Wild and hairy tomatoes and resistance to pests.

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Introduction - The tomato (*Lycopersicon esculentum*) hosts more than 200 pest species[1], most of which are managed with synthetic pesticides. Synthetic pesticides have many negative impacts on the health of the environment and humans. Furthermore, resistance to synthetic pesticides has been documented for many pests of the tomato. Trichome-based host plant resistance of wild *Lycopersicon* species, if introduced into *L. esculentum*, may reduce the use of synthetic pesticides. Resistance is attributed to glandular trichomes that have a membranous head containing toxins and adhesives that entrap and/or kill pests. Genetic links between unfavourable fruit characteristics and resistance make widely researched wild species, *L. hirsutum and L. pennellii*, unsuitable for breeding resistance into *L. esculentum.* In contrast, *L. cheesmanii* f. *minor* has a close relationship with *L. esculentum* and research[2] suggests this wild species may also possess resistance, though it is unknown whether the resistance is trichome based.

Materials and Methods – Ten green peach aphid (*Myzus persicae*) nymphs were placed on the leaves of several accessions of *L. cheesmanii* f. *minor*, one cultivar of *L. esculentum* and one accession of *L. hirsutum* f. *glabratum*. After 24 hours, nymphs were designated dead, trapped, hindered, unhindered or emigrated, and the types and densities of trichomes on the leaf surface of each plant were determined. Data for all accessions of *L. cheesmanii* f. *minor* were pooled and differences in the densities of trichomes between species were tested by ANOVA. Differences in the numbers of nymphs in each designation were determined by categorical logistic regression (CLR). A generalised linear model (GLM) was used to determine relationships between the densities of trichome types and the numbers of nymphs in each designation

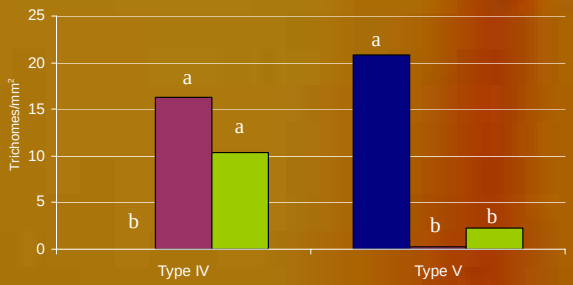
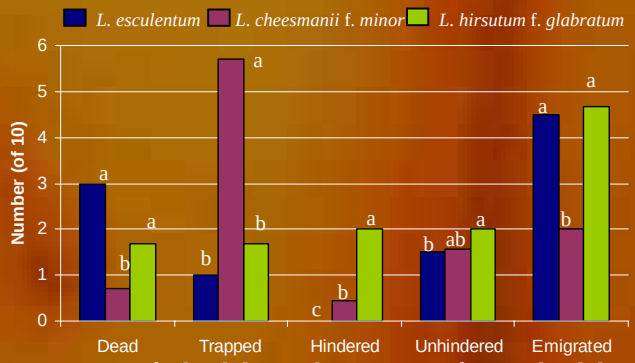


Figure 1 (above) – Differences between species in the densities of type IV and type V trichomes. **Figure 2 (below) –** Differences between species in the numbers of *M. persicae* nymphs dead, trapped, hindered, unhindered and emigrated. Columns with different letters differ significantly (P = 0.005)



Dependant variable	Parameter estimate	S.E.	P
Hindered			
Constant	0.199	0.343	0.563
Type IV	0.321	0.0896	<0.001
Trapped			
Constant	-0.300	1.05	0.004
Type VI	1.809	0.595	0.002
Emigration			
Constant	1.976	0.198	<0.001
Type VI	-0.225	0.0744	0.002

Table 1 (left) - GLM regression for the numbers of *M. persicae* hindered, trapped and emigrated.

Results - Four types of glandular and one type of non-glandular trichome were present on *L. cheesmanii* f. *minor*. Of these, the density of glandular type IV trichomes was greater on *L. cheesmanii* f. *minor* and *L. hirsutum* f. *glabratum* than on *L. esculentum* ($P < 0.001$) (figure 1) and non-glandular type V trichomes were most dense on *L. esculentum* ($P < 0.001$). Differences between species in the numbers of nymphs dead, trapped, hindered, unhindered and emigrated were significant when analysed by CLR ($P < 0.001$) (figure 2). Though numbers of dead nymphs were relatively low on *L. cheesmanii* f. *minor*, entrapment on this accession was several times greater than on other species. Analysis by GLM detected relationships between the numbers of nymphs trapped and the densities of type IV trichomes ($P < 0.001$), nymphs trapped and type VI trichomes densities ($P = 0.002$) and emigration and the densities of type VI trichomes ($P < 0.001$) (table 1).

Conclusions - Previous research has found that entrapment in trichomes exudates leads to mortality[3,4] and resistance is, therefore, best defined as the sum of the numbers of dead and trapped nymphs. Although *L. cheesmanii* f. *minor* had the lowest numbers of dead nymphs, it had the greatest numbers of trapped nymphs and the greatest numbers of dead and trapped nymphs combined. *L. cheesmanii* f. *minor* was, therefore, the most resistant species. The associations between found by GLM suggests this resistance is trichome-based and that *L. cheesmanii* f. *minor* may be a suitable parent from which to introduce trichome-based resistance into *L. esculentum.* Further study is required, however, to determine whether resistance is effective across a broad spectrum of arthropod pests.

Figure 3 – A type VI glandular trichome on *L. hirsutum* f. *glabratum*

[1] Lange *et al.* 1981. *Ann. Rev. Entom.* **26**, 345; [2]Schuster 1977. *J. Econ. Entom.* **70**, 434; [3] Simmons *et al.* 2003. *Aust. J. Entom.* **42**, 373; [4] Simmons *et al.* 2004. *Aust. J. Entom.* **43**, 196;