Detergent as a Method of Fire Ant Control in Floodwater

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The record flooding across large areas of Texas during the month of December, 1991 brought the fire ant problem home to many people in a previously unknown way. In its native environment in South America, the red imported fire ant (Solenopsis invicta Buren) is an inhabitant of flood-prone bottomland adjacent to rivers. The species has become adapted to surviving periodic flooding by floating in rafts composed of all members of the colony including brood (larvae and pupae) and then reinvading ant-free areas quickly after floodwaters recede. The ants can evacuate a flooded mound and float for some time until a tree or structure on which to climb has been encountered.

Residents of flooded areas have had to dodge these floating rafts while wading through high water and have returned to their homes and outbuildings to find them covered with thousands of fire ants. It was reported that some people were spraying the floating ant masses with detergent solutions and drowning them. This experiment was conducted to determine the quantity of detergent required to sink and kill a floating fire ant mass.

Materials and Methods

Test I. Nine tall, plastic Petri dishes were lined with talcum powder and filled with about 0.75 cup of tap water. From fire and colonies maintained in the laboratory, approximately one teaspoon of ants, including some brood and queens, was dropped onto the surface of the water in the Petri dishes. The ants immediately formed a tight, floating ball in the center of the dish.

Serial dilutions of Dove® dishwashing liquid (4,3,2 tablespoons, 1 tablespoon, 1, 0.5, 0.25, and 0.125 teaspoon liquid soap per gallon of water) were prepared. Using a trigger-spray mister, each solution was sprayed onto the ball of floating ants in the tall Petri dish. The sprayer was rinsed thoroughly with fresh water between the applications of each of the eight soap concentrations. The ninth dish was sprayed with tap water as a control. Each dish received approximately two milliliters of solution. Observations made at 20 minutes, 1 and 2 hours following treatment included 1) approximate percentage of sunken ants and 2) estimated number of ants that appeared dead. Notes on the general appearance of the floating ant masses were also made.

Test II. Five 5-gallon plastic buckets were filled with approximately 3 gallons of water. Five freshly dug colonies of fire ants were dripped out of the soil and transferred directly into the water-filled buckets. A solution of 2 tablespoons of dishwashing liquid in one gallon of water was sprayed onto the floating ant masses for 3-5 seconds with a hand pressure-sprayer. Total volume delivered was approximately 50 ml.

Results and Discussion

Test I. The degree and speed of fire ant mortality was shown to be directly proportional to the concentration of the soap solution sprayed onto the mass of floating ants (Table 1). As little as one teaspoon per gallon was enough to break the surface tension of the water and prevent raft formation, though one tablespoon per gallon was required to affect rapid ant death of 50 % or more.

Test II. This test was designed to better simulate the dilution factor that would be encountered in a flooding situation. Ant mortality ranged from 80-95 %, most of which occurred within 10 minutes of spraying.

NOTE: Results of this experiment are not intended to constitute a recommended fire and raft control practice in floodwater. Use of chemical solutions, including soap, for the control of insect pests must be approved by the Environmental Protection Agency.

Table 1. Effect of applying 2 ml. Dove® dishwashing liquid concentrations to floating rafts of the red imported fire ant in tall petri dishes.

Percent ants sunk/Percent dead

Concentration	20 min.	1 hr.	2 hr.	Observed raft structure
4 tbsp./gal.	70/90	90/98	90/100	spread near edges of dish
3 tbsp./gal.	60/80	75/90	95/98	spread on water surface
2 tbsp./gal.	50/75	75/80	80/90	spread on water surface
1 tbsp./gal.	30/50	50/75	50/75	spread on water surface
1 tsp./gal.	25/25	25/25	50/50	raft reformed after 1 hr.
½ tsp./gal.	20/25	20/25	30/30	loose ball, floaters alive
1/4 tsp./gal.	5/5	5/5	5/5	small ball, floaters alive
1/8 tsp./gal.	5/5	5/5	5/5	small ball, floaters alive
Check	1/1	1/1	<5/<5	tight ball, shed spray

Table 2. Effect of applying approx. 50 ml of 2 Tablespoon/gallon Dove® dishwashing liquid solution to whole red imported fire ant colonies floating in 3 gallons of water.

% of water surface covered by ants / % ants sunk / % dead

Colony	Initial	10 minutes	30 minutes	1 hour
1	98/0/0	15/80/90	10/90/90	10/90/95
2	100/0/0	40/80/90	30/80/90	30/80/95
3	80/0/0	40/70/85	40/70/90	30/80/90
4	85/0/0	40/80/90	25/80/90	25/80/95
5	70/0/0	40/60/80	35/70/80	30/75/85