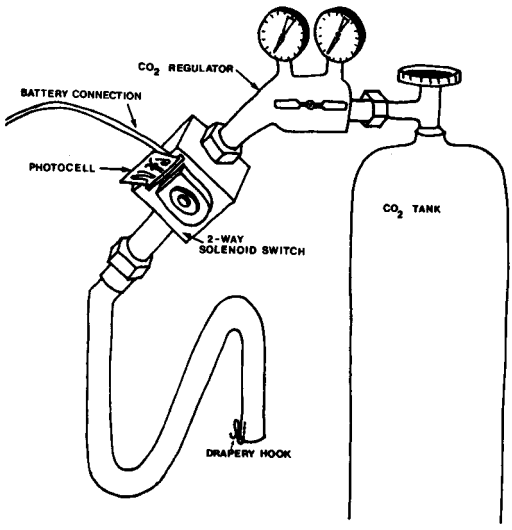

Fig. 1. A carbon dioxide delivery system with a photoelectrically operated 2-way solenoid switch.

baited trap nights. We consistently obtained 5 nights of trapping using 20 lb (9.1 kg) tanks with an emission rate of 2,500 ml/min. The temperature during our work ranged from 21 to 27°C, and each 9–10 hr night of trapping used ca. $0.95 worth of CO_2.

A mosquito trap with the described CO_2 delivery system provides an accurate, economical and consistent method to gauge nuisance mosquito levels.

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SUSCEPTIBILITY OF THREE SPECIES OF MOSQUITOES TO A PASTEUR INSTITUTE PREPARATION OF *BACILLUS SPHAERICUS* (STRAIN 2297)

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Bacillus sphaericus is a spore-forming bacterium, ubiquitous in nature, which grows readily on a variety of synthetic media and raw materials (Singer 1980). Some strains of *B. sphaericus* have a high level of insecticidal activity towards larvae of several mosquito species. This bacterium kills the mosquito larva by means of a toxin which accumulates rapidly during sporulation. Recycling can occur when spores germinate in the midgut of susceptible larvae, multiply vegetatively and produce fresh spores in the larval cadaver (Davidson 1984). This recycling provides a potential source of spores which may infect reinfesting larvae after the initial field treatment making this bacterium an ideal biocontrol agent.

There are no commercially available formulations of *B. sphaericus* and most of the experimental preparations currently being tested are developed in government and university laboratories (Lacey 1984). For this study, a lyophilized preparation of *B. sphaericus* strain 2297 serotype H25 (SPH 84), provided by the Pasteur Institute in 1984, was tested in laboratory against larvae of three of the major species of mosquitoes found in Fiji. The sample was first suspended in deionized water prior to the start of the tests. Field-collected *Culex quinquefasciatus* Say larvae and laboratory-reared *Aedes pseudoscutellaris* (Theobald) and *Ae. polynesiensis* Marks larvae were tested against this preparation at concentrations of 0.002, 0.003, 0.005, 0.008, 0.01, 0.02, 0.03 and 0.04 mg/liter. Twenty-five early 4th instar larvae were placed in each of the test dishes containing 150 ml deionized water and the appropriate *B. sphaericus* concentration. Four replicates were prepared for each concentration and a control population was run simultaneously. The experiment was conducted at 25°C and observations were made 24 hr after the application of the *B. sphaericus* preparation.

In addition, the tests against *Cx. quinquefasciatus* were repeated after the resuspended sample of *B. sphaericus* had been stored at 6°C for

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Table 1. Tests results of *Bacillus sphaericus* against three mosquito species from Fiji.

Mosquito species	Mortality (%) of larvae* at various concentrations (mg/liter)								
	0.002	0.003	0.005	0.008	0.01	0.02	0.03	0.04	Control
Culex quinquefasciatus									
Fresh sample no. 1	59	84	96	96	99	99	100	100	13
1 month storage	69	86	91	93	95	100	99	98	15
3 months storage	62	81	93	94	96	—	—	—	7
Fresh sample no. 2	54	77	83	86	89	92	95	100	7
Aedes pseudoscutellaris									
Fresh sample no. 1	—	—	10	10	10	22	15	16	8
Aedes polynesiensis									
Fresh sample no. 1	—	—	1	1	2	4	1	3	0

* 25 early 4th instar larvae in each dish; 4 replicates per concentration.

1 month and again after 3 months of storage. A second lyophilized sample of *B. sphaericus* was resuspended in the same way and tested against *Cx. quinquefasciatus* larvae.

The results, given in Table 1, revealed that the *B. sphaericus* preparation resulted in the rapid mortality of the *Cx. quinquefasciatus* population. After 24 hr, a concentration of 0.003 mg/liter produced a mortality rate of 84%. When the sample was stored at 6°C there was little, or no, variation in the mortality rates obtained. The second sample of *B. sphaericus* produced similar results when tested against *Cx. quinquefasciatus* larvae.

In comparison with the high mortalities achieved with the *Cx. quinquefasciatus* larvae, very little effect at the concentrations used was observed when the preparation was tested against the two *Aedes* species. There was some death in the test population of *Ae. pseudoscutellaris* larvae, but as the control mortality was also relatively high, no conclusions can be drawn as to the cause of death. However, *Ae. polynesiensis* larvae did not appear to be affected by the *B. sphaericus* preparation.

These experiments demonstrated that the *Cx. quinquefasciatus* larvae were very susceptible to the toxicity of the *B. sphaericus* preparation whereas the *Ae. pseudoscutellaris* and *Ae. polynesiensis* larvae were refractory. This restricted host range has been previously reported and may be the greatest obstacle to the widespread use of this agent in mosquito control programs. Most species of *Culex* tested have been very susceptible to this pathogen whereas most species of *Aedes* mosquitoes are quite insensitive to it (Davidson 1984). However, as indicated by these experiments, the organism appears to be effective against a South Pacific population of *Cx. quinquefasciatus*. This supports the findings of various workers from other regions and confirms the growing belief that it may prove to be the most effective biological control agent for *Cx. quinquefasciatus* which transmits Bancroftian filariasis worldwide.

In addition, it was shown in these experiments that this *B. sphaericus* preparation, when suspended in deionized water, can be stored successfully at 6°C for a period of 3 months without loss of larvicidal activity.

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