Title Uneven application can influence the efficacy of *s*-methoprene against *Rhyzopertha dominica* (F.) in wheat

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Abstract

The Juvenile Hormone analogue *s*-methoprene is used to protect stored grain from pests such as the lesser grain borer, *Rhyzopertha dominica* (F.). The possibility that uneven application influences *s*-methoprene efficacy against this species was investigated in the laboratory. Adults of methoprene-susceptible strains were exposed for 14 days to wheat treated at doses of up to 0.6 mg kg^{-1}, or to mixtures of treated and untreated wheat giving equivalent average doses. Adult mortality after exposure to treated wheat was negligible in all cases ($\leq$3.3%) and there was no significant effect of either average dose or evenness of application. In contrast, the number of adult progeny depended on both the average dose and evenness of application. Average doses of 0.3 and 0.6 mg kg^{-1} reduced the number of live F_1 adults by 99–100% relative to the untreated wheat and no effect of evenness of application was detected. At lower doses, however, efficacy tended to decrease with increasing unevenness of application. When adults from the parental generation were transferred to untreated wheat for another 14 days neither the average dose nor evenness of application in the wheat from which they came had any significant effect on reproduction of these adults. This study demonstrates that uneven application can reduce the efficacy of *s*-methoprene against *R. dominica*, but that this is unlikely to influence the performance of *s*-methoprene against susceptible populations at target doses likely to be used in practice (e.g. 0.6 mg kg^{-1} in Australia). However, the possibility that uneven application leads to underdosing and selects for resistance should be investigated.