Study on the application of enriched *Daphnia* with n-3 HUFA and its effect on the growth, survival and stress resistance of Persian sturgeon larvae (*Acipenser persicus*)

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Abstract

Success in rearing of fish at larval stage is the most critical period in the production cycle for many fish species. The primary problem in rearing larval fish is due to food supply (Leger et al., 1986; Abi-Ayad and Kestemont, 1994). Dietary lipids play an important role in fish nutrition with provision of both essential fatty acids (EFA) and energy (Sargent et al., 1999). Live feed that are commonly used for first feeding of larvae, such as *Rotifer* and *Artemia* are naturally low in EFA, therefore enrichment of live feed with lipids rich in EFA prior to feeding is necessary (Copeman et al., 2002).

The Persian sturgeon (*Acipenser persicus*) is considered as one of the most important fishes in enhancement programs of the Caspian Sea resources in Iran. *Daphnia sp*, however poor in EFA, is one of the important starter live feed in sturgeon larviculture aiming at Caspian Sea recruitment plan. It has been suggested that white sturgeon may require both n-3 and n-6 fatty acids based on growth and the 20:3n-9/20:4n-6 and 20:3n-9/22:6n-3 ratio in liver phospholipids (Webster and Lim, 2002). Therefore, it is necessary to improve the EFA content of *Daphnia* as a live food by proper enrichment method prior to feed the sturgeon fish. Some researchers have enhanced significantly higher EFA level in *Daphnia sp* (Sundbom and Vrede, 1997; Von Elert, 2002 and Ravet, 2003) and no study exists for effect of enriched Daphnia on Persian sturgeon larvae.

Persian sturgeon larvae (12 days post hatch) were obtained from Shahid Rajaee sturgeon hatchery center in Sari, Iran. The larvae were fed on *Artemia* nauplii (Instar 1) for two days before collection. Feeding n *Artemia* nauplii increased the ability of the fish larvae to prey *Daphnia*.

Larvae were randomly distributed in to 12 × 15 liter white elliptic fiberglass tank. Each tank was stocked with 150 larvae (10 larvae/ liter) with 61.6 mg in initial wet weight and 22.3 ± 0.3 mm in total length. Each tank was supplied with water via 1 inch PVC pipe at flow rate of 3 l min^{-1}. Water quality was cheked periodically; pH was about 7.8 and dissolved-oxygen (DO) level was about 6.3 ppm. Temperature was 19 ± 1° C. *Daphnia magna* used for this study, were obtained from pond in Rajaee center, and used for enriching with mean size 1.6 ± 0.15 mm in length. Enrichment solution was prepared with Cod liver oil (Seven seas), polysorbate (Tween 80, Merck) and fresh water according to Ako et al. (1994). The density of *D.magna* was found to be 10,000 Daphnia/liter. *D.magna* were enriched at temperature of 20° C according to Von Elert (2002) in three different times that were 3, 6 and 9 hours. Larvae were fed *ad libitum* with four groups of *Daphnia* were non enriched *Daphnia* (control) and enriched *Daphnia* in three different times (3, 6 and 9 hours) with three replicate in each treatment. In order to study growth status, biometries of 10 larvae in each replicate were done on 3rd, 5th, 12th and 14th days. Also during the rearing period, all dead larvae gathered daily to calculate the survival. After 14 days period of larvae rearing, resistance of larvae to pH stress, 4.5 (1 N NaOH) and 11