1973

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Water Research Pergamon Press 1973. Vol. 7, pp. 1915–1916. Printed in Great Britain

NOTE

A SIMPLIFIED FLOW-SPLITTING CHAMBER AND SIPHON FOR PROPORTIONAL DILUTERS

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(*Received* 9 *May* 1973)

Abstract—Simplified flow-splitting chambers and siphons were designed and tested for use with proportional diluters in bioassay systems. The apparatus allows each concentration from the diluter to be thoroughly mixed and divided four ways for delivery to duplicate fry and adult exposure tanks. Test water delivered to each exposure tank varied by only 5–10 per cent of the calculated volumes.

THE PROPORTIONAL diluter developed by MOUNT and BRUNGS (1967) provided a dosing apparatus which can maintain a series of constant concentrations of toxicant in flowing water for bioassay systems. A typical bioassay system usually requires that each concentration be divided four ways for delivery to duplicate fry and adult exposure tanks. Flow-splitting chambers and siphons described in this report were designed to be used with a proportional diluter which delivers 2 l. per concentration, but the system can be modified to fit a diluter of any size. The simplified siphon has several advantages over the conventional U-tube siphon: difficult tube bending is eliminated, water volumes siphoned through each flow-splitting tube are easily adjusted, and tubes can be disassembled for cleaning simply by removing each sleeve from the standpipe.

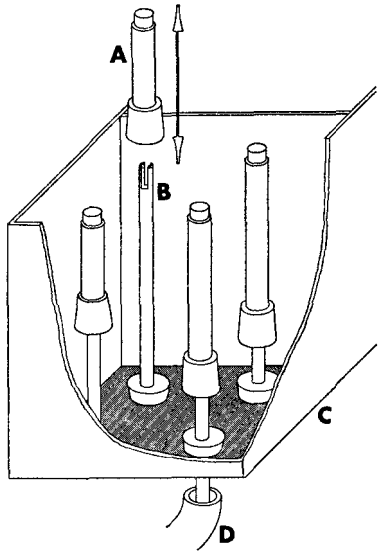

FIG. 1. Flow-splitting chamber and siphons for proportional diluters: *A*, siphon sleeve; *B*, siphon standpipe; *C*, flow-splitting chamber; *D*, delivery tube to exposure tank.

The apparatus consists of six identical chambers with four flow-splitting siphons per chamber (FIG. 1). Glass flow-splitting chambers measured 10 × 15 × 18 cm high. Four 2·5 cm holes were drilled in the bottom of each chamber. Glass-tube standpipes, with two notches cut in one end (0·6 cm wide by 1·6 cm deep) and a neoprene stopper around the other end, were inserted in each of the four holes so the bottom of the notches measured 15 cm above the bottom of the chamber. Glass-tube sleeves, with a neoprene stopper around the outside of one end and the core from the hole bored in the stopper inserted in the other end, were placed over each standpipe. The flow-splitting chambers with siphons were then positioned beneath the diluter so the toxicant-bearing water and dilutant water fell directly into each chamber. This arrangement allows additional mixing before delivery to each exposure tank. As the test water rises slightly above the top of the sleeves in each chamber, water is forced through the notches and down the standpipes. This action creates a siphon which empties the chamber and delivers test water to each exposure tank.

The diameter of each standpipe and sleeve was determined by the flow rate of each concentration delivered from the 2-l. diluter into each chamber. If the diameters of the standpipes are too large, some siphons will not start; and if they are too small, some siphons will start ahead of the others. Siphon tubes for each duplicate fry and adult exposure tank delivered 150 and 850 ml per cycle, respectively, and were calibrated by moving the stoppers, in or out, on either end of the siphon sleeve. Siphon sleeves for the adult tanks must be kept as long as possible so each mixing chamber empties after every cycle. Test water delivered to each exposure tank varied by only 5–10 per cent of the calculated volumes.

Delivery tubes from the flow-splitting chamber to each exposure tank should be large enough to fit loosely over the lower end of each standpipe. The air break between standpipe and delivery tube eliminates back pressure which can cause the siphon to malfunction. If delivery tubes must be attached directly to the standpipes, they must slope downward toward the exposure tanks so each delivery tube empties after every cycle.

REFERENCE

MOUNT D. I. and BRUNGS W. A. (1967) A simplified dosing apparatus for fish toxicology studies. *Water Research* **1**, 21–29.