

BurrowRx Carbon Monoxide Sprayer Ground Squirrel Efficacy Data

Synopsis

The BurrowRx Carbon Monoxide Sprayer (“BurrowRx”) was evaluated for efficacy against natural populations of ground squirrels located in central California field sites in November 12, 2017 by Sierra Research Laboratories, Inc. of Modesto, CA. The ground squirrels (*Spermophilus* sp.) were of mixed age and sex.

Initial visual assessment of the test site indicated a high level of ground squirrel infestation and a very extensive burrow system with primary burrow systems located on berms and ditch banks within the test site. There was no history of ground squirrel control measures on the test site. Prior to treatment, all burrows were closed with surrounding soil or other available media and observed for reopening after one day; any burrow that was opened back up was considered active and was included in the treatments.

The BurrowRx Carbon Monoxide Sprayer was set to full throttle and an initial double shot of smoke oil was added to the reservoir. The exhaust hose for the carbon monoxide sprayer was placed into an open burrow and covered slightly with dirt to create some back pressure. The carbon monoxide sprayer was turned on and allowed to run for a full three minutes per burrow. Holes showing smoke exuding from them were filled with surrounding soil. As holes were filled, more were observed to be part of the same system by the appearance of the smoke, and subsequently filled in. At the conclusion of each burrow’s treatment the exhaust hose was removed from the burrow opening and the hole was closed with soil.

Visual observations approximately one hour after burrow treatments indicated no ground squirrel activity (no tunneling to escape treatment) or above ground activity in the treatment plots. Twenty-four (24) hours after the initial treatment all treated burrows were inspected for reopening and any previously-inactive unopened burrows that may have been utilized and opened after the treatment were also inspected. Any reopened burrows were retreated and another census repeated the following day. The number of burrows was recorded and the average was used to calculate efficacy (the percent of burrows not reopened).

Walk-through census counts of active ground squirrels and open burrows were conducted on test days 1, 3 and 7, recording the total number of ground squirrels observed in each test plot. Ground squirrel populations and burrow density were very high on the test site. The number of active burrows in the treated group (23) and the untreated group (31) indicated a high level of activity during the evaluation period. The burrow systems were very extensive in the test areas and all buffer zones and areas outside of the test plots.

The efficacy of the carbon monoxide gas delivered by BurrowRx, i.e. the average percent reduction of ground squirrels or evidence of activity, was calculated by open burrow counts. BurrowRx-treated plots showed a high degree (95.7%) of efficacy in open burrows through Test Day 3. Efficacy dropped to 73.9% by Test Day 7 due to new holes being excavated by ground squirrels most likely from outside the treatment zone. Open burrows within the untreated control plots increased by 54.8% by Test Day 7. The smoke oil during treatment made the complexity of the burrow systems easy to observe and helped improve efficacy by allowing applicators to thoroughly treat an entire system. There were no open escape burrows of any kind within the

treated areas up to 24 hours after initial treatment. A single, previously unopened hole, was observed on Test Day 1 and was subsequently treated with BurrowRx with no observed reopening through the seven day study.

BurrowRx Carbon Monoxide Sprayer is very effective ($\geq 95\%$ efficacy) at controlling burrowing California ground squirrels in actual field conditions (See **Table 1**).

Table 1: Ground squirrel burrow census counts on Test Day 0 (treatment) and Test Days 1, 3 and 7 post treatment with the average percent reduction of active burrows determined.

		Number of Open Burrows in Plots			
Test Group	Plot I.D.	Day 0	Day 1	Day 3	Day 7
BurrowRx	Treated 1	9	0	0	1
	Treated 2	7	0	0	0
	Treated 3	7	1	1	5
	Σ	23	1	1	6
	Average % Reduction	-	95.7	95.7	73.9
Untreated Control	Untreated 1	4	5	9	11
	Untreated 2	27	21	36	37
	Σ	31	26	45	48
	Average % Change	-	16.1	(-45.2)	(-54.8)