minute quantities of this compound occur in commercial tomatoes, such as those in our study. In contrast, our findings constitute an unambiguous case of chronic toxicity to an insect (inhibition of larval growth) by ingestion of 'secondary compounds' from trichomes without a concomitant inhibition of feeding. Thus, in *L. esculentum*, trichomes on leaves and other organs may provide multiple defensive functions (physical and/or chemical) against different insect herbivores attacking this plant species.

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Acetaldehyde: a low-concentration resource and larval attractant in 3 *Drosophila* species

P.A. Parsons and G.E. Spence[1]

Department of Genetics and Human Variation, La Trobe University, Bundoora (Victoria 3083, Australia), 28 October 1980

Summary. Acetaldehyde is used as an energy source and attracts larvae up to low concentrations where it becomes a stress and a larval repellant, in *D. melanogaster*, *D. simulans*, and *D. immigrans*. This result is expected, since acetaldehyde is an intermediary compound between ethanol and acetic acid, both of which are utilized as resources and attract larvae to varying thresholds according to species and genotype.

Ethanol and acetic acid are normal energy sources in *Drosophila* species attracted to fermented-fruits in nature[2-5] to thresholds where they cease to be resources and become stresses. The threshold ranking for 3 sympatric *Drosophila* species from Melbourne, Australia is *D. melanogaster* > *D. simulans* > *D. immigrans* for both metabolites[6], which is expected because of their close metabolic association[7]. Indeed, the concentrations of the 2 metabolites tend to be correlated in nature[8], so that parallel utilization patterns would be predicted to occur through natural selection.

The threshold ranking between larval attraction and avoidance follows the same sequence. In addition, an alcohol dehydrogenase-null mutant[9] of *D. melanogaster*, Adh^{n2}, utilizes ethanol to an extremely low threshold, while acetic acid is utilized to a threshold close to that of the *D. melanogaster* population[10]; this predictable result is paralleled by larval attraction to acetic acid but not ethanol[10].

Acetic acid is normally formed from ethanol via acetaldehyde, and thence to products producing energy. Even though acetaldehyde is often regarded as highly toxic[11], low concentrations presumably occur in nature. Here we show

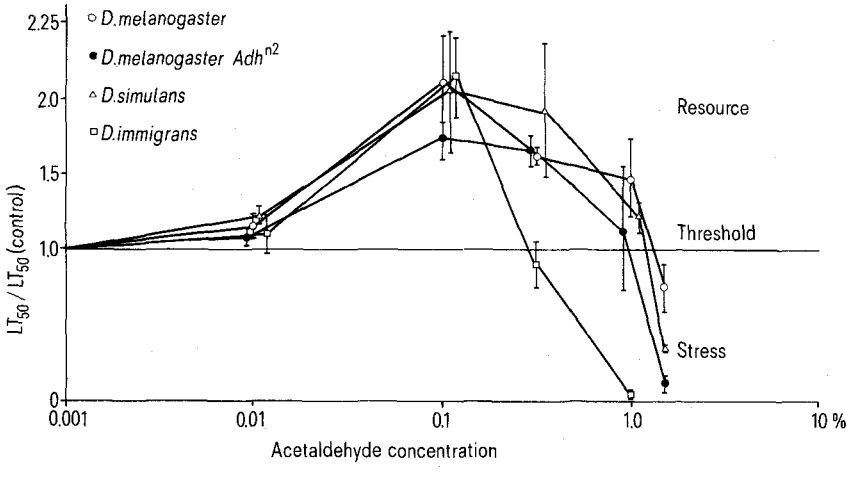

Fig. 1. Adult survivorship expressed as the ratio LT_{50}/LT_{50} control for 5 replicates of 20 flies (10 per sex) per acetaldehyde concentration tested for each species and genotype. The vertical bars indicate 95% confidence limits. The intersection of the plots with the horizontal straight line gives the threshold concentration between acetaldehyde as a resource and as a stress. Mean LT_{50} control life spans were *D. melanogaster* 52 h, *D. melanogaster*, Adh^{n2} 49 h, *D. simulans* 34 h, and *D. immigrans* 47 h.

that acetaldehyde at low concentrations is utilized both as a resource and is a larval attractant.

Adults of the above populations and the Adh^{n2} mutant of *D. melanogaster* were exposed in a closed system containing a constant amount of gaseous acetaldehyde (water vapour in controls) in equilibrium with the liquid phase in the apparatus, as previously described for exposure to gaseous ethanol[3,5]. Adult tolerances were expressed as mean LT_{50}'s being the mean number of hours at which 50% of flies had died. Since control LT_{50}'s varied among species, LT_{50}/LT_{50} control values were used for comparative purposes[6]. The thresholds (fig. 1) were all close to 1% acetaldehyde except for *D. immigrans* where the threshold was somewhat lower. The increased longevity at low acetaldehyde concentrations indicates resource utilization.

Newly-hatched larvae are additionally good indicators of resource utilization, being the stage of maximum feeding[12].

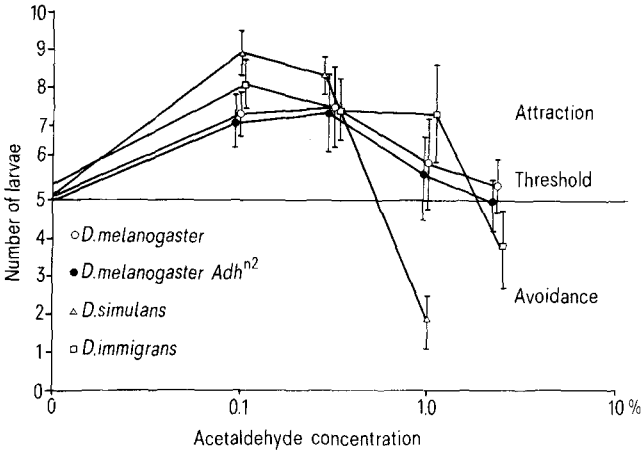

Fig. 2. Mean number of larvae out of 10 choosing agar containing acetaldehyde after 15 min based upon 8 replicates of each concentration tested for each species and genotype. The plots were very similar after 30 min. The intersection of the plots of each species with the straight line gives the threshold concentration between attraction and avoidance. The vertical bars indicate 95% confidence limits.

Larval behaviour was assessed by placing ten newly hatched larvae centrally on a Petri dish containing agar[12,13]. One semicircle of the agar contained one of the acetaldehyde concentrations, the other being pure agar. A range of concentrations was selected whereby the thresholds between attraction and avoidance could be identified. They were all in the region of 1% acetaldehyde (fig. 2).

Hence acetaldehyde at low concentrations is utilized as an energy source, and is a larval attractant for the 3 species and the Adh^{n2} mutant. However, at concentrations where ethanol and acetic acid are often resources and attractants[5,6], acetaldehyde is both toxic and a larval repellant. In addition, while there is a good correspondence between biochemical and behavioural phenotypes for the 3 species and the Adh^{n2} mutant for ethanol and acetic acid[10], this relationship is not apparent for acetaldehyde. Inter-and intraspecific differences would in any case be extremely difficult to detect given the toxicity of acetaldehyde at all except the low concentrations here examined. Investigations of acetaldehyde levels in *Drosophila* habitats in nature appear necessary.

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The effect of potato virus X on the nitrogenous constituents of potatoes

S. Chandra and N.I. Mondy

Department of Food Science, Cornell University, Ithaca (NY 14853, USA), 9 December 1980

Summary. Infection with potato virus X (PVX) increased the total nitrogen and non-protein nitrogen contents of Katahdin tubers. Protein nitrogen remained unchanged, but a 22% increase in free amino acid content accompanied infection. No differences were observed in the number or composition of protein fractions in infected tubers.

The potato is an important vegetable with regard to nutritive value and extent of cultivation. However, many varieties are susceptible to infection with potato virus X (PVX), and several researchers have reported that PVX caused appreciable reduction in tuber yield[1-3]. Potato tubers from PVX-infected Katahdin plants were significantly higher in specific gravity than tubers from healthy plants, however, Kennebec variety did not show any significant changes with infection[4]. Previous work from our laboratory revealed that potato tubers from PVX-infected plants were more susceptible to enzymatic discoloration, higher in phenolic and lower in lipid content than the controls[5]. Potato plants infected with PVX have been reported to have 70-150% more free amino acids in the leaves, but no studies have been reported showing the effect of PVX on the tuber, the part of the plant used for human consumption. The present investigation was undertaken to study the changes in the nitrogenous constitutents of potato tubers following infection with potato virus X.

Katahdin potatoes used in this study were grown during 2 seasons at the Uihlein Vegetable Research Farm of Cornell University at Lake Placid, N.Y. PVX-free and PVX-infected tuber-lines originating from the same Katahdin clone were planted in a field plot using a randomized block design. Following a 104-day growth period the vines were removed by cutting with a corn knife leaving 10-12 cm