Title Physical and ecological changes in insect- and fungus-induced hotspots.

Authors Cook, D. A. and Armitage, D. M.

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Abstract

Insect- and fungus-induced hotspots were observed during 1999-2001 in field trials conducted in the UK. The insect-induced hotspot (dry grain heating) occurred in an unaerated section of a 250-tonne bulk of wheat, with a free-roaming infestation of *Sitophilus granarius* and *Oryzaephilus surinamensis* of 1 insect per 2 kg grain. Sprouting at the surface was observed in December after 12 weeks. This grain heated to 40 deg C at 0.5 m depth. The lateral profile showed heating spreading to 1.4 m from the core, where temperatures remained at the bulk temperature of 12 deg C. The heating was accompanied by a sharp 60-fold increase in *O. surinamensis* caught in one trap on the hotspot periphery between weeks 9 and 13. The hotspot was monitored and then cooled, using an aeration spear, four weeks later. Incubation of samples and trap records suggest a succession of species responsible for hotspot formation, starting with *S. granarius* as the catalyst. Fungus-induced heating (damp grain heating) occurred in unventilated wheat at 19% moisture content (m.c.), which gradually increased from 20 to nearly 30 deg C in two months; in wheat at 24% m.c., which rose from 25 to over 50 deg C in eight days; and in barley at 19% m.c., which heated from about 22 to above 40 deg C in five weeks. The principal fungi detected were *Eurotium* spp., *Wallemia sebi* and *Penicillium* spp. including *P. verrucosum*, with ochratoxin A being detected after heating on wheat at 24% m.c. and barley at 19% m.c. These observations have relevance in the context of grain being held before drying due to harvest backlogs and point to the importance of aeration.