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Acute toxicity of un-ionized ammonia to milkfish (*Chanos chanos*) fingerlings

E.R. Cruz

The acute toxicity of un-ionized ammonia to milkfish (*Chanos chanos*) fingerlings was determined using a static bioassay system.

The median lethal concentration (LC_{50}) for all the bioassay runs at different time intervals and the 95% confidence interval as estimated by the Reed-Muench method are shown in Table 1. These values are expressed as ppm total ammonia (NH_3-N) and ppm un-ionized ammonia (NH_3). The 24 hr LC_{50} values obtained for the three tests ranged from 24.55-27.04 ppm NH_3-N (1.81-2.18 ppm NH_3). By 48 hr, the LC_{50} values ranged from 19.53-25.70 ppm NH_3-N (0.93-1.75 ppm NH_3). At 72 hr, the LC_{50} values obtained were 18.49-23.55 ppm NH_3-N (0.88-1.43 ppm NH_3). From the lethality curves (Figs. 1A & B), the LC_{50} values were determined at 25.74 ppm NH_3-N (1.89 ppm NH_3) for 24 hr, 23.06 ppm NH_3-N (1.46 ppm NH_3) for 48 hr, 21.62 ppm NH_3-N (1.25 ppm NH_3) for 72 hr, and 20.65 ppm NH_3-N (1.12 ppm NH_3) for 96 hr.

The highest concentration tested wherein no mortalities occurred after 96 hr was 16 ppm NH_3-N (0.76 ppm NH_3). The mortality rate varied directly as ammonia concentration increased giving an almost 100% mortality for 23 ppm NH_3-N (1.49 ppm NH_3).

The median lethal concentration (LC_{50}) values determined in this study show that milkfish fingerlings have a high tolerance to ammonia and it is unlikely that levels as high as those employed for the acute exposure would be found to occur under natural conditions. The values also greatly exceed the "safe" level of 0.10 ppm total ammonia recommended by Spotte (1970). Thus, the threat of acute toxicological effects on milkfish fingerlings induced by ammonia is probably remote. However, ammonia concentrations as high as those observed in this study might be encountered in stressed natural environments or in heavily loaded aquaculture systems. Although we can expect no rapid fish mortalities due to acute ammonia pollution, the threat of low level and long term poisoning at more realistic and predictable concentrations should be investigated by additional bioassays of considerably longer durations.

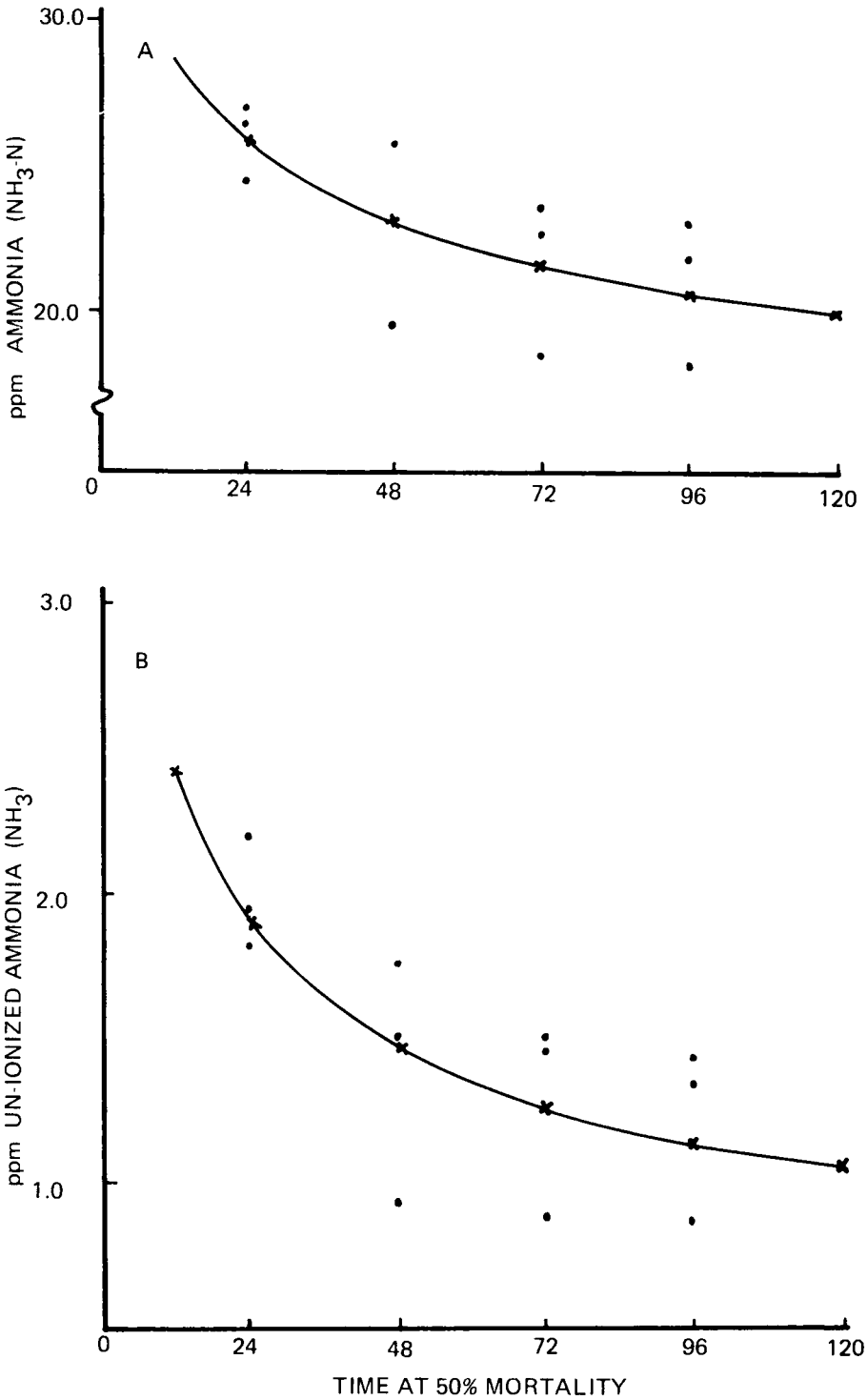

Fig. 1. Reed-Muench LC_{50} lethality curves for milkfish fingerlings. A. Ammonia; B. Un-ionized ammonia.

Table 1. Reed-Muench estimates (in ppm) of median lethal concentration (LC_{50}) of ammonia-nitrogen (NH_3-N) and un-ionized ammonia (NH_3) to milkfish (*Chanos chanos* Forsskal) fingerlings.[a]

Trial	Time (hours)			
	24	48	72	96
I				
NH_3-N	24.55[b]	19.53	18.49	18.25
	(22.74-26.49)	(18.24-20.92)	(17.90-19.70)	(17.68-18.85)
NH_3	1.93[b]	0.93	0.88	0.87
	(1.73- 2.16)	(0.89- 0.97)	(0.85- 0.92)	(0.86- 0.88)
II				
NH_3-N	26.42[b]	23.23	22.66	21.91
	(24.13-28.94)	(21.99-24.53)	(21.79-24.46)	(20.92-22.94)
NH_3	1.81[b]	1.48	1.45	1.33
	(1.49- 2.20)	(1.41- 1.56)	(1.38- 1.51)	(1.23- 1.44)
III				
NH_3-N	27.04[b]	25.70	23.55	23.06
	(22.75-25.43)	(23.10-28.59)	(22.27-24.90)	(21.49-24.74)
NH_3	2.18[b]	1.75	1.49	1.43
	(1.93- 2.46)	(1.57- 1.94)	(1.42- 1.58)	(1.28- 1.59)

[a]Enclosed in parentheses is the 95% confidence interval of the estimated LC_{50}.

[b]Estimated by graphical method.

Literature cited:

Spotte, S., 1970. Fish and invertebrate culture. John Wiley and Sons, Inc. 145 p.