Title Metabolic response of insects and moulds to changes in controlled atmospheres and temperature

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Abstract

Metabolic heat rate (MHR; measurement of the response of small insects to changes in controlled atmospheres (CAs) and temperature) for onion thrips (*Thrips tabaci*) were determined in air and in CAs of 0, 15, 30, 45 and 60% CO_2 + air for 20-30 h. After 24 h in air, MHR was approx equal to 65% of the initial value and approx equal to 35% of the thrips were still alive. None survived any of the carbon dioxide (CO_2) CAs. Thrips appeared to have died after 10-15 h in CA. MHR of adult rice weevil (RW; *Sitophilus oryzae*) and adult and larval confused flour beetle (CFB; *Tribolium confusum*) were measured in air, at 25 deg C, then in CAs (air, 5% O_2 + N_2, 5% O_2 + 5% CO_2 + N_2, 5% O_2 + 60% CO_2 + N_2 and 60% CO_2 + N_2). Generally, calorimetric results correlated well with the insect life status at the end of the experiments. The 60% CO_2 + N_2 CA killed all the insects at 45 deg C. CFB larvae were more resistant than the adults. The MHR of agar slants inoculated with a defined number of black onion mould (BOM; *Aspergillus niger*) spores was measured for 83 h in the same CA as those used for the thrips experiments. Increasing CO_2 concentrations in the CA delayed the time of maximum MHR. For this 83-h period, total metabolic heats in air and all four CAs were practically identical. CAs containing higher CO_2 levels suppressed the diameter increase in colonies grown on agar. Both experiment types showed some enhanced activity for CA containing 15% CO_2. None of these CAs showed promising BOM control.