

Fairy shrimps as a source of carotenoids for fish feeding

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Abstract. Short time production of fish to marketable size with a suitable color is very important. But achieving this goal is largely dependent on using live food for feeding fish larvae, fry, fingerlings and adults. Poeciliidae are freshwater livebearer fish including some popular aquarium fish. Fairy shrimps (Anostraca) are branchiopod crustacean and freshwater relatives of brine shrimps habitant in temporary vernal pools. Nowadays, the use of fairy shrimps as a live food in aquaculture is increasing. In this scientific note the importance of carotenoids and the potential of fairy shrimps as live food to enhance body coloration and growth of different ornamental fish species and prawns is discussed.

Key words: fairy shrimps, ornamental fish, carotenoid pigments, Poeciliidae.

Fairy shrimps are freshwater crustaceans living in stressful temporary vernal pools that lack fish all over the world. Recently, fairy shrimps and their nauplii have been used in fish feeding and as test organisms in ecotoxicological experiments (Brendonck et al 1990; Dorostkari et al 2013). Fairy shrimps have a wide distribution in Iran, especially East Azerbaijan Province (Seidgar et al 2007). From a nutritionally point of view, fairy shrimps are comparable with *Artemia* sp., containing carotenoprotein complexes and carotenoids with high amounts of astaxanthin, canthaxanthin and antheraxhantin (Munuswamy 2005; Velu & Munuswamy 2003).

Poeciliidae are freshwater livebearer fish including guppies, mollies, platies, and swordtails as popular aquarium fish. The males are usually smaller than the females and display a brighter color and also have a gonopodium to fertilize the female. They are found in habitats of Mexico and Central America, but distributed over various tropical and subtropical areas (Hill & Yanong 2016). Guppies have been used as anti-malaria agent since it feeds with mosquito larvae in ponds. But introducing it may have a negative effect on native fish (Monks 2007). More than 250 species of poeciliids belonging to 22-28 genera were recognized, including *Gambusia*, *Poecilia*, *Xiphophorus*, *Poeciliopsis*, *Phalloceros* and *Limia* (Stockwell & Henkanathbegedara 2011). Many arid springs have been stocked with non-native fish species such as *Gambusia affinis* to control mosquito borne diseases, promote sport fisheries and as breeding source for aquarium fish (Henkanathbegedara et al 2015). Also, it has been revealed that the presence and colonization of invasive *G. affinis* fish caused a decline in zooplankton population, especially fairy shrimps due to predation (Leyse et al 2004; Henkanathbegedara et al 2015).

Carotenoid pigments are responsible for pigmentation of ornamental fish skin and edible fish muscle (Sales & Janssens 2003; Velasco-Santamaria & Corredor Santamaria 2011). Success in the ornamental fish marketing and trade is largely dependent on the skin color of the fish (Ramamoorthy et al 2010). That is why there is a need to add carotenoids in cultured fish that cannot synthesize them. Carotenoids are only synthesized by plants, phytoplankton, zooplankton and crustaceans. The carotenoids play a key role as an anti-oxidant, enhancer of immune response, growth, reproduction,

maturation and photo protection (Velasco-Santamaria & Corredor Santamaria 2011; Sinha & Asimi 2007). The high cost of synthetic pigments has encouraged the use of natural sources including yeast, marine bacteria, green algae (*Chlorella vulgaris*) to improve the skin color of ornamental fish (Velasco-Santamaria & Corredor Santamaria 2011). Ezhil et al (2008) showed that marigold petal meal can be used in swordtail (*Xiphophorus helleri*) as a pigmenting source. It has been shown that live food leads to enhancement of skin color of *Carassius auratus*, compared to concentrate diet. As in concentrate, concentrate and freeze-dried *Artemia* diets amounts of total carotenoids were equal to 1.09, 3.90 and 2.07 mg g⁻¹ astaxanthin were equal to 84.57, 205.82 and 102.24 mg g⁻¹ and canthaxanthin were equal to 0.24, 35.79 and 30.64 mg g⁻¹ and beta carotene were equal to 34.73, 138.78 and 69.77 mg g⁻¹ of fish skin, respectively (Seidgar et al 2015). Also, The use of fairy shrimps as a live food can improve skin color of ornamental fish prawns such as the existing of green stripes on the head, redness of tail, dorsal and pectoral fins of green terror (*Aequidens rivulatus*), existing of black wavy distinct spots, snaky skin of gourami (*Trichopodus trichopterus*) and corydoras (*Corydoras aeneus*) and existing of red pink strips on the head of severum (*Heros severus*) (Seidgar 2015). Fairy shrimps can be used as a suitable live food in order to improve growth and the reproductive performance and enhance skin color of ornamental fish due to its high nutritional value, environmental friendly feature and lower cost, compared to expensive synthetic pigments. Although fresh-fairy shrimp diet has a high nutritive value, harvested ones can be frozen, freeze-dried or made into flakes for later use (Seidgar et al 2015).

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