

PRELIMINARY STUDIES ON ROTIFER ENRICHMENT FOR THE IMPROVEMENT OF AMBERJACK LARVICULTURE

J.A. Pérez¹, Y. Pérez¹, S. Jerez², N.G. Acosta¹, V. Martín² and C. Rodríguez¹

¹ Universidad de La Laguna (janperez@ull.es)

² Instituto Español de Oceanografía

Introduction

Within the context of DIVERSIFY, the adequacy of rotifer nutritional value for optimizing greater amberjack (*Seriola dumerili*) larval growth, survival and production costs is a key objective. Most current enrichment procedures for live feed use triacylglycerols (TG) or fatty acid ethyl esters as dietary lipids, whereas enrichment diets with high PL content have only occasionally been used (Li et al. 2014). However, dietary phospholipids seem to be more efficient for LC-PUFA (22:6n-3, DHA; 20:5n-3, EPA and 20:4n-6, AA) larval supply (Olsen et al. 2014).

Carotenoids including astaxanthin, can inhibit LC-PUFA peroxidation (Guerin et al. 2003), and are found as a determining factor for good egg quality in seriola (Watanabe et al. 2003). Thus, the present experiments were conducted to obtain the best LC-PUFA-carotenoid enrichment protocol for rotifers to improve amberjack larval culture performance.

Materials and Methods

Two triplicate experiments were carried out. Firstly, rotifers (initial density of 300 rot/ml, 10l tanks) were enriched with three different lipid sources (8%) varying in their chemical structure combined to supply high LC-PUFA levels and DHA/EPA/ARA ratios resembling those of wild amberjack eggs. E1 was based on a marine lecithin (PL), E3 a mixture of TG and E2 a blend of both lipid forms. Results were compared with a commercial booster rich in TG used as control (C). In a second trial, the best combination of LC-PUFA was mixed with three proportions of carotenoids (50, 100 or 150 ppm Naturose ~2% natural astaxanthin). Wild eggs and rotifers (4 treatments and 4 enrichment times) were immediately frozen at -80°C until analysis.

Results

Our sampled amberjack wild mature gonads contain around 2.7 ± 0.7 ppm of total carotenoids, and the viable wild eggs presented around 16.6% of total lipid (TL) content DM (30% TG, 20% PL) with 26% of DHA and 5% of EPA in both TL and PL, and 3 and 4% of AA in TL and PL, respectively. Regardless of the treatment, longer enrichment periods (10 and 24 h) tended to decrease oxygen saturation of media and LC-PUFA in rotifers. In addition, treatment E2 gave the worst results in terms of rotifer population (survival and ovigerous females). Table I shows the TL content (%DM), the proportions of PL and TG (%TL), and main fatty acid composition of TL and PL from rotifers enriched for 3 and 6h. The best combination in terms of rotifer PL absolute contents and proportions of DHA, EPA and ARA was achieved with the marine lecithin used in treatment E1 for 3h.

No significant variation in rotifers population condition was registered when E1 was combined with increasing proportions of carotenoids. Regardless of the treatment, maximum absorption of carotenoids was reached after 3 h (Fig. 1).

	C		E1		E2		E3	
	3 h	6 h	3 h	6h	3 h	6h	3 h	6 h
TL (% DM)	12.7±1.1b	17.6±0.1B*	19.9±1.4a	15.1±0.2B*	19.9±1.4a	22.9±0.8A	12.7±1.6b	13.9±1.4B
20:4n-6	1.2±0.1d	1.6±0.0D*	7.4±0.0a	8.4±0.2A*	4.8±0.4b	4.7±0.2B*	3.8±0.3c	3.8±0.4C*
20:5n-3	2.3±0.2c	3.2±0.2D*	8.0±0.2a	9.3±0.1A*	8.6±0.3a	8.4±0.3B	4.8±0.3b	5.8±0.1C*
22:6n-3	13.5±0.5c	19.1±0.7B*	17.4±0.5b	20.4±0.1B*	31.9±0.5a	32.1±1.3A	16.1±1.9b	19.1±1.3B*
∑ n-3HUFA	16.8±0.6d	23.5±1.0D*	25.9±0.6b	30.5±0.2B*	42.9±0.8a	42.7±1.6A	21.9±2.3c	26.9±1.3C*
PL (% TL)	26.1±1.9a	26.0±2.2A	31.5±2.9a	31.1±0.8A	13.6±0.5c	17.5±2.7C	24.9±0.2b	24.1±1.9B
20:4n-6	0.8±0.1b	1.6±0.0C*	4.0±0.0a	4.5±0.5A	3.7±0.3a	4.4±0.3A*	3.7±0.2a	3.6±0.0B
20:5n-3	1.1±0.1d	3.3±0.2B*	6.4±0.2a	6.5±0.7A	5.0±0.5b	6.4±0.6A*	3.1±0.3c	4.1±0.6B
22:6n-3	2.4±0.2c	11.4±0.4B*	16.3±0.5a	16.5±2.8A	15.3±1.1a	18.1±2.8A	7.4±0.1b	9.5±0.1B*
∑ n-3HUFA	4.3±0.3c	16.0±0.7B*	23.2±0.5a	23.7±2.4A	21.0±1.7a	25.6±2.2A	11.2±0.4b	14.9±0.5B*
TG(% TL)	33.5±0.7b	39.8±1.8A*	24.5±0.9c	33.5±0.3B*	43.4±0.8a	42.2±2.4A	35.9±2.5b	41.6±2.4A*

C, commercial booster; E1, 100% marine lecithin; E2, 30% marine lecithin + 70%blend of oils rich in TG; E3, 100% blend of oils rich in TG. Different letters within a row denote significant differences among treatments for a particular enrichment period; * denote differences between hours of enrichment for a dietary treatment

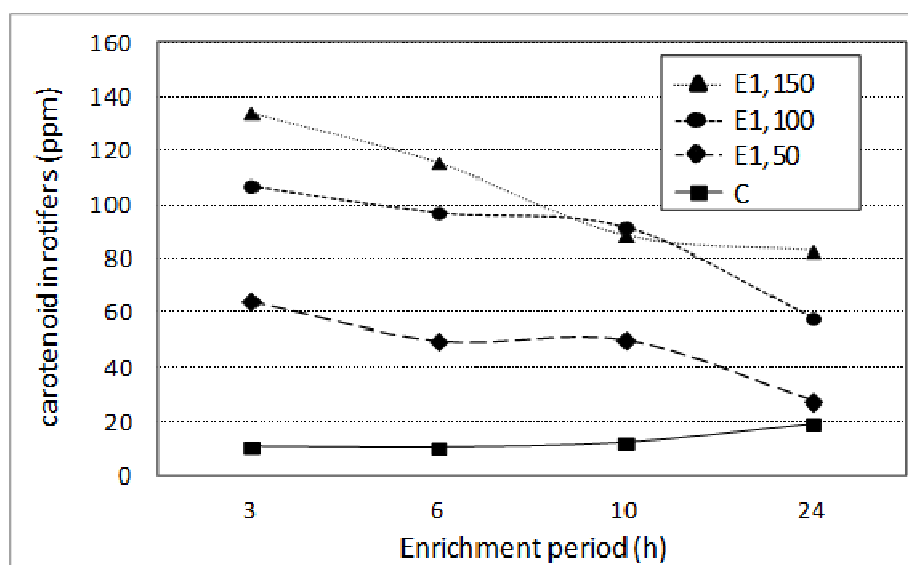


Fig.1. Evolution of carotenoids proportion in rotifers enriched with the PL-rich emulsion and increasing concentration of carotenoids (50, 100 and 150 ppm)

Discussion and conclusions

According to the carotenoid and lipid and fatty acid composition of wild seriola eggs, rotifers enriched for 3h with 8% of a marine lecithin (LC-60) with a light supplementation of AA (E1) may improve amberjack larval performance. Also accordingly, a combination of this treatment with a range of carotenoids below 50ppm will be asses within DIVERSIFY frame.

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References

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