

Title Protection of stored maize from insect pests using a two-component biological control method consisting of a hymenopteran parasitoid, *Theocolax elegans*, and transgenic avidin maize powder

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Abstract

The hymenopteran parasitoid, *Theocolax elegans* (Westwood), and transgenic avidin maize powder were tested to determine if their individual or combined use would protect stored grain from infestation by both internal and external insect pests. Small-scale tests were conducted in plastic jars containing 3 kg of non-transgenic maize. We tested treatments of 0.3% powdered avidin maize, the parasitoid wasp, and the combination of the parasitoid plus 0.3% powdered avidin maize. One pair each of *Sitophilus zeamais* Motschulsky, *Tribolium castaneum* (Herbst), and *Cryptolestes ferrugineus* (Stephens) was added to each jar. After 8 weeks, the entire contents of each jar were examined for adult insects. Control and avidin maize powders had no detrimental effects on the beneficial insect parasitoid *T. elegans*. The parasitoid suppressed populations of the internal feeder *S. zeamais*. The avidin maize powder treatment had no effect on *S. zeamais* because these larvae developed inside the maize kernels where no avidin maize powder was present. For *S. zeamais*, the combination treatment was not significantly different from the parasitoid treatment. In contrast, populations of the external feeder *T. castaneum* were not suppressed by the parasitoid but were suppressed by the avidin maize powder treatment. The parasitoid-avidin combination treatment produced the greatest percentage reduction for all three insect species and resulted in 78%, 94%, and 70% reductions in populations of *S. zeamais*, *T. castaneum*, and *C. ferrugineus*, respectively, when compared to the control treatment. The percentage reductions for the parasitoid treatment were 70%, 8%, and 20% for *S. zeamais*, *T. castaneum*, and *C. ferrugineus*, respectively. For the avidin maize powder treatment, populations of *S. zeamais*, *T. castaneum*, and *C. ferrugineus* were reduced by 10%, 85%, and 40%, respectively. The combination treatment of avidin maize powder plus the release of parasitoid wasps was superior to either treatment alone when applied to mixed populations of internal and external feeders.