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Insecticidal activity of Sri Lankan isolates of *Bacillus thuringiensis* against white grubs of strawberry

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White grubs belonging to family Scarabaeidae of order Coleoptera, are root feeders reported as general pests of strawberries. Identification of grubs revealed the presence of 3 genera belonging to two subfamilies; *Melolontha* (subfamily Melolonthinae), *Anomala* (subfamily Rutelinae) and *Phyllopertha* (subfamily Rutelinae), out of which *Phyllopertha* was not recorded earlier as a pest. Three Sri Lankan *Bacillus thuringiensis* (*Bt*) isolates, 1, 2, 3, were tested for relative insecticidal activity against white grubs. The objective was to evaluate the bio-efficacy of isolates, 1, 2 and 3, against the white grubs of strawberry. Treatments consisted of soil dip assay containing different *Bt* spore concentrations and exposure times as treatment combinations, recording mortalities at 5, 10, 15, 20 and 25 days after treatment (DAT). Twenty 100 ml clean plastic containers each containing 0.25 g ± 0.05 g of strawberry roots, one larva and 25g ± 0.2 g of soil were used for each concentration. Five spore densities prepared as a dilution series were tested with 20 replicates. For isolates, 1, 2 and 3, the initial spore concentrations were 5.57×10^8, 6.40×10^8 and 1.45×10^9 spores/ml, respectively. The lethal *Bt* concentrations required for 50% mortality (LC_{50}) were calculated. Significant differences were determined based on the non-overlap of 95% CI. All 3 *Bt* isolates showed good insecticidal activity and isolate 2 showed the highest activity having LC_{50} values 3.363×10^7 spores/ml at 10 DAT and 2.898×10^6 spores/ml at 15 DAT. Hence, isolate 2 (9.41×10^{10} spores/ml) was used for the root dip assay. For the root dip assay, a treated strawberry plant per pot was planted and 10 pots were used per treatment. Five grubs per pot were added 3 days after treatment. Chlorpyrifos (rate 10 ml/10 l of water) was used as the positive control. Recorded mortality data were transformed using arcsine transformation before analysis. A two-way ANOVA was conducted that examined the effect of treatments and duration of exposure on white grub mortality. The treatments were significantly different from each other ($F = 11.719$; $df = 2, 24$; $P < 0.05$). A Tukey's post hoc test indicated that the *Bt* isolate 2 was similarly effective as the chemical insecticide Chlorpyrifos in controlling white grubs. Grub identification was done using morphological characteristics using an identification key.

Keywords: *Bacillus thuringiensis*, insecticidal activity

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