Antioxidant potential of new micro and macroalgae products for live prey enrichment

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Introduction

Brachionus plicatilis and *Artemia* are commonly used in aquaculture as live food for fish larvae. However, these preys are deficient in LC-PUFA and need to be enriched in order to improve their nutritional value. These fatty acids, particularly DHA, are essential nutrients for the normal development of larval tissues, especially nervous system (brain and visual perception). However, LC-PUFA are readily oxidable, being susceptible to lipid peroxidation due to the presence of free radicals causing oxidative stress (Viciano *et al.*, 2017). During early stages of larval development and live prey enrichment protocols, there is a pro-oxidant environment due to the high metabolic activity and the aeration systems, respectively, compromising the appropriate supply of LC-PUFA to fish larvae. Algae are rich in omega-3 LC-PUFA and bioactive compounds with antioxidant potential, such as carotenoids. Thus, new products obtained from microalgae and macroalgae were tested in the presence or absence of a pro-oxidative LC-PUFA environment in order to evaluate their potential as enrichment and antioxidant compounds.

Material and Methods

➢ **Three experiments carried out on microalgae-enrichment of *Artemia* (A) and rotifer (R) with or without lipid emulsion (LE)**

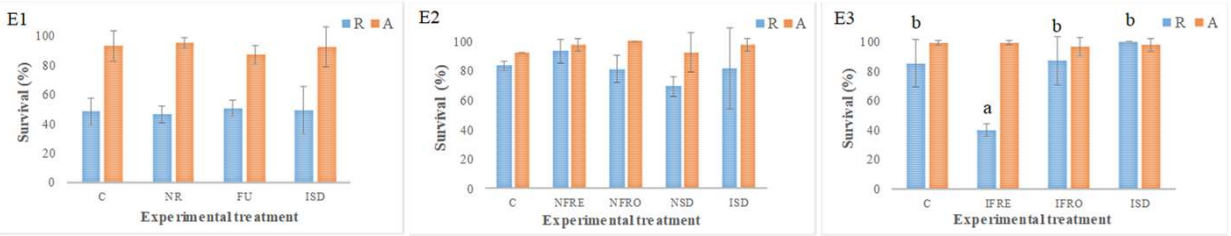
- Survival rate
- Peroxides index (PI)
- Malondialdehyde content (TBARS)

One-way ANOVA. Posthoc: Tukey ($p < 0.05$)

LE: Incromega DHA500 **(C)**; LE + astaxanthin (NatuRose®) **(NR)**; LE + fucoxanthin (*Lobophora variegata)* **(FU)**; LE + spray-dried *Isochrysis galbana* **(ISD)**	**E1**
LE: Incromega DHA500 **(rotifer)** or Marine lecithin **(Artemia) (C)**; LE + fresh *Navicula salinicola* **(NFRE)**; LE + frozen *N. salinicola* **(NFRO)**; LE + spray-dried *N. salinicola* **(NSD)**; LE + spray-dried *I. galbana* **(ISD)**	**E2**
Baker's yeast **(rotifer)** or PhytoBloom Prof **(Artemia) (C)**; Fresh *I. galbana* **(IFRE)**; Frozen *I. galbana* **(IFRO)**; Spray-dried *I. galbana* **(ISD)**	**E3**

Results and Discussion

Figure 1. Survival (%) of rotifer (R) and *Artemia* (A) in E1, E2 and E3. Data are presented as mean ± SD (n=3). Different letters denote significant differences (P<0.05)



The only difference among treatments was registered for rotifer IFRE. The generally lower survival rate of E1-rotifer could be related to the higher culture density used in this trial compared to that of E2 and E3 (470 *vs* 200 and 87 ind mL^{-1}, respectively).

Figure 2. PI (mEqO$_2$ kg^{-1}) of rotifer (R) and *Artemia* (A) in E1, E2 and E3. Data are presented as mean ± SD (n=3). Different letters denote significant differences (P<0.05)

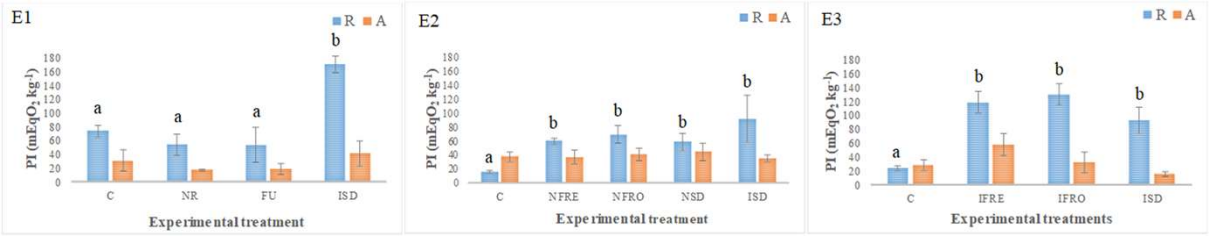
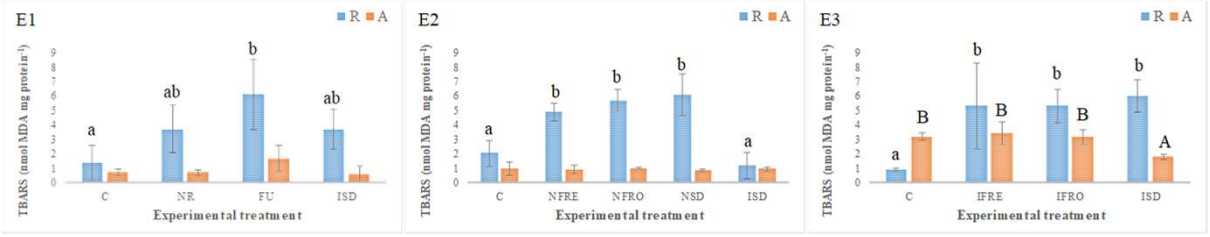


Figure 3. TBARS (nmol MDA mg protein^{-1}) of rotifer (R) and *Artemia* (A) in E1, E2 and E3. Data are presented as mean ± SD (n=3). Different letters denote significant differences (P<0.05): a,b for rotifer and A,B for *Artemia*.



Both PI and TBARS were lower in *Artemia* than in rotifers, probably due to the high content of the carotenoid cantaxhanthin in the crustacean (D'Abramo *et al.*, 1983), which may act as an antioxidant agent in this species. In addition, *Artemia* E3-ISD show reduced amounts of TBARS compared to the commercial product.

Conclusion

The formats and concentrations of new ingredients assayed as single enrichment products or in combination with lipid emulsions, do not adversely affect the survival compared to the control treatments. The lower amounts of PI and TBARS in *Artemia* seem to indicate a better antioxidant defense and a higher potential for the effective use of the micro and macroalgae products in this species.

References: D'Abramo *et al.*, 1983. *Canadian Journal of Fisheries and Aquatic Sciences* 40(6): 699-704. Viciano *et al.*, 2017. *Aquaculture Research* 48(3): 1006-1019.

Acknowledgements

Interreg Proyect 2014-2020: MACBIOBLUE (MAC/1.1b/086). CajaSiete (fellowship A. Galindo). C. Rodríguez is member of ITB (Canary Islands).