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EFFECT OF TEA STEM EXTRACTS ON THE SHOT-HOLE BORER BEETLE AND THE SYMBIOTIC AMBROSIA FUNGUS

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Studies carried out by us have shown that caffeine inhibits oviposition of the shot-hole borer (SHB) beetle, *Xyleborus fornicatus* (*Coleoptera:Scolytidae*), in laboratory culture media containing 100 ppm of caffeine. But SHB infestation occurs in tea (*Camellia sinensis*) stems containing 800 - 1000 ppm of caffeine and the beetle manages to survive at these concentrations and cause serious damage to tea at higher elevations of Sri Lanka.

The *in vivo* tolerance of SHB to high concentrations of caffeine suggests that caffeine could be in a biologically inactive or bound form in tea stems. Complex formation is known to occur between caffeine and tea polyphenols e.g. (-)-catechin, (-)-epicatechin and (-)-epigallocatechin and has also been reported to reduce physiological effects of caffeine. This paper reports the effect of stem bark extracts of tea containing caffeine and polyphenols on SHB and its associated Ambrosia fungus, *Monacrosporium ambrosium.*

An aqueous methanol extract of the bark of beetle-infested stems from tea clone TRI 2025 was separated into five fractions 1-5 and their activities against the beetle and the fungus determined using suitable bioassays. None of the fractions showed significant anti-fungal activity at 500 ppm in the TLC bioassay against *M. ambrosium* or against two other fungi tested, *Curvularia trifolii* and *Cladosporium cladosporioides.*

Fractions 1 and 2 which contained mainly hydrocarbons, showed no effect on mycelial growth or beetle development. Fraction 3 containing >80% of caffeine increased mycelial growth at 100 ppm, but inhibited growth at 200 to 1000 ppm. Fraction 4, which appeared to contain a single compound, increased mycelial growth while fraction 5 containing phenolic compounds significantly increased mycelial growth at 100 to 500 ppm and sharply inhibited growth at 500 to 2000 ppm.

Beetles were cultured in artificial media respectively containing fraction 4, caffeine from tea stem, commercially available AR caffeine, tea stem phenolics and both caffeine and phenolics from tea stem. Beetles were found to oviposit and hatch into larvae but not pupate in all but one of replicates of media containing caffeine from tea stem at 100 to 500 ppm. When AR caffeine was used no oviposition occurred. Beetle emergence was in the order, media containing caffeine + phenolics > fraction 4 > phenolics > caffeine from tea.

The study confirmed the inhibitory effect on oviposition and the larvicidal effect of caffeine on the shot hole borer beetle. It also suggests that polyphenols in tea stems affect the biological effects of caffeine on the beetle.