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Shrimp (*Penaeus monodon* Fabricius) Production in Brackishwater Ponds Applied Varying Fertilizer Combinations*

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Production in extensive shrimp (*Penaeus monodon* Fabricius) farms varies widely from 50 to 500 kg/ha/crop. At stocking densities greater than 2000 fry/ha, a combination of organic and chemical fertilizers is needed to increase pond productivity. Growth of natural food which varies with pond location and condition is promoted through the use of different fertilizers. However, due to limited information, shrimp growers apply fertlizers on the basis of availability, price, and operating budget, not knowing the right quantity to apply. Such a practice could be unprofitable.

In this study, production of *Penaeus monodon* Fabricius reared in brackishwater earthen ponds applied with different fertilizer combinations were determined in two sets of experiment. Phase I was conducted during the dry season (December 1985 - March 1986) in fifteen 500-m^2 ponds given four different nitrogen (N) and phosphorus (P_2O_5) fertilizer treatments (Table 1). Basal application of

*Source: *Israeli J. Aquacult.-Bamidgeh* 43(2):69-76 (1991).

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Additional application of nitrogen and phosphorus fertilizers in brackishwater shrimp ponds did not give a marked increase in shrimp yield.

Table 1. Various fertilizer treatments and their corresponding rates used in two phases of experiments conducted in earthen ponds

Treatments	Fertilizer		
	Type	Application rate (kg/ha)	$N:P_2O_5$ ratio[1]
Phase I			
Ia (control)	-	none	0
IIa	Diammonium phosphate	32.8	15:15
IIIa	Urea	20.2	
IVa	Diammonium phosphate	32.8	15:15
	Urea	20.2	
	Chicken manure	1000	
Va	Diammonium phosphate	32.8	30:15
	Urea	53.6	
	Chicken manure	1000	
Phase II			
Ib	Diammonium phosphate	65.3	15:30
	Urea[1]	7.21	
IIb	Diammonium phosphate	87.0	20:40
	Urea	9.64	
IIIb	Diammonium phosphate	108.7	25:50
	Urea	12.1	
IVb	Diammonium phosphate	130.5	30:60
	Urea	14.5	

[1] Kg urea fertilizer/ha = rate of nitrogen to be applied minus kg/nitrogen obtained from diammonium phosphate/ha divided by percent nitrogen in urea.

chicken manure (1 t/ha, wet basis) was given only in Treatments IIIa and Va. The total input of chemical fertilizer was divided into six biweekly applications. During the wet season (July-November 1986), Phase II was undertaken using higher rates of N and P_2O_5 fertilizers in twelve 1000-m^2 ponds. Chicken manure was added to all ponds at 1 t/ha during pond preparation. Eight biweekly applications of chemical fertilizers were made beginning one week before stocking. Due to obvious slow growth of shrimps in unfertilized ponds in Phase I, control ponds were not included in Phase II. In Phase I, shrimp juveniles (mean body weight, 0.88g) were stocked at a rate of 5000 ind/ha. In Phase II, 0.26-g shrimps were stocked at 7000 ind/ha. Shrimps were harvested after 86 (Phase I) and 120 (Phase II) culture days.

Pond preparation included draining, drying, and eradication of pests and predators. Water replenishment in both studies was made possible through tidal flushing. About 30-50% of the water volume was replenished every 2 weeks during spring tide just before fertilizers were applied. Water depth ranged from 30 to 60 cm. Pondwater temperature in the morning ranged from 24 to 27°C (Phase I) and 25 to 34°C (Phase II).

In the control ponds (Treatment Ia), mean final body weight and daily weight increment of shrimps were significantly lower than those obtained in fertilized ponds (Table 2). Survival rates among all treatments were not significant. Highest yield was achieved in Treatment Va (96 kg/ha) and lowest was 41.2 kg/ha in control ponds. Significant differences in gross production were observed between Treatment Ia and Treatments IIIa and Va. Results of Phase I experiment indicated that the application of fertil-

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Table 2. Body weight at harvest, daily weight increment, survival, and gross production of *P. monodon* in earthen ponds

Treatments	Mean final body weight (g)	Daily weight increment (g/day/shrimp)	Survival (%)	Gross production (kg/ha)
Phase I (5000 ind/ha)				
Ia(control)	9.3 ± 3.3^a	0.10 ± 0.0^a	88 ± 18^a	41.2 ± 11.4^a
IIa	18.9 ± 5.6^b	0.22 ± 0.1^b	73 ± 25^a	62.9 ± 5.7^{ab}
IIIa	18.8 ± 1.1^b	0.22 ± 0.0^b	93 ± 4^a	87.8 ± 7.4^b
IVa	17.9 ± 0.1^b	0.21 ± 0.1^b	80 ± 7^a	71.3 ± 38.8^{ab}
Va	19.2 ± 4.0^b	0.23 ± 0.1^b	100 ± 0^a	96.0 ± 20.4^b
Phase II (7000 ind/ha)				
Ib	36.9 ± 3.4^b	0.30 ± 0.0^b	77 ± 4^b	199.2 ± 50.5^b
IIb	37.9 ± 12.7^b	0.31 ± 0.1^b	73 ± 16^{ab}	218.9 ± 105.7^b
IIIb	32.9 ± 11.3^b	0.27 ± 0.1^b	63 ± 24^a	172.4 ± 52.5^a
IVb	25.9 ± 9.8^a	0.21 ± 0.1^a	82 ± 3^b	170.0 ± 53.4^a

Values are means ± standard deviation of three replicates; means in a column with the same superscript are not significantly different (P>0.05).

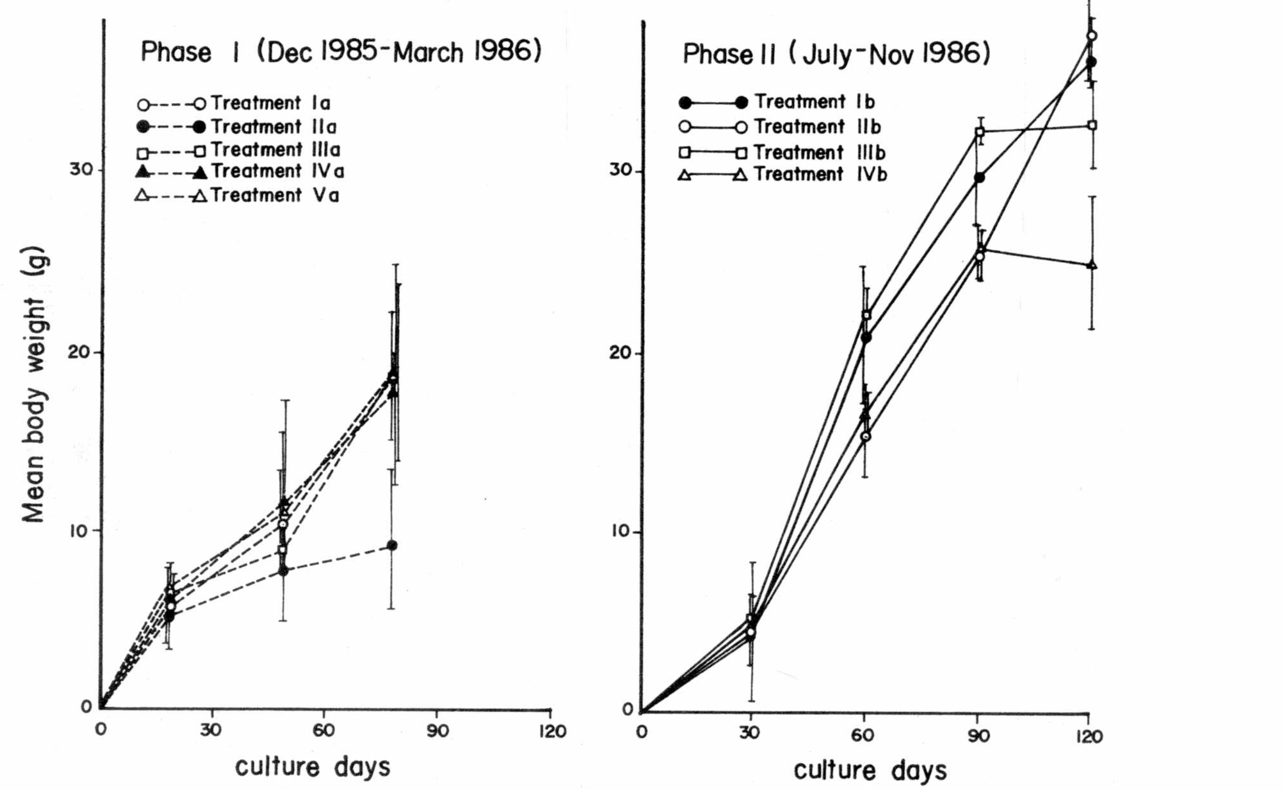


Fig. 1. Growth curve of *P. monodon* Fabricius reared in earthen ponds of SEAFDEC Leganes Brackishwater Station, Iloilo, Philippines

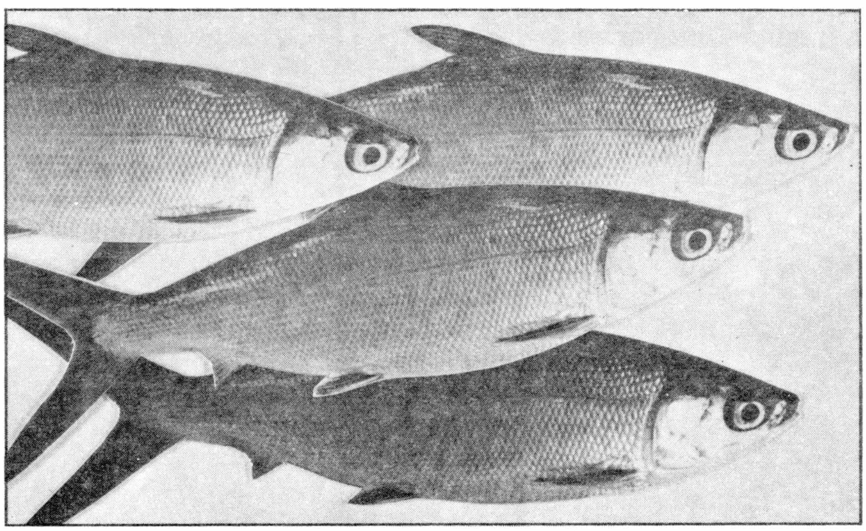
izers in ponds is essential to sustain growth of shrimps at a stocking density of 5000 ind/ha. Results further suggest no significant differences in yield with different combinations of fertilizers and whether or not chicken manure was applied.

At stocking density of 7000 juveniles/ha (Phase II) the yield was highest in Treatment IIb (218.9 kg/ha) and lowest in IVb (170 kg/ha) (Table 2). Ponds applied a lower dose of fertilizer had the most efficient treatment, with a high growth rate of 0.31 (Treatment IIb) and 0.30 g/day (Treatment Ib) (Fig. 1). The highest and lowest mean body weights at harvest were 37.9 g (Treatment IIb) and 25 g (Treatment Vb), respectively. Results showed that further increases in the amount of nitrogen and phosphorus fertilizer failed to improve yield significantly. Low mean salinity levels of pond water (6.1-6.8 ppt) in all treatments may have affected survival. *Chaetomorpha* sp. and *Enteromorpha* sp. were abundant in one of the replicates of each treatment throughout the culture period. These ponds were located near the inlet gate of a secondary canal which supplied freshwater from the river to the experimental ponds. These algae, which grow best in low salinity at a water depth of 60 cm or more, had intruded into the ponds through the river water during water replenishment. Excessive growth of these algae affected survival as shrimps got entangled and trapped by the algae. Intrusion of these species into shallow ponds could not be avoided. Fertilizers are usually wasted in these ponds because nutrients are used by macrophytes rather than by phytoplankton.

These experiments showed that additional application of nitrogen and phosphorus fertilizers did not give a marked increase in shrimp yield; rather the excess fertilizer was wasted. Production results achieved were promising and indicated that greater attention should be given to the applicability of these fertilization schemes to other sites, culture periods, and stocking densities. ●

Report: bumper milkfish egg collection

New Egg Collection Record



Milkfish culture in ponds and pens relies exclusively on the natural seed supply. Expansion of the milkfish industry in the Philippines is hampered by the inadequate and unstable seed supply. Furthermore, the seed supply is also threatened by coastal pollution. One of the major goals of milkfish research at the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD) is mass fry production to supplement the natural supply and ultimately break the dependence.

Captive milkfish broodstock (5-13 years old, 3.0-8.5 kg body weight) reared in floating net cages at SEAFDEC/AQD's Igang Marine Substation and concrete tanks at Tigbauan Main Station spontaneously spawned from April to November, 1991. Spawning mostly occurred at midnight to early morning hours with very rare spawnings occurring during daytime.

The 1991 total egg collection of milkfish broodstock in 15 cages amounted to 61.1 million. Last year's collection was the highest since 1986 when egg collection techniques were developed. Last year's collection also was an increase of 38% from the 1990 egg collection of 44.2 million eggs. A mixed stock of 51 over 13-year old milkfish spawners reared in a 10-m diameter by 3-m deep floating net cage gave the highest collection of 17.6 million eggs. A homogenous stock of 19 eleven-year old milkfish broodstock with 12 females, initially from wild-caught fry, produced 16.4 million eggs. Egg collection from both stocks amounted to 56% of the 1991 total.

One of the highlights from last year's spawning epi-