HIGH DENSITY FLOW-THROUGH CULTURING OF BRINE SHRIMP *ARTEMIA* ON INERT FEEDS – PRELIMINARY RESULTS WITH A MODIFIED CULTURE SYSTEM

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ABSTRACT

A modified filter system is described for the intensive culturing of Artemia *in a continuously renewed medium. Extrapolated to a 1 m³ tank, 25 kg live weight* Artemia *could be produced over a culture period of two weeks on a diet of micronized and defatted rice bran using the salt enriched effluent of an abandoned geothermal well as a culture medium.*

A few years ago the *Artemia* Reference Center together with the St Croix Marine Station of the University of Texas Marine Science Institute developed a new technique for high density culturing of brine shrimp under flow-through conditions (Tobias *et al.*, 1979). The most important innovation was the interchangeable screen-cylinder with aeration collar that assures efficient drainage of culture water and faecal pellets. Using monospecific algal cultures as combined culture medium and food source, it was shown at St Croix that, extrapolated from repeated 100 litre culture trials, up to 25 kg of *Artemia* can be produced in a 1 m³ tank within a growing period of only two weeks (Roels *et al.*, 1979).

Since the use of live algae greatly restricts the applicability of this type of intensive culturing of brine shrimp (Sorgeloos, 1982), we were interested to test flow-through culturing with cheap inert diets that had already proven to be acceptable in the batch culturing of *Artemia* (Dobbeleir *et al.*, 1980). The availability of sufficient volumes of warm water (5 $m^3 h^{-1}$ at 29°C and 8 ppt salinity) from an abandoned artesian well

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enabled us to study the technical feasibility of flow-through culturing of *Artemia* inert feeds. Results reported here were obtained with micronized defatted rice b as food source.

Initial testing revealed that clogging of the filter screen is much more critical w rice bran as food than with live algae; i.e. during the first week when use was made the smallest mesh screens, cylindrical filters appear not to be suited. Filter surfa that are slightly inclined, however, are more efficiently cleaned by the effect of ris air-bubbles. Taking this into consideration we have developed a new filter system t is schematically outlined in Fig. 1.

An oblong and funnel shaped frame is assembled with PVC-tubing, elbows and pieces. The four stand-up sides are mounted at an angle of about 9° with the botto Nylon screen bags (mesh sizes: 130, 225, 300 and 400 μm) are sewed to the frame ensure perfect fitting over the frame support. The upper part of the filter, starti from just underneath the water level, is finished in nylon cloth. For those larvae t have been foamed off, this smooth nylon surface provides a chance for them to sli back into the culture medium. Furthermore, each filter bag is equipped with a dr tube (2 cm diameter) mounted in one of its ends under the water level. The fil system, i.e. filter bag fixed on frame, fits exactly into a rectangular aeration col that has been glued to the bottom of the culture tank. This collar is made of PV tubing, 10 mm diameter with 1·5 mm holes at 1 cm intervals. The air-bubbles rising the outside of filter systems not only prevent clogging of the filter surfaces but at t same time assure sufficient culture aeration and mixing.

The filter system outlined in Fig. 1 was installed in polyethylene tanks (110 65 cm) containing a 500 litre culture medium. Well water was pumped into a consta head cylinder that also acted as sand filter. Flow rates to the individual culture tan were adjusted so as to assure acceptable removal of faecal pellets. Working with a lar density of 10 000 litre^{-1} culture water, retention times were kept at 3 h during t first week and were then progressively lowered to a minimum of 1 h from day 10 o wards. Once every day filters were lifted out of the culture tanks and cleaned. On da 3, 6 and 9 filter bags were changed for a larger mesh size. Every 5 min micronize rice bran suspension (20 g litre^{-1} NaCl brine) was pumped into the culture tanks usi the automatic distribution system described in Bossuyt and Sorgeloos (1980). Feedi rates were adjusted so as to maintain the culture medium transparency, measur inside the filter system with a modified Secchi-disc (Bossuyt and Sorgeloos, 198 within the range 15–20 cm during the first culturing week and 20–25 cm during t second week (Sorgeloos *et al.*, 1982). Water temperature in the culture tan fluctuated between 26 and 27°C.

The first culture tests with the new set-up revealed that the rectangular/funn shaped filter bag-system is very well suited to flow-through culturing of *Artemia* rice bran. Production results with Great Salt Lake (Utah, USA) *Artemia*, howeve were low due to proliferation of filamentous bacteria and peritrichous ciliates in t low salinity waters. Best harvests at the end of the two-week culturing period on amounted to an extrapolated 8 kg m^{-3} (Brisset, 1981).

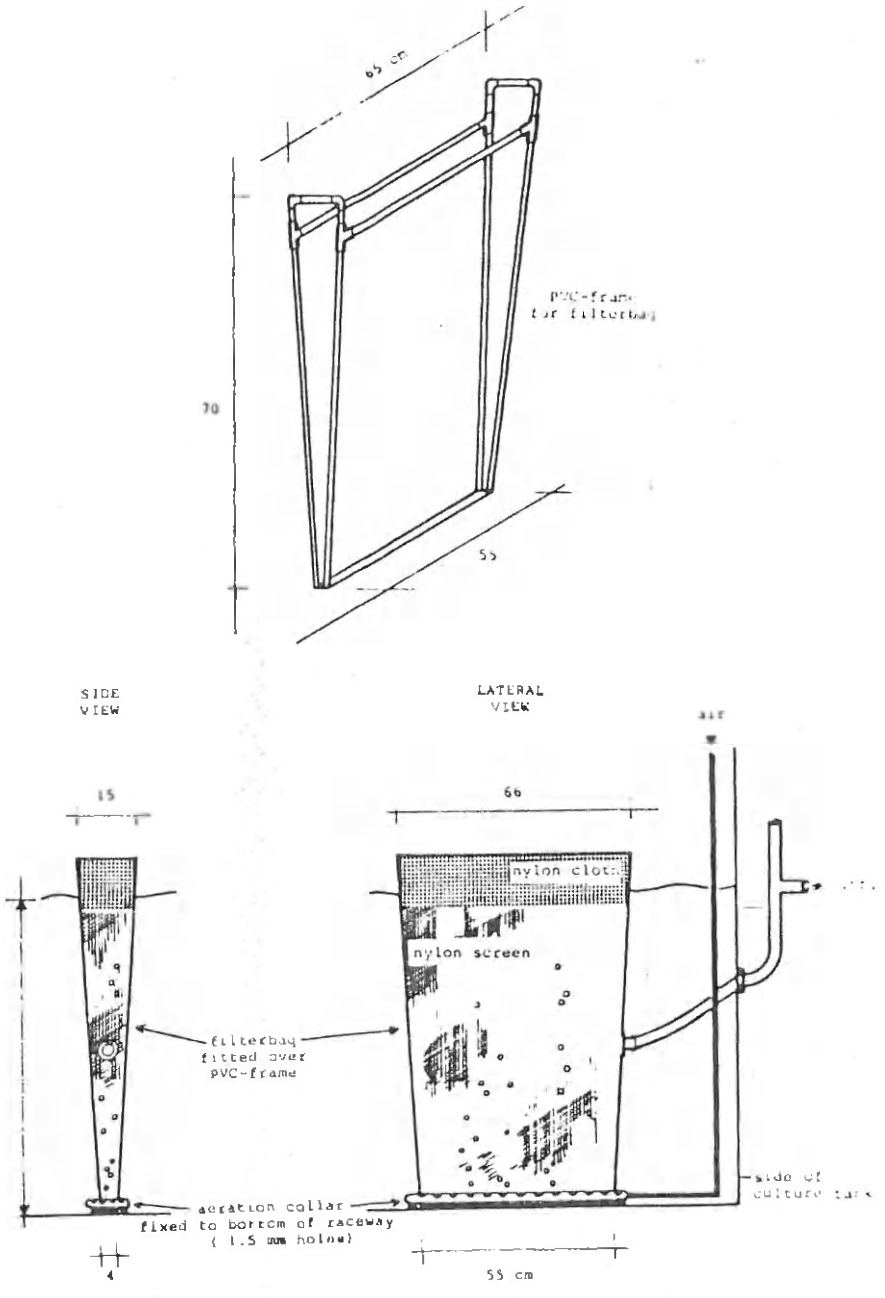

Fig. 1. Schematic diagrams of new filter-systems.

In order to verify the effect of low salinity, a last series of experiments was conducted in Turnhout (Belgium) with salt enriched well water. Salinity levels in the culture tanks were maintained at about 35 ppt by continuous addition of saturated NaCl-brine from a Sterling brinomat (Spotte, 1970; Sorgeloos *et al.*, 1982) into the inflowing well water. *Artemia* cultures were not contaminated any more with harmful floccules and high production yields were achieved: i.e. after two culturing weeks in a 500 litre tank 13 kg live weight pre-adults were harvested for a total consumption of 8 kg micronized rice bran and 55 m^3 culture water. Extrapolated to a 1 m^3 tank this means a production capacity of 25 kg *Artemia*, which is comparable to the yields obtained on St Croix with live algae.

Although the production results reported here are about four times higher than the best figures reported for batch culturing of *Artemia* with the same inert feed (Bossuyt and Sorgeloos, 1981), they should be considered as preliminary. It is indeed very likely that further R & D with regard to maximal larval densities, minimal food demands, optimal flow rates, etc., will result in increased production capacities. Flow-through culturing of *Artemia* on inert feeds could furthermore be intensified by partial recycling of culture effluents.

In conclusion, we are convinced that, provided cheap sources of suitable feed and culture water are available, industrial production of *Artemia* will become attractive for specific uses of this high quality animal protein.

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