

Introduction

Live microalgae is used in hatcheries as food for rearing bivalve molluscs and for enhancing the food value of zooplankton used in rearing the larval stages of some marine fish species. This algae is produced in a variety of large-scale systems.

Bag culture



The Seasalter continuous flow algae culture system.

The challenge for the hatchery operator is to match supply and demand, without over-producing costly algae or failing to provide sufficient algae food.

One way of achieving this would be to use **preserved algae diets**. This could provide an off-the-shelf product to be used as the only food source or as a food supplement.

Preservation methods

Following concentration by centrifugation, algae can be preserved in various ways, to provide a low bulk product. These include:

- storage at low temperature, including freezing
- freeze-drying
- spray-drying

Approach

Experiments using a range of nutritionally valuable algae species to determine:

- most effective method of preservation – by assessing cell recovery, biochemistry and shelf life
- food value of preserved algae for bivalve molluscs
- food value of preserved algae for zooplankton (Rotifers and Artemia)
- food value of zooplankton fed preserved algae for fish larvae

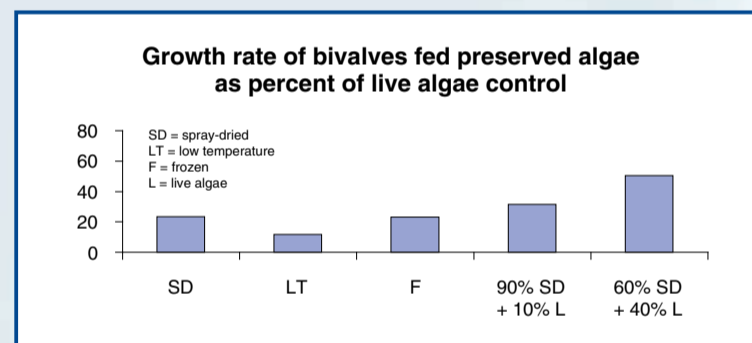
Table 1: Preservation of algae

Algae species	Low temperature (4 °C)	Frozen (-20 °C)	Spray-dried
<i>Chaetoceros ceratosporum</i>	**	*	*
<i>Chaetoceros calcitrans</i>	**	Not tested	*
T-ISO	*	***	***
<i>Nannochloropsis oculata</i>	*****	*****	*****
<i>Pavlova lutheri</i>	**	*	**
<i>Rhinomonas reticulata</i>	***	*	***
<i>Tetraselmis suecica</i>	****	****	****
Bloomed pond water	*****	*****	Not tested

Key: *very poor; **poor; ***fair; ****good; *****excellent

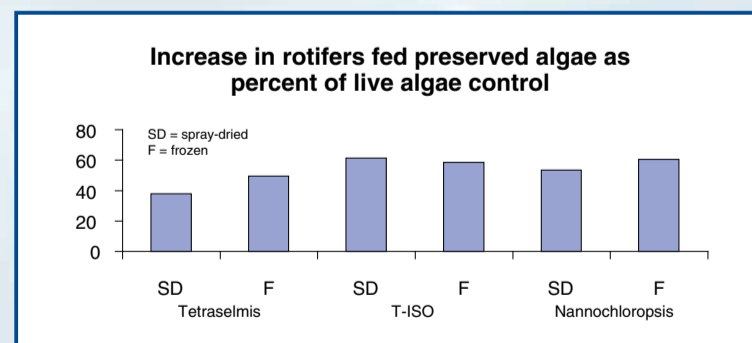
- Methods have been developed for several species.
- Concentrates can successfully be made for all algae food species.
- Diatoms, which are very useful as bivalve mollusc diets, do not preserve well.
- Freeze-drying was not appropriate for any of the algae tested.
- Shelf life of algae stored at low temperature is limited (2 – 5 weeks)
- Spray-drying and freezing are the best methods but they can destroy some cells and may also bring about some changes in cell biochemistry, including essential fatty acid content. Values in the Table reflect these considerations.

Figure 1: Food value for bivalve molluscs



- Experiments with Pacific oysters and king scallops
- Preserved algae give much lower growth rates than fresh live algae
- Dried algae can be used as a food supplement, but there is still a need for a high proportion of live algae. Evidence from previous work suggests that higher proportions of dried algae may support good growth of clams.

Figure 2: Food value for zooplankton



- Experiments with rotifers
- Spray dried and frozen algae diets both gave an increase in rotifer numbers but neither were better than live algae diets. There appears to be very little difference between the two methods of preservation and this is probably due to loss of important fatty acids 20:5 (n-3) and 22:6 (n-3) during the preservation processes.

Summary

- Algae can successfully be concentrated and preserved. Some species preserve better than others, and the most appropriate method varies with the species.
- Preserved algae are of limited value for bivalves - the best food species do not preserve well and loss of the essential fatty acid 20:5 (n-3) compromises value of other algae.
- Preserved algae diets show some promise as foods for zooplankton in fish culture

Spray dried algae



The Laboratory Spray-Drier and an example of the algae powder produced (Tetraselmis).

The final year

Results to date indicate that a spray-dried product using the algae species *Nannochloropsis*, T-ISO and *Tetraselmis* as feeds for zooplankton is a promising application for preserved diets.

Fish larvae will be reared with zooplankton fed these preserved algae diets singly and in mixtures.

Partners

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