D-22: Effect of caffeine on the development of *Xyleborus fornicatus* (shot-hole borer beetle)

Priyadarshine Hewavitharanage, N S Kumar
(*Dept. of Chemistry, Univ. of Peradeniya*)

This paper is a report on the development of *Xyleborus fornicatus* shot hole borer beetle in laboratory culture media containing varying concentrations of caffeine. We reported recently that the alkaloid caffeine has an inhibitory effect on the fungus *Monacrosporium ambrosium* symbiont of the Shot-hole borer beetle. This could be the reason for the resistance of certain tea clones to beetle attack. Caffeine is known to be a naturally occurring insecticide and therefore, it was of interest to determine whether it has any effect on the growth and development of shot-hole borer beetles.

Laboratory culture media were prepared according to the procedure described by Sivapalan and Sivanandarajah (1977). Four types of culture media were used. (1) Control medium, (2) Control medium + tea bark extract, (3) Control medium + tea bark extract + caffeine, (4) Control medium + caffeine.

Diet tubes (6 of each type) were autoclaved, allowed to set to room temperature, 500 mm^3 of penicillin (50 units/ml) were added and the tubes were allowed to stand for 24 h. One freshly emerging female beetle (which had mated in the parent gallery) was added to each tube. Therefore 24 culture tubes were prepared for each concentration of caffeine (5000, 2000, 1000, 500, 200, 100 and 50 mgl^{-1}.)

The culture tubes, the galleries constructed and their contents (eggs, larvae, pupae) were kept under observation and the number of females emerging from each tube was counted.

The following observations were made:

There was no fungal growth in the tubes containing 5000 mgl^{-1} caffeine. Slight fungal growth was observed in tubes containing 1000-2000 mgl^{-1} caffeine. Fungal growth was normal in the tubes containing 500-50 mgl^{-1} caffeine. Galleries were constructed in all the tubes.

Eggs were deposited in the control tubes (sets 1 & 2) which did not contain any caffeine. Larval stages, pupae and emerging beetles (light yellowish colour, darkens with age) were observed only in these tubes.

Eggs were not laid in any of the culture tubes containing caffeine, but the beetles remained alive for 30-60 days inside the galleries.

The number of emerging females was greater in control tubes containing tea bark extract (set 2).

Results indicate that caffeine has a deterrent effect on oviposition of Shot-hole borer beetles in laboratory culture media. However the same beetles infest tea stems where the caffeine concentration is 600-900 mgl^{-1}. Therefore interactions with other chemical factors found in tea stems probably reduce the toxic effect of caffeine on the beetles.

Oviposition involves recognition and orientation, and then eggs are laid only if conditions are suitable for larval growth. Our *in vitro* laboratory experiments suggest that caffeine probably has a toxic effect on the larval stages of the Shot-hole borer beetle.