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Brief Technical Note

CULTURE OF *ARTEMIA* ON RICE BRAN: THE CONVERSION OF A WASTE-PRODUCT INTO HIGHLY NUTRITIVE ANIMAL PROTEIN[1]

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ABSTRACT

Sorgeloos, P., Baeza-Mesa, M., Bossuyt, E., Bruggeman, E., Dobbeleir, J., Versichele, D., Laviña, E. and Bernardino, A., 1980. Culture of *Artemia* on rice bran: the conversion of a waste-product into highly nutritive animal protein. *Aquaculture*, 21: 393—396.

The age-old problem of finding a cheap and suitable food for *Artemia* is finally solved with rice bran, in fact a waste-product which is available at a very low price in many countries all over the world.

Of the various batch culturing techniques we have tested for growing *Artemia* larvae from nauplius to adult, the air-water-lift operated raceway proves to be the most suitable. The construction and operation of the culture tank are simple, and high production results can be obtained. A detailed description of this culturing technique is reported in Bossuyt and Sorgeloos (1980).

Although it is known from the literature that a wide range of live and inert feeds can successfully be used in culturing brine shrimp (see review in Sorgeloos and Persoone, 1975), a cheap food, available world-wide, has not yet been reported.

For more than 2 years now, we have been using rice bran, i.e. the broken coat of the rice grain, as a most suitable diet for brine shrimp. This waste-product of a major agricultural crop is available in large quantities on most continents at a wholesale price of less than US $ 0.15/kg.

In our experience, good results are guaranteed only when the rice bran is free of contamination by pesticides, which are often applied during long-term transport or storage of the crude product. When available, defatted rice bran is to be preferred: compared with crude rice bran it is as good a food for brine shrimp but is cheaper and more stable, i.e. less liable to become rancid (Dobbeleir et al., 1980).

The particle size of the *Artemia* food should be under 50 μm. As regards the local costs of manpower, manual preparation or mechanical grinding can be applied. The manual method consists of wet homogenization in a blender followed by screening the suspension through a 50-μm filter screen. Dry processing techniques, such as Ultrafine®-micronization, are now available to reduce particle sizes below the 50-μm level. These applications however, are economically feasible only for large quantities. More details on the processing of rice bran and the selection of other cheap inert feeds for *Artemia* are reported in Dobbeleir et al. (1980).

Although the nutritional value of rice bran as a sole food for fishes and crustaceans is known to be very low, it appears to be an excellent diet for brine shrimp. After 2 weeks batch culturing in a 1-m^3 raceway at 28° C, the nauplii hatched out of 10 g cysts are converted into approximately 2 kg liveweight pre-adults. Rice bran can also be used for flowthrough culturing of brine shrimp (Tobias et al., 1979; Sorgeloos, 1980). Preliminary tests indicate

TABLE I

Amino acid composition (expressed as percentage of the dry weight) of rice bran (Barber and Benedito de Barber, 1977), naturally-grown adult San Francisco Bay *Artemia* (Gallagher and Brown, 1975), and pre-adult *Artemia* cultured from San Francisco Bay cysts in an AWL-raceway on homogenized rice bran

	Rice bran	Naturally-grown *Artemia*	Rice-bran-fed *Artemia*
Crude protein	13.4	58	60
Lysine	0.49	3.27	4.00
Histidine	0.27	0.77	1.18
Arginine	0.82	2.80	4.05
Aspartic acid	0.97	3.96	4.53
Threonine	0.39	1.98	2.50
Serine	0.54	2.06	2.52
Glutamic acid	1.63	6.11	6.41
Proline	0.52	2.24	4.00
Glycine	0.57	2.28	2.65
Alanine	0.72	2.97	3.50
Cystine	0.21	0.95	0.90
Valine	0.69	2.32	2.49
Methionine	0.28	1.16	1.39
Isoleucine	0.50	2.28	2.53
Leucine	0.88	3.44	3.40
Tyrosine	0.46	1.93	2.75
Phenylalanine	0.57	2.02	2.84
Total amino acids	10.51	42.54	51.14

that up to five times more biomass can be produced per unit of tank volume as compared with results obtained with batch culturing.

The amino acid data in Table I indicate that brine shrimp, at least at the qualitative level, are very efficient protein converters. Although their food contains only low levels of plant protein, 60% of the adult dry weight is composed of an animal protein which is rich in essential amino acids.

It appears from Table II that there are important differences in the fatty acid pattern of natural brine shrimp and those fed rice bran. Nevertheless, no significant differences in growth or survival were reported when sole (*Solea solea*) and lobster (*Homarus americanus*) larvae, respectively, were fed 2-day-old or adult *Artemia* fed rice bran versus *Spirulina* (Dobbeleir, 1979 and non published data).

However, in view of the essential role of long-chain poly-unsaturated fatty acids in the diet of larval fishes (Watanabe et al., 1978), further research will be devoted to determining the nutritional value of rice-bran-fed *Artemia* for various predators, as well as to the potential of modifying the fatty acid pattern in *Artemia* through diet modifications and/or alternations (cf. Dobbeleir et al., 1980).

TABLE II

Fatty acid analysis of the lipid fraction (expressed as percentage of the total fraction) of naturally-grown adult San Francisco Bay *Artemia* (Gallagher and Brown, 1975) and pre-adult *Artemia* cultured from San Francisco Bay cysts in an AWL-raceway on homogenized rice bran

Fatty acid	Naturally-grown *Artemia*	Rice-bran-fed *Artemia*
14 : 0	1.4	0.74
14 : 1	2.3	0.68
15 : 0	0.7	0.23
15 : 1	0.8	
16 : 0 branched		0.33
16 : 0	13.5	11.87
16 : 1	13.8	6.60
17 : 0	1.3	0.03
17 : 1	0.9	
18 : 0 branched		0.13
18 : 0	5.9	5.56
18 : 1	35.6	41.66
18 : 2	6.2	25.66
18 : 3		3.55
20 : 0	2.0	
20 : 1		
20 : 4	2.2	
20 : 5	12.0	
21 : 0		1.62
21 : 1		1.30

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