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Murai, T.

Aquaculture Department, Southeast Asian Fisheries Development Center

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Improvement of diet attractability for *Penaeus monodon* by supplementing various attractants

T. Murai, A. Sumalangkey and F.P. Pascual

Since feeding response of shrimp is very slow, it is desirable for shrimp diet to emit some chemotactically favorable substances. Although various substances such as certain amino acids and clam, fish or squid extract have been shown to be attractants to shrimps, no such substance which attract *P. monodon* has been reported yet.

This experiment was carried out to test the effect of supplemental krill meal, earthworm meal, glycine, sucrose or mussel water on the diet attractability for *P. monodon*. The composition of the test diets and their proximate chemical analysis are shown in Tables 1 and 2, respectively. Full-fat soybean meal (roasted at 170-180°C for 15 minutes) was used in diets 1-6 instead of ordinary soybean meal which was used in the maintenance diet (diet 7). The ratio of the full-fat soybean meal for the diets 1-6 was increased from 15% (for the maintenance diet) to 25% at the expense of fish meal to make amino acid composition of the diets closer to that of *P. monodon*'s whole body.

Twenty P-58 *P. monodon* were randomly stocked in each of 14 aquaria with 40 liters of water and were fed the maintenance diet for one week previous to the study. After acclimatization, they were measured for length and weight. Each diet was randomly assigned to duplicate aquaria. Attractability of the diets was determined by the time elapsed from the moment that the pellets sank to the bottom to the time that any one shrimp (except one which happened to be close to the pellet) grasped the pellet. The determinations were conducted twice a day in the morning (9:00) and afternoon (6:00) for three consecutive days.

Results are summarized in Table 3. The diets without any attractant (diet 1 and 7) showed similar attractability both in the morning and afternoon feeding. Compared to these diets, addi-

Table 1. Composition of the experimental diets containing various types of attractants.

| Ingredient | Diet No. | | | | | | |
|-------------------|----------|-------|-------|-------|-------|--------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 ** |
| Shrimp meal | 150 g | 150 g | 150 g | 150 g | 150 g | 150 g | |
| Full fat soybean | 250 | 250 | 250 | 250 | 250 | 250 | |
| Fish meal | 200 | 200 | 150 | 200 | 200 | 200 | |
| Krill meal | | 50 | | | | | |
| Earth worm meal | | | 50 | | | | |
| Glycine | | | | 20 | | | |
| Rice bran | 150 | 150 | 150 | 150 | 150 | 150 | |
| Rice meal | 170 | 170 | 170 | 170 | 170 | 170 | |
| Sucrose | | | | | 50 | | |
| Crude sago starch | 50 | 50 | 50 | 30 | | 50 | |
| Cod liver oil | 20 | 20 | 20 | 20 | 20 | 20 | |
| Vit-Min mix* | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 | |
| Vitamin C | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | |
| Water | 340 | 340 | 340 | 340 | 340 | 340*** | |
| Total (w/ water) | 1340 | 1340 | 1340 | 1340 | 1340 | 1340 | |

* Refer to Felicitas P. Pascual

** Maintenance diet for prawn (2-S), refer to Felicitas P. Pascual.

*** Mussel water, which was obtained by boiling whole mussel for 30 minutes.

Table 2. Proximate chemical analysis of the test diets.

| Diet No. | Crude Protein | Crude Fat | Crude Fiber | Ash | Moisture |
|----------|---------------|-----------|-------------|-------|----------|
| 1 | 36.35 | 12.47 | 5.24 | 11.52 | 2.04 |
| 2 | 35.58 | 12.92 | 5.32 | 11.55 | 1.00 |
| 3 | 36.04 | 13.33 | 5.30 | 10.64 | 2.00 |
| 4 | 38.38 | 12.96 | 5.58 | 11.29 | 3.00 |
| 5 | 33.54 | 12.41 | 5.25 | 10.94 | 2.00 |
| 6 | 35.96 | 12.13 | 5.81 | 11.27 | 2.00 |
| 7 | 25.96 | 9.84 | 5.88 | 18.19 | 4.50 |

Table 3. The effect of various attractants supplemental to the diets on the time elapsed (seconds)* before shrimps grasped the diet.

| Diet No. | Attractants | Feeding Period | |
|----------|--------------------------------|--------------------------------|--------------------------------|
| | | A.M. | P.M. |
| 1 | None | 34.0 \pm 5.51 ^d | 30.0 \pm 11.06 ^{bc} |
| 2 | 5% krill meal | 29.8 \pm 7.5 ^{bcd} | 27.3 \pm 6.35 ^{abc} |
| 3 | 5% earthworm meal | 23.7 \pm 6.56 ^{abc} | 30.7 \pm 7.42 ^{bc} |
| 4 | 2% glycine | 15.3 \pm 5.01 ^a | 22.3 \pm 6.44 ^{ab} |
| 5 | 5% | 36.3 \pm 8.50 ^d | 25.8 \pm 7.68 ^{abc} |
| 6 | Mussel water | 21.8 \pm 6.71 ^{ab} | 17.3 \pm 8.64 ^a |
| 7 | Control (maintenance diets 2s) | 32.0 \pm 10.30 ^{cd} | 34.3 \pm 13.29 ^c |

*Mean \pm S.D. of values from duplicate tanks for 3 consecutive days.

tion of krill meal, earthworm meal and sucrose, improved the diet attractability to a certain extent either in the morning or afternoon feeding, but not significantly. The supplement of glycine or mussel water significantly ($P < 0.05$) improved diet attractability. Improvement of attractability by adding mussel water may be partly due to the fact that these shrimps had been raised with mussel meat. Like *P. japonicus*, supplemental glycine may be an attractant for *P. monodon* and diet attractability could be improved by adding glycine to the diet. The results of growth response and feed efficiency will be reported later.

Literature cited:

Pascual, F.P. Nutrition and feeding of sugpo *Penaeus monodon*. Aquaculture Extension Manual No. 3, SEAFDEC Aquaculture Dept., Tigbauan, Philippines.