Title Insect and mite control by manipulating temperature and moisture before and during chemical-free storage

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Abstract

Insect and mite control by sufficient drying and cooling of commodities would satisfy growing market desire for pesticide-free storage and help control increased insect resistance, particularly to phosphine. The response of insects and mites to such conditions, as opposed to those specifically targeted for disinfestation, is reviewed. The responses to temperatures at various humidities within the range 9–55 °C are examined which include those that induce individual mortality, those at the threshold for population growth, and those where rates of growth are slow. Drying is examined mainly in terms of an enhancement to the detrimental effects of temperature. A 10 °C range in minimum threshold temperature for population growth was found among the insect and mite species examined. A substantial level of protection was seen at temperatures just above these thresholds. At conditions roughly 6 °C below the threshold for population growth, >99% mortality of major coleopteran species is possible after 9 months at 45% r.h. Insect mortality at moderately elevated grain temperatures (35–55 °C) is examined as an opportunity to disinfest grain during drying. Several coleopteran and psocopteran species were found to suffer at least 99% mortality at 50 °C after 2.5 h. The extent of variation among species is discussed in terms of targeting particular susceptibilities to moderately low or high temperatures at low humidities as an alternative to chemical treatments.