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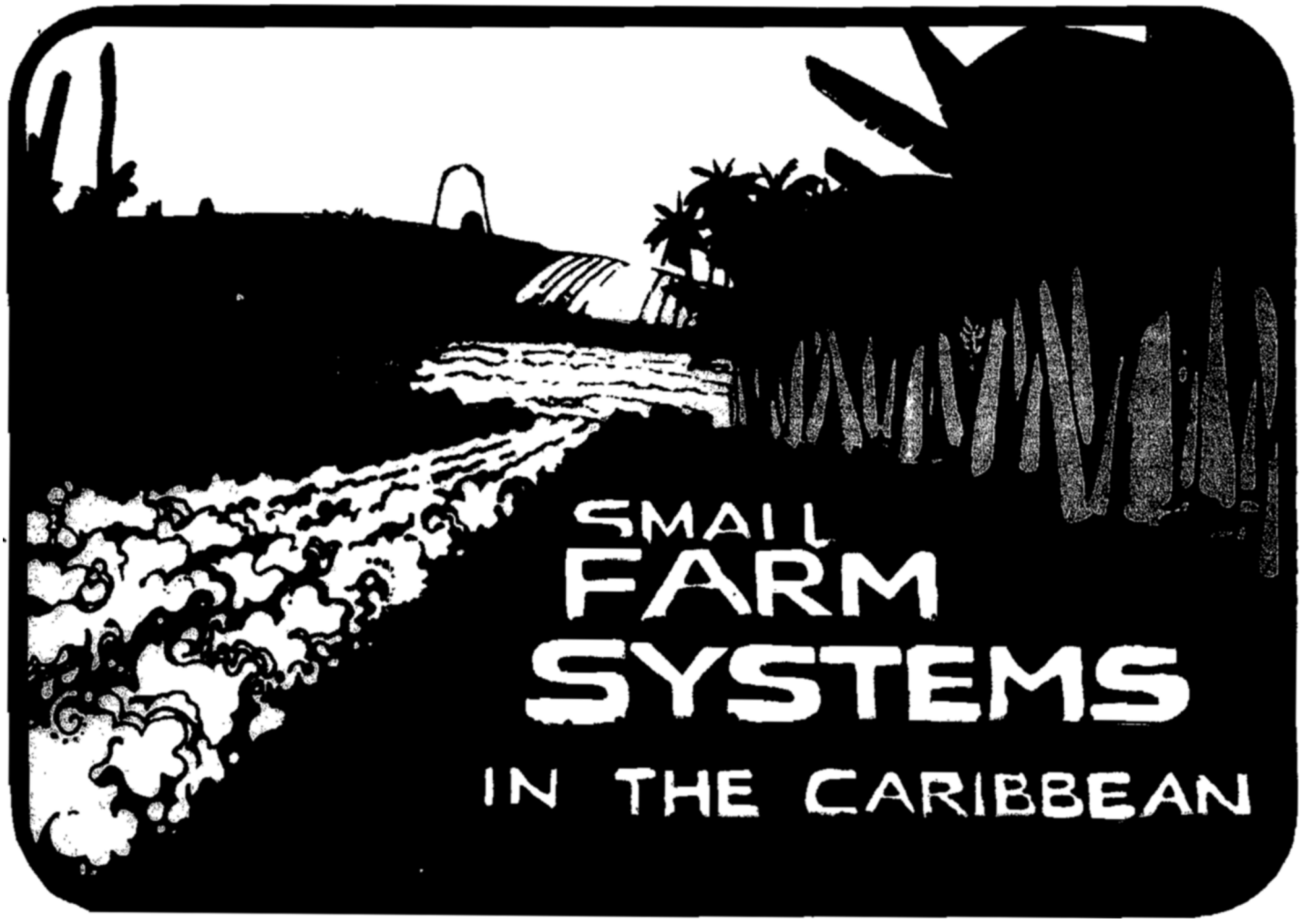

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Effects of High pH on *Macrobrachium rosenbergii* Postlarvae

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By adjusting pH through additions of NaOH solution (~8N), the response of recently metamorphosed *Macrobrachium rosenbergii* postlarvae to pH values ranging from 7.5 to 12.0 was determined. At pH 9.0 weak animals and subsequent mortalities were observed. At pH 9.5 or greater, mass mortalities occurred. The effect of high pH resulting from algal photosynthesis in water with a heavy phytoplankton bloom was also evaluated. High mortality rates were recorded in water with a heavy bloom and high pH (10.0-10.5) compared with control water without a bloom and with a lower pH (8.5-9.0).

Photosyntheric activity of unicellular algae is primarily responsible for pH variations in aquacultural ponds. It is widely suspecred that high afternoon pH in ponds with heavy plankton blooms may kill fish fry (Boyd, 1979). Mortalities of adult freshwarer prawns, *Macrobrachium rosenbergii*, have been attributed to higher pH values resulting from CO_2 uptake by photosynthesizing algae (AQUACOP, 1979).

Fujimura (1974) suggests that postlarval *M. rosenbergii* be cultured in water with an already established algal popularion (green water). The present experiments were therefore designed to test the response of *M. rosenbergii* postlarvae to high pH levels which may occur in culture systems with heavy phytoplankron blooms.

MATERIALS AND METHODS

Chemically Adjusted pH

This experiment tested the shock effect of abrupt pH increases on the mortaliry of *M. rosenbergii* postlarvae. Experimenral units were twenty 37-liter aerated aquaria filled with 20 liters of tap water. The pH was adjusted in each aquarium by adding quantities of concentrated NaOH solution (~8N). The pH values ranged from pH 7.5 to 12.0 with 0.5 pH intervals. The ten pH treatment levels were replicated twice in a completely randomized design.

Thirty recently metamorphosed postlarvae were acclimatized to freshwater of pH 8.2 and placed in each aquarium. The pH was monitored with a Corning 3D pH meter. Temperature ranged from 28 to 29°C. Mortaliries were recorded at 0.5, 1, 2, 4, 6, 8, 24, 48, 72, and 96-hour intervals. All dead animals were removed from the aquaria.

Photosynthetically Altered pH

By comparing two water treatments, green and clear, this experiment tesred the effecr of high pH resulting from photosyntheric activity of phyroplankton on the survival of *M. rosenbergii* postlarvae. Experimental units were eight fiberglass pools (4.12 m²). Four pools were filled to 30 cm with clear water conraining no algae and four pools were filled to the same level with green water containing a heavy bloom of the blue-green algae *Anacystis* sp. Each pool was provided with 3 lengths (40 cm each) of 3.75 cm diameter PVC pipe as shelter. The pools were outdoors and exposed to full sunlight.

TABLE 1. Percent mortality of postlarvae exposed to various pH levels.

	Exposure Time (hours)					
pH	0.5	1	2	4	6	8
7.5	0	0	0	0	0	0
8.0	0	0	0	0	0	0
8.5	0	0	0	0	0	1
9.0	0	0	13	23	36	40
9.5	0	3	50	100	100	100
10.0	0	3	73	100	100	100
10.5	0	26	100	100	100	100
11.0	0	30	100	100	100	100
11.5	1	48	100	100	100	100
12.0	100	100	100	100	100	100

Each pool was stocked with 140 recently meramorphosed postlarvae (~30 mg). The animals were stocked at 0700 hours and were harvested 96 hours later.

RESULTS

Chemically Adjusted pH

No significant morralities were recorded for animals exposed to pH 7.5-8.5 after 96 hours of exposure. At pH 9.0 dead animals were observed after 2 hours of exposure. Increasing pH above 9.0 resulted in higher mortalities in less rime (Table 1). Beyond 8 hours exposure no further mortality was recorded at any pH level.

Photosynthetically Altered pH

Algal growth and photosynthetic acrivity were heavy in the green water rreatment (average afternoon maximum pH 10.5 and 91 mg/l COD) and lighr in the clear water (average afrernoon maximum pH 9.0 and 12mg/l COD). Average toral hardness was 78 mg $CaCO_3$ for the green water treatmenr and 126 mg $CaCO_3$/l for rhe clear. Dissolved oxygen never fell below 7.3 mg/l, nor did ammonia concentrarion rise to more than 0.01 mg in any of the eight pools. Temperarure fluctuated equally in all pools from 28°C in the morning to 36°C in the afternoon.

A significantly ($p>0.01$) higher postlarval mortality was recorded for the green water rrearment. An average of 78.5 animals were

recovered from each of the green water pools versus an avetage of 125 animals recovered from each clear pool, representing mortality rates of 43.9% and 8.9%, respectively (Table 2).

DISCUSSION

Mortality in postlarval prawns has been attributed to high pH values (pH 9.0-9.5) (Sarver et al., 1982). Cortoborating data from the chemically adjusted pH experiment suggest that pH values of 9.0 ot greatet cause mortality in unacclimatized postlarvae. When stocking postlarval prawns, watets with pH 9.0 should be suspect. Waters with pH 9.5 ot greatet tnay not be suitable for direct stocking of postlarvae.

The tesults of the photosyntheticaIly altered pH experiment show that phytoplankton activity can be cottelated with mortality in postlarval prawns. It is ptobable that high pH resulting from photosynthetic activity of phytoplankton was the primary cause of mortality in this expetiment, although othet factors, such as algal toxicity, cannot be discounted until futthet work is done in this area. The difference in total hardness values between the treatments can be attributed to salt precipitation occasioned by the high pH values observed in the green watet treatment.

TABLE 2. Photosynthetically altered pH replicates.

	% Mortality	
Rep	Green	Clear
1	42.1	5.7
2	51.4	5.0
3	45.0	15.0
4	37.1	10.0
	Avg=43.9	8.9
	SD= 6.0	4.6

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