

**Title** A preliminary study on the fumigant toxicity of essential oils to eggs and larvae of Queensland fruit fly *Bactrocera tryoni*

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### **Abstract**

Essential oils are natural volatile compounds extracted mainly by a process of distillation. They are often used in daily lives of human food as flavours, fragrances, in alternative medicine, as antiseptics and mosquito repellents. In addition, these oils have been reported to have various lethal and sub lethal effects on many kinds of agricultural pests including the postharvest ones. However, very little is known on their biological activities against fruit flies. The aim of this study was to evaluate the fumigant toxicity of eight plant essential oils (A, B, C, D, E, F, G and H) against eggs and larvae of Queensland fruit fly *Bactrocera tryoni* (Froggatt), a key pest of many horticultural crops in Australia especially in the eastern part of the country.

To evaluate the efficacy of essential oils, experiments were undertaken in the laboratory. One of the aims was to evaluate their ovicidal efficacy against fruit fly eggs. Forty eggs, placed on a moist black filter paper, were exposed to each plant essential oil at a dose of 100 µL/L air for 6 and 24 hours in a fumigation chamber consisting of a 950 ml glass jar. After treatment, the treated and control eggs were transferred to Petri dishes containing carrot-based diet. Treatments were replicated four times. Observations were conducted on egg hatching, pupation and adult emergence. Similarly, the fumigant toxicity of the essential oils was tested against the first, second and third instars of *B. tryoni*. Twenty larvae of each instar were placed in carrot-based diet and exposed to each essential oil at a dose of 100 µL/L air for 24 hours.

The results of the 24 hour exposure test showed that essential oil F had strong fumigant effect on eggs of *B. tryoni*, reducing the hatching to 3.8% in treated eggs compared to untreated 91.9%. However, the same essential oil F showed low fumigant effect against the larval stages. Essential oil D showed low fumigant effect against eggs but it showed strong fumigant effect on the first and second instars of *B. tryoni*. From 20 larvae exposed to essential oil D, first instar only 10% reached the pupal stage and of the second instar only 3.8 % pupated compared with 95.0% and 98.8% in each control. None of the tested essential oils showed fumigant effects on third instars of *B. tryoni*. Since essential oil F was only effective against the eggs, whereas the essential oil D was effective against the first and second instars, further trials will be done to establish the fumigant toxicity of their mixtures to both egg and larval stages of *B. tryoni*.