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

References

