FUMIGATION OF BROWN TREE SNAKES WITH METHYL BROMIDE, SULFURYL FLUORIDE, AND PHOSPHINE.

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The brown tree snake (Boiga irregularis) is a significant, exotic nocturnal arboreal pest that was probably introduced on the island of Guam in the late 1940s via cargo from Papua New Guinea after World War II. This snake is presently distributed throughout Guam with population densities of 50-100 snakes/ha in some areas. The brown tree snake is considered to be the primary factor responsible for the extirpation or drastic reduction in populations of Guam's native vertebrate fauna. It is mildly venomous and poses a human health risk, causes electrical power outages by climbing on wires, and preys on domesticated birds. Apparently Guam has the only known reproducing population of brown tree snakes outside of its native range. Guam is a focal point of air and ship cargo traffic in the Pacific, and there is the threat that brown tree snakes could be inadvertently introduced to other snake-free islands in the Pacific through cargo shipments. Individual snakes have been discovered in other Pacific regions such as Honolulu, Hawaii; the islands of Wake, Kwajalein, Saipan, Tinian, Rota, and Pohnpei; and on Diego Garcia Atoll in the Indian Ocean. In May 1993, a brown tree snake was documented on the mainland United States at Ingleside Naval Station near Corpus Christi Bay, Texas, in crated household goods that had arrived from Guam.

Fumigation of cargo is a potential method that could be used to reduce the accidental dispersal of snakes. Using standard USDA/PPQ treatment procedures, we evaluated the effectiveness of methyl bromide (METH-O-GAS®100), sulfuryl fluoride (VIKANE®), and magnesium phosphide (MAGTOXIN®) as fumigants for brown tree snakes on Guam in 20-ft tarpaulin-covered cargo containers with nonfood cargo to simulate a typical shipment. Twelve individually bagged snakes were randomly assigned by weight to each fumigation treatment and bags were randomly assigned to positions near the top, middle, and floor by ropes

along 6 rows the width of the container. Control snakes were handled similar to the treated snakes except that no fumigant was introduced into the container. After each fumigation treatment, containers were aerated by an exhaust fan and snakes were returned to their cages and observed for 7 days for signs of intoxication.

Snakes were exposed for 2 hr to methyl bromide dosages of 0.7, 1.3, and 2.0 lb/1000 ft^3. All treated snakes were lethargic within about 5 hr after treatment, but only snakes exposed to dosages of 1.3 and 2.0 lb/1000 ft^3 died.

Sulfuryl fluoride required higher dosages and longer exposure periods than methyl bromide to produce 100% mortality. A dosage of 1.5 lb/1000 ft^3 for 2 hr did not kill snakes but dosages of 7.5 lb/1000 ft^3 for 2 hr and 4.0 and 5.0 lb/1000 ft^3 for 4 hr killed all the snakes.

Magnesium phosphide was an effective fumigant but required a longer exposure period than either methyl bromide or sulfuryl fluoride; however, the dosages were much smaller. Based on the maximum amount of phosphine that could have been released from magnesium phosphide, 0.04 and 0.06 lb/1000 ft^3 for 10 hr killed all the snakes, but 0.06 lb/1000 ft^3 for 5 hr killed only 2 out of 12. The mortality data indicate that it took 5 to 10 hr for magnesium phosphide to liberate high enough phosphine concentrations to produce 100% mortality. Phosphine required 6.4 oz - hr to achieve 100% mortality, whereas methyl bromide and sulfuryl fluoride required 42 oz - hr and 240 oz - hr, respectively.

The effectiveness of methyl bromide as a brown tree snake fumigant was demonstrated in 1991 and the brown tree snake has since been added to the methyl bromide label by Great Lakes Chemical Company (METH-O-GAS® Q Commodity Fumigant for Quarantine/Regulatory Use Only (EPA Reg. No. 5785-41). The present study confirmed the effectiveness of methyl bromide as a snake fumigant. Efficacy data from the present study could be used to support label claims for sulfuryl fluoride and phosphine as effective alternatives to methyl bromide. The dosages of sulfuryl fluoride and magnesium phosphide (phosphine) that produce 100% snake mortality are within many of the currently registered application rates for other pests.