Impact of physical and biological factors on efficacy of hydroprene

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Contact and residual insecticides applied to specific target areas instead of broad-scale application is considered an alternative to methyl bromide, as defined by the Technical Options Committee. One product that is being applied commercially in the United States is the insect growth regulator hydroprene (Gentrol®), at a label rate of 1.9×10^{-3} mg [AI]/cm^2. New formulations of hydroprene and other IGRs are also being evaluated for the post-harvest market.

The red flour beetle, *Tribolium castaneum,* and the confused flour beetle, *Tribolium confusum,* can be major pests of mills, processing plants, and food warehouses. Previous studies have shown that when late-stage larvae of both species are exposed on concrete treated with the label rate of hydroprene, effects produced from the exposure include arrested larvae, incomplete adult emergence, and deformed adults that often die shortly after emergence. The red flour beetle appeared to be more susceptible to hydroprene than the confused flour beetle.

Two new formulations of hydroprene were compared to the established product Gentrol®. Concrete was treated with 1.9×10^{-3} mg [AI]/cm^2 of the Gentrol® formulation of hydroprene and 0.85 and 1.9×10^{-3} mg [AI]/cm^2 of two new hydroprene formulations 202-080 and 202-084. Tests were conducted at 27 and 32°C, 40 and 75% RH. At 40% RH there was no difference between species regarding the percentage of individuals arrested in the larval stage (arrested larvae), but 75% r.h. there were more arrested red flour beetle larvae than confused flour beetle larvae in 5 of 6 treatments. Also, red flour beetles did not survive in the adult stage, while the percentage of live confused flour beetles ranged from from 1.0 to 41.0% depending on treatment. Both of these new products were as effective as Gentrol® when applied at the label rate, but the red flour beetle was more susceptible than the confused flour beetle. Additional testing was done to evaluate the effects of temperature, relative humidity (RH), and sanitation on product efficacy.

Late-instar confused flour beetles were exposed at 0, 6 and 12 weeks post-treatment on concrete treated with 1.9×10^{-3} mg [AI]/cm^2 of hydroprene formulations 202-080 and 202-084, and stored at the same temperature-RH conditions as stated in the preceding paragraph. Both formulations gave acceptable residual control for 6 weeks, but residual efficacy declined between weeks 6 and 12. When the concrete was covered with flour for 6 weeks before larvae were exposed, there was very little residual control, and the flour could have compromised residual control by absorbing the hydroprene residues.