SPAWNING PERFORMANCE AND OFFSPRING QUALITY OF DOMESTICATED BLACK TIGER SHRIMP (*Penaeus monodon*) FED A SEMI-MOIST MATURATION PELLET

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INTRODUCTION

Research into broodstock nutrition is a key element in the domestication of peneid shrimp. Improved pellet formulation and manufacturing techniques can enhance pellet ingestion by domesticated broodstock and increase fecundity and hatching results. The present study investigates the potential of a newly-developed formulated broodstock pellet to replace a typical broodstock diet based on fresh-food components. The artificial feed is a semi-moist pellet (SP) (BREED-S® FRESH, INVE Aquaculture) formulated to the specific needs of domesticated broodstock in terms of nutrients, attractants and palatability.

MATERIALS AND METHODS

In two independent experiments, spawning and reproductive performance of 11 and 13-month old F2-domesticated black tiger shrimp *Penaeus monodon* fed different feeding regimes were evaluated. Females were tagged for individual monitoring, and a stocking density of 4 females and 4 males per 5-m3 recirculation tank was applied in experiment 1 with 4 tank replicates per treatment. In experiment 2, the tanks were stocked with 6 males and 4 females, with 6 replicate tanks per treatment

In experiment 1, the shrimp were fed three feeding regimes:

100FF: 100% mixed fresh food
40SP: 40% semi-moist pellet plus 60% mixed fresh food
60SP: 60% semi-moist pellet plus 40% mixed fresh food

In experiment 1, the fresh-food mixture was composed of squid, oyster, marine worm and pork liver and was formulated to resemble ARA/EPA, DHA/EPA, and n-3/n-6 fatty acid ratios of mature ovaries of wild black tiger shrimp (Marsden *et al*., 1992). In experiment 2, treatments 100FF and 60SP were repeated but marine worms were omitted from the fresh food mixture.

RESULTS AND DISCUSSION

The results of both trials (Table 1 & 2) demonstrated that up to 60% of the fresh food mixture could be replaced with the commercial soft pellet without loss in spawning performance: the spawning frequency and fecundity results were very similar (P>0.05). This confirms that the pellets were readily ingested and assimilated, and that the formulated lipid level of the diet supported normal spawning performance.

Table 1. Spawning performance and offspring quality of domesticated shrimp breeders fed different maturation diets in experiment 1

	100FF	40SP	60SP
Female weight (g)	114.65 ± 6.6^{a}	100.9 ± 7.4^{b}	106.8 ± 5.0^{ab}
Spawns per female	3.6 ± 0.5^{a}	3.3 ± 0.5^{a}	3.6 ± 1.1^{a}
Fecundity (eggs/spawn)	291,346 ± 31,972^{a}	277,647 ± 71,736^{a}	306,636 ± 18,865^{a}
Egg hatching (%)	62.5 ± 5.74^{a}	66.7 ± 6.0^{ab}	75.0 ± 1.9^{b}
Metamorphosis into zoea (%)	93.1 ± 1.7^{a}	93.6 ± 2.06^{a}	96.3 ± 0.8^{b}

Table 2. Spawning performance and offspring quality of domesticated shrimp breeders fed different maturation diets in experiment 2

	100FF	60SP
Female weight (g)	119.6 ± 13.8^{a}	120.8 ± 11.6^{a}
Spawns per female	3.1 ± 1.16^{a}	3.3 ± 1.2^{a}
Fecundity (eggs/spawn)	265,949 ± 56,819^{a}	273,888 ± 37,008^{a}
Egg hatching (%)	66.1 ± 7.6^{a}	77.9 ± 4.8^{b}
Metamorphosis into zoea (%)	92.3 ± 1.5^{a}	93.6 ± 1.6^{a}

Interestingly, the use of this pellet improved egg and larval quality. The treatment with the highest level of fresh-food replacement (i.e. 60SP) yielded significantly improved (P<0.05) egg hatching rates (experiment 1 and 2) and larval metamorphosis rates (experiment 1 only), as compared to control treatment 100FF. This positive effect persisted during the hatchery cycle, as can be seen from the PL15 survival rates in Figure 1. We speculate that this is due to essential nutrients such as carotenoids, vitamins and highly-unsaturated fatty acids provided through the formulated feed as was also shown in previous studies (reviewed by Wouters *et al.*, 2001).

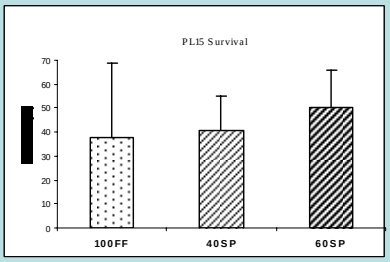

Fig. 1 Survival at postlarval stage PL15 of *Penaeus monodon* offspring originating from treatments 100FF, 40SP and 60SP of maturation experiment 1.

CONCLUSIONS

The tested semi-moist – yet storable and commercially available – maturation pellet is able to replace at least 60% of the fresh food mixture without any loss in reproductive performance and resulting in a better offspring quality.

The study furthermore demonstrates that a combination of diversified fresh-food components with a balanced maturation pellet can significantly improve nauplii production, therefore improving the success rate of domestication programs as well as the profitability of shrimp hatcheries.

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