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Aquafeeds

Suspended solids loads vary with feeding methods

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Experiment was carried out at the Technological Institute of Sonora in southern Mexico

With steady development of the shrimp-farming industry over the last decade and response to increasing world market demands, the waste loads from culture ponds – mainly uneaten feed and metabolic waste – have generally increased. The nutrient and organic matter effluents discharged from shrimp farms during culture and draining for harvest can have negative environmental impacts.

The authors recently evaluated two feeding practices – using feed trays and a mechanical feed dispersal device – as well as their relationship to total suspended solids (TSS) and organic suspended solids (OSS) loads during pond culture and drainage.

Mexico study

The experiment was carried out over 203 days at the Technological Institute of Sonora in southern Mexico. Six 5-ha ponds with 11 percent water exchange were stocked with Pacific white shrimp, (*Litopenaeus vannamei)*, at 15 postlarvae per m^2. The animals in three ponds were fed using 15 feeding trays per hectare, and in the other three ponds, feed was applied mechanically from the pond edges.

Shrimp production

Significant differences in harvest size and live-weight crop were observed (Table 1), with higher values in the ponds with feed trays. Feed conversion and survival rates of about 87 percent were comparable for both sets of ponds.

Casillas-Hernandez, Mean summary data, Table 1

Variable	Trays	Mechanical Feeding
Harvest size (g)	32.3 ± 0.9	29.5 ± 0.5
Live-weight crop (kg/ha)	3,325.0 ± 153.2	2,920.0 ± 30.0
Feed usage (kg/ha/crop)	5,928.0 ± 413.4	5,182.7 ± 228.4
Fertilizer (l/ha/crop)	305.8 ± 8.5	339.7 ± 4.2
Feed-conversion ratio	1.78 ± 0.04	1.79 ± 0.03

Table 1. Mean summary data for experimental shrimp ponds.

OSS, TSS values

Shrimp fed using feed trays generated 1,829 kg OSS per hectare, equivalent to 0.55 kg OSS per kilogram harvested shrimp. Ponds fed by mechanical dispersion unloaded 3,596 kilogram per hectare, or 1.23 kilogram per kilogram shrimp. The higher values may be associated with the organic matter from unconsumed feed.

During culture, the ponds with tray feeding revealed higher TSS loads of 12,623 kilogram per hectare, meaning 3.79 kg TSS per kilogram harvested shrimp. Ponds fed by dispersion registered 6,491 kilogram per hectare, or 2.22 kg TSS per kilogram shrimp. Such differences could be associated with the turbulence caused by the outboard motor on the boat used during the feeding operation. Dispersion feeding was performed mechanically from the pond edges, avoiding ground sediment at the edges of the ponds.

Effluents composition

The ponds in which feed trays were used produced 3,962 kg TSS per hectare and 1,101 kg OSS per hectare during pond drainage, or 1.19 kg TSS and 0.33 kg OSS per kilogram harvested shrimp, respectively. Ponds with shrimp fed by mechanical dispersion produced 5,518 kg TSS per hectare and 1,554 kg OSS per hectare, or 1.88 kg TSS and 0.53 kg OSS per kilogram shrimp, respectively.

Pond bottom composition

Ponds where shrimp were fed by mechanical dispersion produced 48 percent more organic matter on the bottom than those fed via tray feeders (Table 2). This differential accumulation may be related to increases in organic waste (unconsumed formulated feed, fecal matter, etc.) that form ammonia and other undesirable compounds after degradation.

Casillas-Hernandez, Mean organic matter in pond bottoms, Table 2

	Trays	Mechanical Feeding
Initial sampling		
Organic matter (%)	0.68 ± 0.11	0.67 ± 0.05
pH	7.32 ± 0.27	7.34 ± 0.28
Final sampling		
Organic matter (%)	1.19 ± 0.19	1.67 ± 0.22
pH	6.82 ± 0.21	6.30 ± 0.19

Table 2. Mean organic matter in pond bottoms and pH in trial ponds during the 203–day trial (27 samples each).

The lowest pH values registered at the end of the culture period for ponds with mechanical feed dispersion could be related to the highest organic matter registered.

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