Cultivar attractiveness affects the spatial range of parasitoid recruitment

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Background/aim

Parasitoids use volatile organic compounds emitted by damaged plants to find their hosts. Not much is known about the distances at which these compounds are relevant in parasitoid host searching. The objective of this study was to investigate whether an increase in distance between host-infested plants affects field parasitism levels. Moreover, we investigated whether using a more attractive cultivar affects parasitism at these distances.

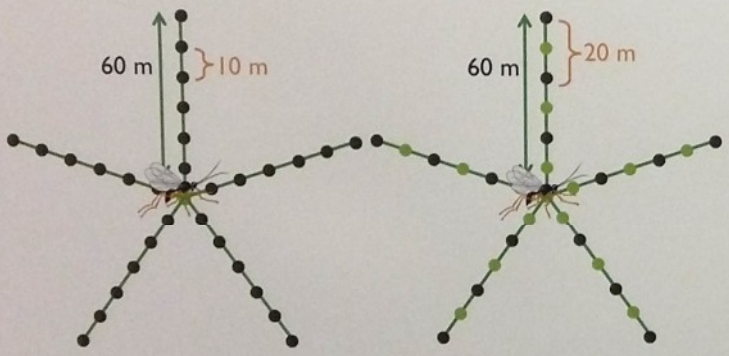


Figure 1: Experimental set-up. Left: all white cabbage plants (circles) in the transects are infested with *Pieris brassicae* caterpillars (dark green). In the right set-up, only the plants at 20 m, 40 m and 60 m were infested, effectively increasing distance between infested plants. Uninfested plants are light green. Background vegetation was grass. Twenty-five *Cotesia glomerata* females were released in the center.

Methods

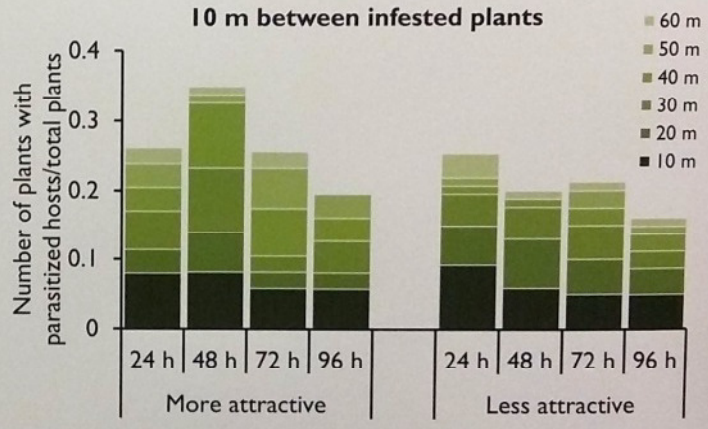
We investigated host finding success of the parasitoid wasp *Cotesia glomerata* in 7 field releases. Parasitoids were released in an arrangement of white cabbage plants (*Brassica oleracea* var. *alba* L.) with a grassy background vegetation and the parasitism rate of *Pieris brassicae* larvae on cabbage plants was assessed. We tested the effect of (1) white cabbage cultivar (more vs less attractive) and (2) plant spacing (10 m or 20 m) (figure 1). Data were analysed by GLMM with binomial distribution and random effects for plant ID and trial week.

Figure 3: *Cotesia glomerata* parasitizing *Pieris brassicae* caterpillars. ©Yavanna Aartsma

Conclusion

The more attractive cabbage cultivar was able to attract parasitoids when distance between host-infested plants was increased from 10 m to 20 m, while the less attractive cultivar failed to attract parasitoids at 20 m.

Retention of natural enemies in agricultural fields is an important aspect of biocontrol and using more attractive crops might lead to enhanced pest control.



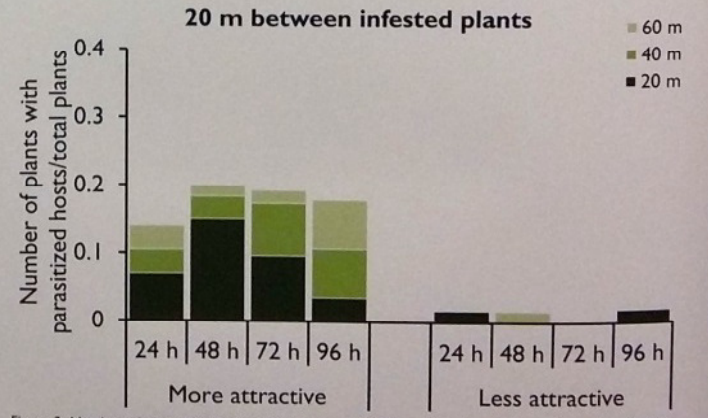


Figure 2: Number of plants visited by at least one parasitoid as a fraction of the total number of plants, summed over all trials. The top graph shows results for arrangements in which the distance between infested plants was 10 m. The bottom graph shows arrangements with 20 m distance between infested plants. Colours indicate distance of plant relative to central release point and results are shown for each day after release.

Results

In the experimental setup with 10 m plant distance, there was no significant difference in parasitism rate between the more and less attractive cultivar ($p > 0.05$). However, with 20 m plant distance, the parasitism rate was much and significantly lower in the less attractive cultivar than in the more attractive cultivar ($p < 0.001$). Furthermore, parasitism decreased with increasing distance from the center of the wheel and time since release ($p < 0.001$ and $p = 0.007$). See figure 2.

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