

Evaluation of Soaps and Oils, Murphy's Oil Soap, QRD400, Canadian Petroleum Products Formulations Lawn 1 and 2

Bastiaan M. Drees and Bill Summerlin

Texas Cooperative Extension, Texas A&M University System, College Station, TX

For these laboratory assessments, worker ant mortality to various dilutions of products or their combinations were assessed using the "straw technique" described by Drees (2002).

Materials and Methods

All trials were conducted under laboratory conditions at room temperature. Time, temperature and relative humidity were recorded daily for each trial. Red imported worker ants were removed from ant colonies maintained in the laboratory under standardized feeding and watering regime. For each trial, roughly 10 red imported fire ant workers were placed in a clear soda straw on a piece of ear cleaner (Q-Tip) stem and clamped on each end. There were four replicates or straws containing ants per treatment or rate of diluted insecticide and one set of four straws received water as an untreated control. Using a pipet bulb and starting with the untreated control followed by the lowest dilution of candidate material to highest concentration, the straw was filled with the solution for roughly 10 seconds, completely submerging ants, before the solution was blown out of the straw. The ants were observed 24 hrs following exposure to the test solution and number of live ants was counted. At the end of the trial the total number of ants per straw was counted after freezing the straws and numbers were converted to number of live ants per 10 ants.

Trials 1 & 2. Two formulations of Dawn® Liquid Concentrated Soap (green or blue formulations) were evaluated for causing worker ant mortality after a 10 second "drench" and assessed 24 hrs following exposure in two trials: 1) Green formulation evaluation initiated Feb. 19, 2007 (72-76 degrees F and 57-69% relative humidity); 2) Blue formulation evaluation initiated Feb. 20, 2007 (75-76 degrees F and 68-69% relative humidity) using dilutions listed in **Table 1**.

Trials 3, 4, 5 & 6. Experimental products were diluted in water as listed in **Table 2**. Trial 1, evaluating Murphy's (pure vegetable oil) Oil Soap was initiated Feb. 14, 2006 (72 degrees F and 58% relative humidity) and Trial 2, evaluating QRD 400 was initiated Feb. 16 ((72 degrees F and 64% relative humidity). Trial 3, evaluating Canadian Petroleum Products (CPP) Formulation "Lawn 1" was initiated March 1 (70 degrees F and 61% relative humidity) and Trial 4, evaluating CPP "Lawn 2" was initiated March 2 (70 degrees F and 62% relative humidity).

Results and Discussion

Trials 1 & 2. Both formulations of Dawn® Liquid Concentrated Soap (green or blue formulations) produced similar levels of worker ant mortality (**Table 3**). Previous trial

results using Safer® Brand Concentrated Insecticide seem to indicate that this insecticidal soap product is slightly more toxic to red imported worker ants than Dawn formulations. Equivalent rates based on similar toxicities indicate that 6.6 ml/gal Safer would have similar mortality to 28.4 ml/gal Dawn (5.7 versus 6.5 live ants per 10 ant sample)(Note: 1 fl oz = 29.573 ml) .

Trials 3, 4, 5 & 6. Murphy's Oil Soap produced 100 percent mortality of worker ants in 24 hrs following a 10-second "drench" at a rate of 20 ml per 40 ml solution, a per gallon equivalent of 1,892.7 ml or 2 qts. (**Table 4**). QRD 400 is more toxic, but a dilution rate of 10 ml per 40 ml QRD 400 solution, or a per gallon equivalent rate of 946.3 ml, or 1 qt. QRD 400 is required (**Table 4**). These application rates may be too expensive to be feasible treatments. The Canadian Petroleum Product formulations show some level of toxicity to worker ants at 5 ml CPP in 40 ml solution (473.2 or 1 pt or 0.5 qt per gal). However, only higher rates (20 to 40 ml per 40 ml solution achieved 100 percent mortality (**Table 4**).

Only field evaluations will verify if these application rates can be deemed effective as individual red imported fire ant mound drenches. If these active ingredients produce effects other than acute mortality, lower rates may achieve higher rates of mortality over a longer period of time following exposure, or have repellent effects causing ants in treated ant mounds to relocate. Furthermore, these higher rates of soap, or oil based treatments, may cause phytotoxic effects on grasses and other plants exposed to these treatments. Finally, because fire ant colonies also contain queen ants and winged male and female sexual forms that are larger than worker ants, treatments based on the lower effective dilution to kill worker ants may not eliminate these larger forms in an ant colony. Whether they can be capable of surviving following elimination of worker ants remains undetermined from laboratory assessments alone.

Literature cited

Drees, B. M. 2002. A new technique for laboratory assessment of red imported fire ant mound drench treatments. *Southwestern Entomologist* 27(2):177-183.

Table 1. Dilutions of Dawn® Liquid Concentrated Soap (green or blue formulations) on mortality of 4 replicates of 10 worker red imported fire ants (40 ml total volume).

Treatment Number	Amount Dawn (ml)	Amount water (ml)
6	0.0	40.0
1	0.003	39.997
	0.007	39.993
2	0.015	39.985
	0.03	39.97
3	0.075	39.925
	0.15	39.85
4	0.3	39.6
	0.6	39.4
5	1.2	38.8

Table 2. Dilutions of Murphy’s Oil Soap, QRD400, Canadian Petroleum Products Formulations Lawn 1 and 2 on mortality of 4 replicates of 10 worker red imported fire ants (40 ml total volume).

Treatment Number	Amount Test Material (ml)	Amount Water (ml)
1	40.0	0.0
2	20.0	20.0
3	10.0	30.0
4	5.0	35.0
5	2.5	37.5
6	1.25	38.75
7	0.625	39.375
8	0	40.0

Table 3. Average number of live red imported fire ant workers of four 10 ant replicates 24 hrs following a 10 second exposure to dilutions of Dawn® Liquid Concentrated Soap, Feb. 19 & 20, 2007 compared results of a previous trial using Safer® Brand Concentrated Insecticide, Jan. 11- 13, 2007 (120 mls Dawn/3,785.3 mls water (= 1 gal.) = 1.2 mls Dawn/37.9 ml water).

Dilution: Soap/ 40 ml	Dawn® Green	Dawn® Blue	Safer®
Untreated control	9.32	9.82	10.0
0.007 ml Safer®	--	--	10.0
0.004 ml Dawn®	9.84	9.71	--
0.018 ml Dawn®	9.38	9.38	--
0.015 ml Safer®	--	--	7.6
0.075 ml Dawn® (7.1 ml/gal)	7.35	8.20	--
0.07 ml Safer®* (6.6 ml/gal)	--	--	5.7
0.14 ml Safer® (13.2 ml/gal)	--	--	3.8
0.3 ml Dawn® (28.4 ml/gal)	6.51	6.19	--

*Mixture range for Insecticidal Soap plus Erath Orange Oil selected for field testing

Table 4. Average number of live red imported fire ant workers of four 10 ant replicates 24 hrs following a 10 second exposure to dilutions of candidate ant mound drench materials, Feb. 14 through march 2, 2007.

Dilution (ml/40ml)	Murphy's Oil Soap	QRD400	CPP Lawn1	CPP Lawn 2
Untreated control	9.7	9.5	9.7	9.5
0.625	9.7	8.9	9.7	9.9
1.25	9.9	9.6	9.9	7.7
2.5	9.1	9.4	10.0	10.0
5.0 (473.2 ml/gal)	8.9	8.1	3.3	2.7
10.0 (946.3 ml/gal)	3.3	0.0	0.8	1.5
20.0 (1,892.7 ml/gal)	0.0	0.0	1.9	0.0
40.0 (full strength)	0.0	0.0	0.0	0.0

4 fl oz = 120 mls

Volume conversions:

1 gal = 4 qts = 8 pts = 128 fl oz = 3.785 l = 3785.3 ml

½ qt = 1 pt = 0.4732 l = 473 ml

1 fl oz = 29.573 ml

1 qt = 2 pts

Erath Earth Orange Oil Erath Earth Gathering and Holding Company, Rt. 2, Box 111, Hico, TX 76457) - cold press citrus peel extract - “6 to 8 oz per gallon of water for soil drench” \$19.95/qt (32 fl oz); Note: 1 Tbsp. = 1 oz of liquid

GreenSense 100% Citrus Oil (RO 1651 Wall St., Garland, TX 75041; <http://www.greensense.net>) - 100% d-limonene (orange oil) - “As a mound drench, mix one-third

GreenSense Citrus Oil, one-third compost tea and one-third blackstrap molasses. Add one cup of this mixture to one gallon of water. Shake well. Pour directly on affected area.” - \$16.95/qt

Murphy Pure Vegetable Oil Soap (Colgate-Palmolive Co., NY, NY 10022; <http://www.murphyoilsoap.com>) - “biodegradable and phosphate free”

Safer® Brand Fire Ant Killer (Safer® Inc., Lititz, PA 17543; <http://www.victorpest.com>) D-limonene (5.6 lbs/gal) 78.20%, inert ingredients 21.80% WARNING - 5.0 fl oz/gal water

Safer® Brand Insecticidal Soap (Woodstream Corp., 69 North Locust St., Lititz, PA 17543 (717/626-2125); <http://www.victorpest.com>) - potassium salts of fatty acids 49.52%, other ingredients 50.48% WARNING - 2.5 fl oz/gal water