Background

Inland culture of mussel spat can play an important role in supporting extensive mussel farming, offering the potential for the reliable, large-scale supply of spat to the aquaculture industry, improving conditions for delicate life stages throughout production and protecting the environment from over-harvesting of wild populations. However, up to half of the production costs of inland bivalve hatcheries and nursery facilities, are used for algal provisioning.

We tested the impact of dietary alternatives to commercial algal feeds (Shellfish Diet 1800) on the survival and growth of Mytilus galloprovincialis spat, widely farmed in Europe.

Methods

Spats (6.8 ± 1.1 mm) were collected from a longline culture in the Basque Country and were cultured for six weeks either hanging from racks in Mutriku or in 2-L tanks in the laboratory (Fig.1). In the laboratory spat were unsupplemented with any food (Negative control, NC) or fed with different diets:

- A) commercial microalgal diet (Shellfish Diet 1800);
- (BB) microencapsulated feeds containing a 1:1 blend of the macroalgae Undaria pinnatifida and the microalgae Schizochytrium (BioBullets; BB);
- (ABB) commercial microalgae and BioBullets combined.

High survival (> 85 %) was displayed throughout the experiment, with no differences found among laboratory treatments and between lab- and field-grown mussels. By the end of the sixth week of the experiment, field-grown mussels exhibited the highest live weight in comparison to the rest of the treatment groups and unsupplemented mussels (NC) exhibited the lowest (Fig. 2) Likewise, higher shell growth rates were observed in mussels grown in the field and fed in the laboratory compared to unsupplemented mussels (NC) (Fig. 3).

Results

Unsupplemented spat showed no growth and little change in body condition (CI) (Fig.5). Spat fed microcapsules (BB) grew at comparable rates and body condition rises in all treatments were observed in mussels fed microcapsules alone (Fig.3, 4, 5). Supplementing microencapsulated feeds with the commercial microalgal (ABB) diet did not significantly improve growth performances relative to mussels fed microcapsules alone (Fig.3, 4, 5).

Conclusions

Weight gain and shell growth rates of mussel spat were similar among all experimental groups in the laboratory after 6 weeks of feeding. The growth enhancement of mussel spat fed BioBullets after 6 weeks indicated that a mixture of inert Schizochytrium sp. and U. pinnatifida (1:1), can substitute 100 % of commercial microalgae in mussel spat diets, which can significantly reduce the hatchery costs compared to conventional feeds. Furthermore, BioBullets microencapsulations also represent a more environmentally sustainable option, by reducing the use of natural resources, such as energy and water, needed for live microalgae production. Likewise, being produced from food industry by-products (i.e. Wakame), microencapsulated feeds promote circular economy and a more eco-friendly mussel aquaculture sector.