

# EVALUATION OF THE LINDANE SEED TREATMENT, GAMMASAN®, TO PREVENT PREDATION BY THE RED IMPORTED FIRE ANT ON SORGHUM SEED

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The red imported fire ant (RIFA), *Solenopsis invicta* (Buren), can be a major pest of newly-planted sorghum (Drees and Vinson, in press). Seed predation can occasionally lead to loss of a planting. Gammasan® is a lindane-based hopper seed treatment produced by Chipman Chemicals. Efficacy and seed protection studies against RIFA using Gammasan® were conducted under laboratory conditions.

## Materials and Methods

Treatment: Label directions recommend adding one packet of Gammasan® Seed Treatment (2.7 oz.) to 25 lbs. of seed in the hopper, mixing thoroughly, adding an additional 25 lbs. and re-mixing. To duplicate this recommendation using a small lot of seeds, .766 g. of Gammasan® was added to 1/4 lb. of sorghum seed and mixed in a plastic bag. An additional 1/4 lb. of seed was added and re-mixed.

Efficacy trials: Equal numbers of Gammasan-treated and untreated germinated sorghum seeds were placed on moist filter paper, allowing them to imbibe overnight. They were placed in tall, Fluon®-treated Petri plates lined on the bottom with filter paper so as to not lose any chemical. Ten ants were placed in the plates. Mortality, defined as ants unable to walk normally, was recorded every 15 minutes for a duration of 60 - 120 minutes. There were 5 replications within each of four trials conducted: 1) 5 seeds germinated overnight and transferred to petri dish, 120 min.; 2) 3 seeds germinated overnight and transferred to dish, 60 min.; 3) 3 seeds germinated overnight in dish, 60 min.; and, 4) 3 seeds germinated overnight and transferred to dish, 90 min. Mortality over time was subjected to regression analysis and time elapsed (minutes) to achieve 10, 50 and 90 percent mortality was conducted for each trial.

Seed Production Trials: Gammasan®-treated and untreated sorghum seeds were soaked overnight on moist filter paper until the hypocotyl emerged. Five seeds of each type were then placed on fry filter paper in separate Petri dishes within laboratory RIFA colony trays. Petri dishes were covered with lids perforated with small (5 mm. diameter) holes to discourage seed removal by the ants and retard seed drying. This test was replicated using four colonies. The number of damaged seeds was recorded after 24 hours. The number of damaged treated and untreated seeds per colony were subjected to a Student's t test (P 0.05).

## Results and Discussion

Efficacy trials: Gammasan® was strongly toxic to RIFA, initially acting within 30 minutes (24.3 to 34.37 min.) To achieve 10 percent mortality. Ninety percent mortality occurred from 49.8 to 118.1 minutes following exposure (**Table 1**). Control mortality was negligible (not over 2%) and is not shown here. It was observed that if the ants in plates with treated seed had not died within the two hour time period, they would survive overnight or for as long as the control ants lived. Seed production trials: RIFA damaged significantly more untreated than Gammasan®-treated seeds in the 4 trials conducted:  $4.25 \pm 0.9574$  vs  $0.0 \pm 0.0$  ( $t = 8.8780$ ; D.F. = 6;  $P 0.0001$ ). None of the treated seeds were harmed or displaced whereas the untreated seeds sustained 85% damage and several were removed from the dishes within 18 hours. All seeds were under intense feeding pressure from the fresh, aggressive colonies that averaged over 30,000 ants each. There was also some ant toxicity noted in the Gammasan®-treated seed dishes.

**Table 1.** Statistical results of four trails to document the rate of mortality for a lindane seed treatment (Gammasan®) under laboratory conditions.

Trail	Regression Coef.		r squared*	Calculated percent mortality		
	duration	dead		constan t	10%	50%
1 (120)	8.97	20.55	29.50	0.8685	65.38	101.23
2 (60)	3.18	21.12	0.7896	24.30	37.02	49.75
3 (60)	3.11	23.21	0.4889	26.31	38.74	51.17
4 (90)	10.46	23.90	0.6776	34.37	76.21	118.06

\* P 0.05; D.F.= 21, 18, 18, and 28, respectively; T=13.601, 5.460, 4.150 and 7.671; and r =0.9319, 0.6235, 0.6992 and 0.8231