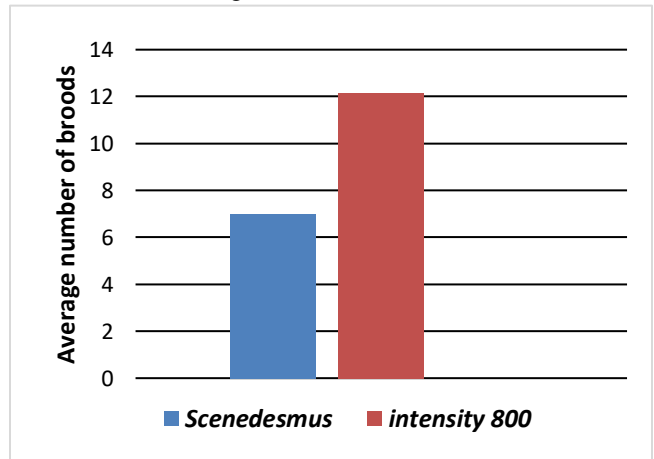
**Fig. 1 Photo of *D. magna*.**

The reproductive characteristics of the Daphnia females were different and significant differences were shown between the studied factors, where the average time of sexual maturity was about 4 to 5 days at the light intensity of 800 lux, where the time was the fastest, while the average time of sexual maturity was in a medium of *Scenedesmus* 6 days, figure 2.



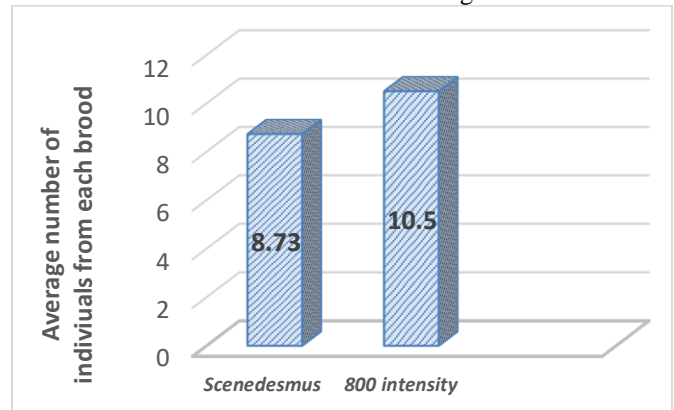
**Fig. 2 Average time of sexual maturity**

The number of broods varied among the studied factors, and the highest rate was 12.14 broods at intensity 800 lux, while the number of broods reached 7 broods in a medium of moss *Scenedesmus*. Figure 3.



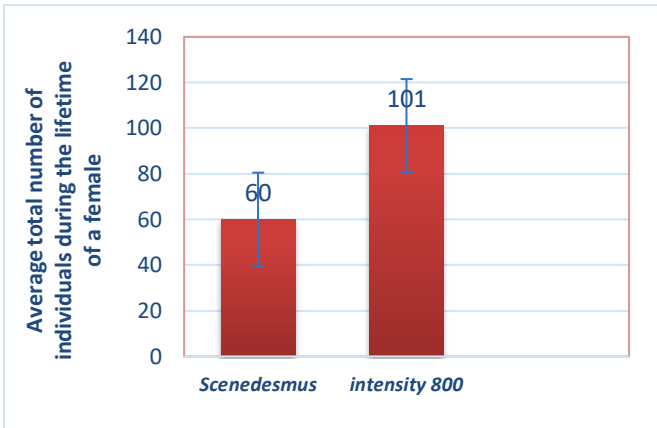
**Fig. 3 Average number of broods**

The number of individuals resulting from each brood at the intensity of 800 lux reached 10.5 individuals, while it was 8.73 in a medium of *Scenedesmus*. Figure 4.



**Fig. 4 Average number of individuals from each brood.**

The total number of individuals in the female's life reached 101 individuals at intensity 800 lux, which was the best compared to the algal medium. During her lifetime in the Scenedesmus medium, the females gave 60 individuals, Figure (5).



**Fig. 5 Average number of individuals during a female's lifetime.**

And the time between ovulation was (1-2 days) in light intensity of 800 lux and algal medium. (Table 1).

**Table 1. Reproductive characteristics of daphnia magna.**

Reproductive characteristics	Studied factors	
	800 lux	Scenedesmus algae
Average time of sexual maturity/ day	4.64	6
The average number of broods during the lifespan of a female/brood	12.14	7
The average time between two ovulations/day	1-2	1-2
The average number of individuals resulting from each brood/individual	10.5	8.73
Average total number of individuals during the lifetime of a female/individual	101	60

**IV. DISCUSSION**

The light intensity (800 lux) led to high rates of growth and reproduction, as the light greatly affects the nervous system of daphnia and the number of nervous secretions, which in turn affects the increase in the release and activation of growth hormone, which is released into the blood and controls the molting process, is directly related to the reproductive efficiency, and this explains the reason for

the increase in shedding associated with the increase in productivity at the light intensity of 800 lux. [25].

**V. CONCLUSION**

The light intensity had a very big impact on the reproductive processes of Daphnia, where it accelerated them, as we can say that it is one of the best light intensities that can be applied to culture while feeding Daphnia with Scenedesmus algae to reach the best possible results.

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