

## A METHOD FOR DISPENSING PLANARIA (*DUGESIA DOROTOCEPHALA*) FOR MOSQUITO CONTROL<sup>1</sup>

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Predation of mosquitoes by the planarian *Dugesia dorotocephala* (Woodworth) (Tricladida: Turbellaria) was first shown by Lischetti (1919). Studies have since shown that *D. dorotocephala* is an effective predator on all larval stages of mosquitoes (Legner and Medved 1972, 1974; Medved and Legner 1974) and has potential as a biological control agent of mosquitoes (Yu and Legner 1976).

Densities of 25 planaria/m<sup>2</sup> have been cited as sufficient to effect significant control of mosquito populations (Yu and Legner 1976). However, no studies describe a practical means of disseminating planaria in the field. Previously, the only method of dispersal was by hand. The objective of this study was to evaluate a compression sprayer for feasibility of planaria application.

Three tests were conducted to determine if sprayer pressure and mechanical injury incurred during spraying affected planaria reproduction, and if a consistent number of planaria could be dispensed over time. The standard nozzle on the 2-gallon sprayer (H. D. Hudson Manufacturing Co., Chicago, IL 60611) was not suitable for dispersal of planaria due to the clearance on the needle valve (0.001 cm). Modifications to the sprayer included the removal of in-line filters and strainers to facilitate passage of the planaria, and replacement of the standard nozzle with a garden hose nozzle (Gilmour Co., Somerset, PA 15501).

A test was performed to determine if pressures within the sprayer were harmful to the planaria. Ten planaria (15 mm or larger) were placed in the sprayer with 500 ml of well water (pH-5.7, alkalinity-2.11, hardness-46.0, conductivity-43.8); the sprayer was pumped to the maximum obtainable pressure of 50 pounds per square inch gauged (psig). The pressure was released after 1 hr, and the planaria were removed. Controls were placed in the sprayer for 1 hr with no pressure and then removed. The planaria placed under pressure and planaria not subjected to pressure were placed in separate containers and

fed 20 fourth instar *Aedes aegypti* (Linn.) per planarian every other day. Planaria surviving after 14 days and those added to the population due to asexual reproduction, which occurs every 7 to 14 days at room temperature, were recorded. No statistical difference was shown between the number of experimental ( $12.64 \pm 2.99$ ) and control ( $11.99 \pm 2.47$ ) planaria remaining after 14 days (Duncan's Multiple Range Test,  $n = 10$ ,  $P > 0.05$ ).

The effect of mechanical injury on survival of planaria was evaluated. Two hundred planaria (15 mm or larger) in 1 liter of well water were placed into a sprayer, pressurized to 50 psig, and allowed to set for 5 minutes. The sprayer was swirled three times to dislodge the planaria from the walls and the contents were sprayed into a 2-liter beaker. Controls were placed into the sprayer, pressurized to 50 psig, allowed to set for 5 minutes, the pressure released, and the planaria removed. Visual structural damage and a marked slowdown of feeding rate was noticed in planaria that were sprayed at 50 psig. Experimental planaria had a 38% survival rate compared to 100% for control planaria. The effect of mechanical injury on planaria survivability was tested a second time. A pressure of 25 psig was chosen for this test. Ten planaria (15 mm or larger) in 500 ml of well water were tested at 25 psig, ten replicates. No visual damage was noticed and the sprayed planaria fed at the same rate as control planaria. No significant difference was shown between the number of experimental ( $17.42 \pm 5.21$ ) and control ( $17.89 \pm 5.62$ ) planaria remaining after 14 days (Duncan's Multiple Range Test,  $n = 10$ ,  $P > 0.05$ ).

The number of planaria dispensed over time was tested by placing 1,000 planaria (15 mm or larger) into the sprayer with 2 liters of well water. The sprayer was pressurized to 25 psig, swirled three times, the nozzle held completely open for 2 seconds, and planaria dispensed into a 1,000 ml beaker. The sprayer was discharged until the sprayer was empty (40 discharges). A mean of  $21.97 \pm 10.73$  planaria and  $50.0 \pm 0.5$  ml of water were sprayed per 2-second discharge.

Data indicated that planaria are not harmed by the pressures (0-50 psig) encountered within the sprayer and that a consistent number of planaria can be successfully sprayed from a modified 2-gallon compression sprayer at 25 psig. Extreme pressures obtainable in the sprayer

<sup>1</sup> The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or as reflecting the views of the Department of the Army or the Department of Defense.

damaged the planaria during spraying and are not recommended. The exact number of planaria and volume of water dispensed per discharge can be controlled by the density of the planaria in the sprayer and the length of spray time.

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