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The water stability of shrimp diets with various polysaccharides as a binding agent

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Diets for shrimps must not only have good quality but also have good stability in water, because shrimps' feeding response are very slow and they have a habit to masticate their food outside the buccal cavity before ingestion. Alginate and other polysaccharides, and especially starches have been used as a binding agents to develop water-stable diets for crustacean. Combination of 5% sago palm starch and 15% wheat flour has been reported to provide satisfactory water stable diet for *Penaeus monodon*, if the pellet is steamed. However, steaming may destroy certain nutrients in a diet.

In this experiment, water stability of diets with various polysaccharides as binding agents were tested without steaming. The composition of the basal diet and type of binders tested are shown in Tables 1 and 2, respectively. Sago and cassava starch, and glutinous rice meal were gelatinized by adding boiling water. Only cold water was added to the others. Each test diet was dried in an oven at 60°C until moisture content was below 5%. Water stability was determined by placing about 10 g pellets (2 mm in diameter, 20 mm in length) of known moisture contents in wire baskets and immersing these in aquaria with 7 liters of continuously aerated seawater (salinity, 32°/oo; temperature, 25°C) for 3, 6, 12 and 24 hours. The water stability was computed as follows:

$$\text{Water stability (\%)} = \frac{\text{Final wt} \times \text{\% dry matter}}{\text{Original wt} \times \text{\% dry matter}} \times 100$$

The diet with alpha-starch was very coarse and completely disintegrated in 5 minutes. Surface of the diets with CMC and cassava starch were smooth like the remaining diets, but they disintegrated almost completely in 6 hours. The diets with sago or glutinous rice flour showed more than 65% water stability at 12 hours, but they also disintegrated completely in 24 hours. The diet with alginate showed the best water stability and did not completely disintegrate in 24 hours.

Table 1. Percentage composition of the basal diet.

Ingredients	%
Shrimp meal	15
Fish meal	30
Soybean meal	15
Rice bran	11
Cod liver oil	4
Soybean oil	4
Vit-Min mix (V-22)	1
+ Vitamin C	
Binders*	20

*Experimental variables, see Table 2.

Alginate may be an excellent binder; however, feed cost will be increased as much as P150 to P230/ton. Thus, the use of alginate is dependent on its cost and availability. Alternate choices may be the combination of sago palm starch and wheat flour or glutinous rice flour.

Table 2. Water stability (%) of shrimp diets containing various type of binders tested at 3, 6, 12 and 24 hours.

	Binders	Hours			
		3	6	12	24
1	5 % Sago starch and 15 % wheat flour	87.6	84.0	76.3	T.D.*
2	5 % C.M.C. and 15 % wheat flour	79.4	T.D.		
3	20 % Alpha-starch	T.D.			
4	20 % Glutinous rice meal	70.5	71.8	66.6	T.D.
5	10 % Cassava starch and 10 % wheat flour	73.4	T.D.		
6	2.5% Alginate, 1 Calgon & 16.5% wheat flour	91.5	90.3	84.5	M.D.**

* Totally disintegrated

** Mostly disintegrated

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