EFFICACY OF METHYL BROMIDE AND SULFURYL FLUORIDE AGAINST THE OAK WILT FUNGUS IN LOGS

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Fumigation experiments were conducted to investigate the efficacy of sulfuryl fluoride (SF) and methyl bromide (MB) against the oak wilt fungus, *Ceratocystis fagacearum*. Red oak trees were artificially inoculated, felled, and cut into logs, which were used for the fumigations. Pre-treatment sapwood samples were plated on potato dextrose agar (PDA) to ensure adequate infestation of *C. fagacearum*. The 2016 and 2017 experiments treated logs at 15.6 °C with varying concentrations of SF for 72 and 96 hours, respectively. The 2017 experiment also fumigated logs with 240 g/m^3 MB for 72 hours. Post-treatment sapwood chips were plated on PDA to evaluate efficacy of the treatments.

Both experiments proved that neither fumigant was completely successful in eradicating *C. fagacearum* from oak logs. In 2016, the logs fumigated with 240 g/m^3 SF displayed complete eradication of *C. fagacearum*. However, the treatments with higher dosages, 280 and 320 g/m^3 SF, had positive recovery for *C. fagacearum* in 2 of the 9 logs. The 2017 fumigations displayed positive recovery from 5 of the 12 logs treated with 128 and 240 g/m^3 SF. Treatments with 240 g/m^3 MB also proved ineffective, with 4 of the 12 logs possessing viable *C. fagacearum*. While complete efficacy was not obtained, the treatments did greatly reduce recovery of *C. fagacearum* in the treated logs. *C. fagacearum* was positively recovered from all untreated control logs, allowing for a direct comparison of treatment efficacy.

Small-scale fumigations with oak blocks were also performed in order to investigate the penetration capabilities of SF and MB. Oak blocks were sealed with wax on 5 sides, allowing for diffusion through the bark face only, mimicking conditions of log fumigations. Results indicate that diffusion of SF and MB across bark into green wood is extremely slow. As the diffusion distance increased, the time required for the fumigant to penetrate the blocks also increased. Based on the kinetic molecular theory, we would expect a quadratic relationship between diffusion distance and time.

Higher concentrations or longer exposure times may be required to fully penetrate logs to eradicate the oak wilt fungus. Additionally, these treatments may be best used as part of a systems approach, rather than a stand-alone phytosanitary measure, as a more practical alternative.