

Low temperature to control insects in grain bins and flour mills

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Abstract

Low temperature has the advantage over other control methods in that it leaves no residues, is compatible with organic grain storage and processing, and will not reduce end-use quality (Fields, 1992; Burks et al., 2000; Fields et al., 2012). We examined the effects of low temperatures in bulk grain and in a packing plant of a flour mill. Barrels with 300 kg of wheat, infested with *Cryptolestes ferrugineus* and *Rhyzopertha dominica*, were cooled using outside air in Canada. During the 3 weeks of cooling, temperatures in the centre reached as low as -5°C. On day 0, the average number of live adults of *C. ferrugineus* and *R. dominica* were 230 and 410 insects/100 g, respectively. *Rhyzopertha dominica* (all dead at 7 d) adults were more susceptible to low temperatures than *C. ferrugineus* (all dead at 21 d). On day 0, the average number of immatures of *C. ferrugineus* and *R. dominica* were 650 and 680 insects/100 g, respectively. After 21 days, average number of immatures of *C. ferrugineus* and *R. dominica* were 40 and 150 insects/100 g, respectively. During 3 days in February 2014 a packing plant attached to flour mill in Canada was cooled using outside temperatures. Outside temperature minimum was -25°C and the average was -17°C, minima inside the packing plant ranged from 0 to -17°C, with an average of -5°C. Mortality of *Tribolium castaneum* adults held in vials in the plant ranged from 10 to 100% (mean = 88%) for non-acclimated insects, whereas adults held in the packing plant for 4 weeks before freeze-out at approximately 15°C had mean mortality of only 20%.

Keywords: cold, *Cryptolestes*, *Tribolium*, *Rhyzopertha*, movement

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