Boosting invertebrate biodiversity on vineyards via sown companion planting in alleyways

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Introduction

Vineyards are a growing land-cover type in the UK. Many are focused around biodiversity-rich regions (e.g. Kent Downs). This means that well-managed vineyards could support significant biodiversity and act as landscape corridors to connect other habitat types. Growers could thus also receive **ecosystem services** from the invertebrate community, e.g. maintaining the soil quality and managing crop pests.

Companion planting may provide a suite of benefits: stimulating crop growth, repel pests; attracting natural enemies; enhancing soil quality. *Matricaria chamomilla* (German chamomile) is a good candidate (El-Kareim et al. 2007): fast-growing, flowering, complex volatile profile. This study aimed to test the impact of chamomile companion-planting in alleyways on pest and beneficial invertebrates in UK vineyards (Fig. 1).

Fig. 1 (a) Vineyard row with chamomile seeded into the alleyway approximately 3 months earlier; (b) close-up showing chamomile flowering in the alleyway sward.

Spotlight on bioacoustics

Bioacoustics – listening to and quantifying the sounds created by natural environments – is a non-invasive way to measure biodiversity and living organism activity.

Here, Baker Ecology's Soil Acoustics team used this approach to measure soil invertebrate activity by inserting probes into the soil in test and control rows. The probes measure digging, chewing and scraping noises from different soil invertebrates (e.g. beetles) with acoustic signatures unique to species.

The Acoustic Complexity Index (ACI) was measured using 3-minute recordings and processed on Kaleidoscope Pro (Pieretti et al., 2011).

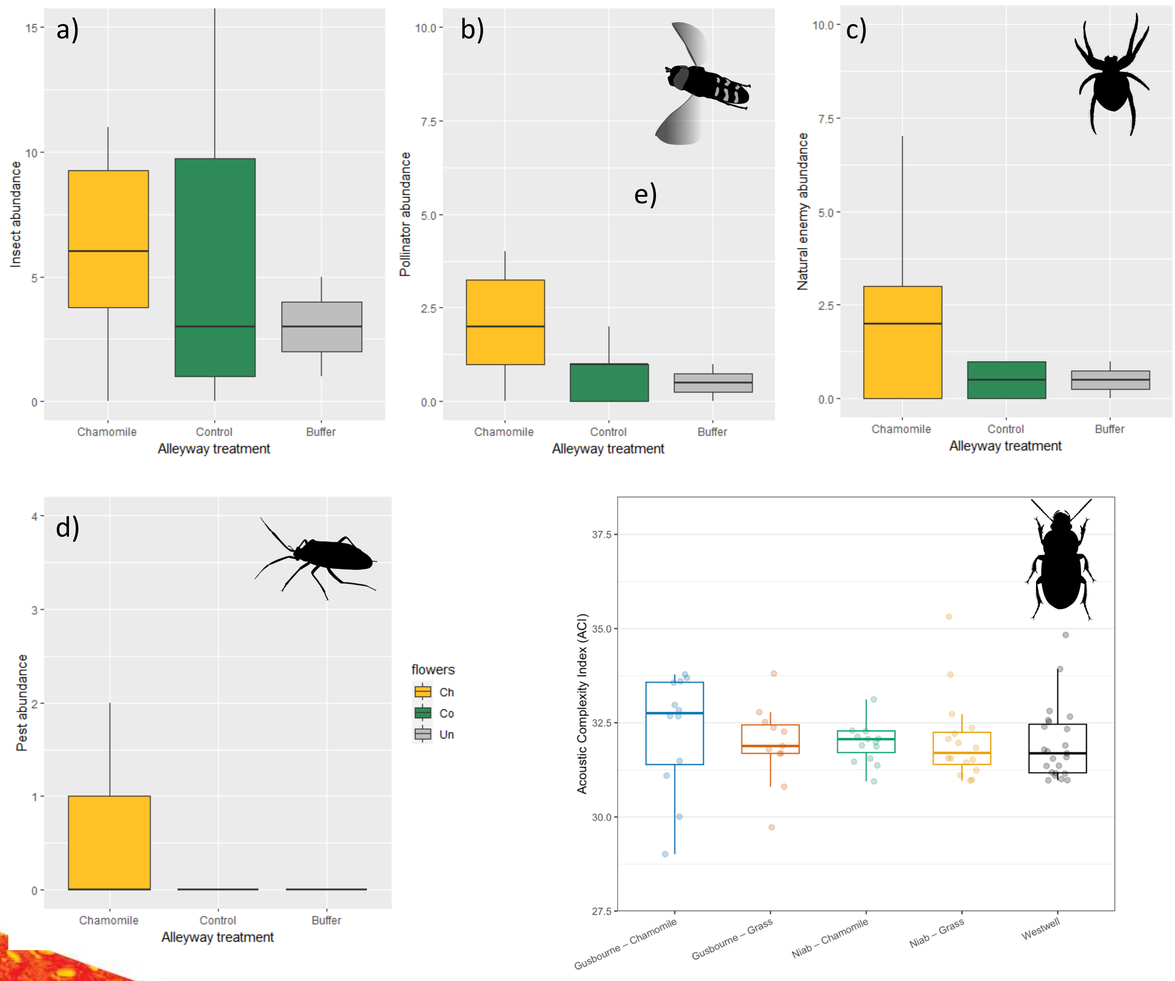

Fig. 2 Invertebrate activity in the alleyways: Effect of companion planting on (a) total invertebrate abundance; (b) pollinator/flower visitor abundance; (c) natural enemy abundance; (d) pest abundance monitored via transect walks recording invertebrate interactions with flowers in the alleyways; and (e) the belowground acoustic complexity index in August 2025, measuring overall activity and the diversity of sounds detected. Points represent individual 3-minute soil recordings; boxes summarise median and interquartile range.

Materials and methods

- Three vineyards in Kent (one experimental, growing Chardonnay; two commercial growing Chardonnay and Ortega)
- Chamomile (*Matricaria chamomilla*) seeds were sown in test rows. Other rows received normal management: mowing to short sward
- Two monitoring visits in August and September 2025 (UK late summer) evaluated the impact on invertebrate biodiversity.
  - Tap-sampling to examine invertebrates on the crop (strike the main vine firmly three times with a padded bat, collecting the invertebrates that fall out).
  - Transect walks to survey invertebrates in the alleyways with and without chamomile (5 minutes walking up and down each row recording all invertebrate-flower interactions).
  - Bioacoustic belowground invertebrate surveying (see box, left).

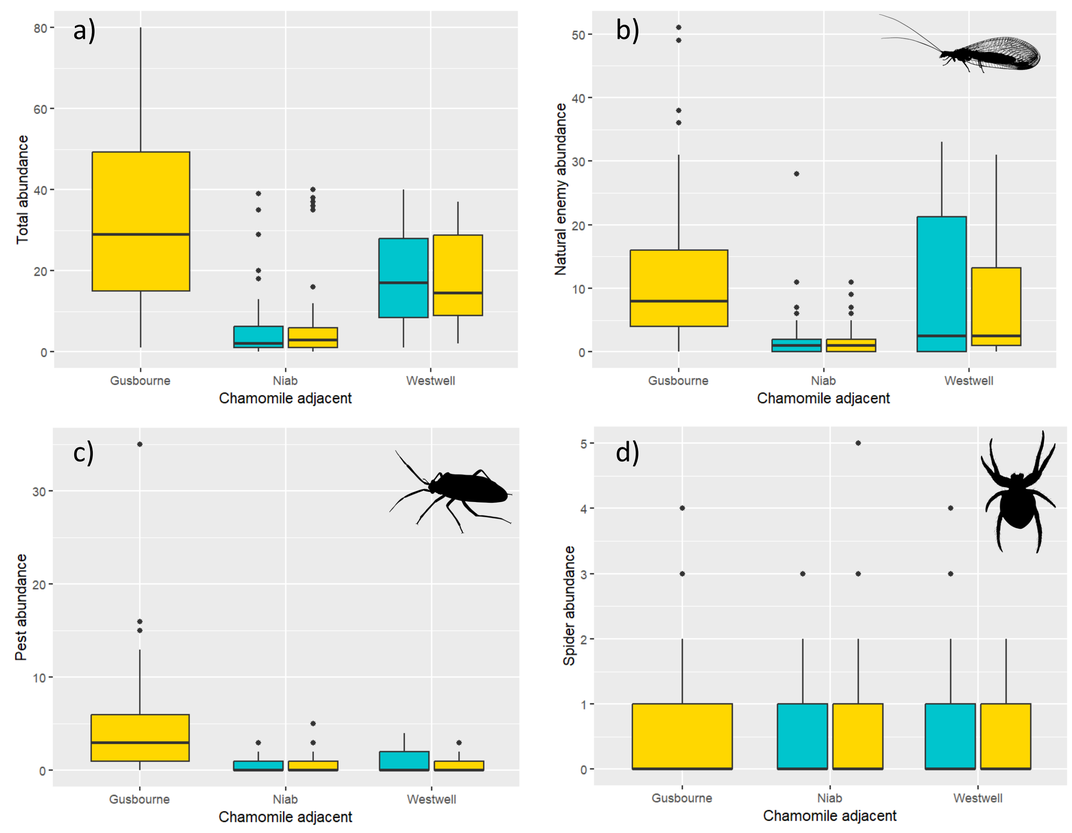

Fig. 3 Invertebrate activity on the vine crop: Effect of companion planting on (a) total invertebrate abundance; (b) natural enemy abundance; (c) pest abundance; (d) spider abundance, monitored via tap-sampling (striking a main branch of the vine and recording the invertebrates that fall from the crop)

Results

- Abundance of different invertebrate groups visiting flowers in the alleyways was much higher in the chamomile seeded rows (Fig. 2a-d) (overall: $p = 0.0044$; flower visitors: $p = 0.0030$; natural enemies: $p = 0.022$; pests: $p = 0.0040$).
- However, invertebrates tap-sampled from the crop in rows with and without an adjacent chamomile alleyway did not differ (Fig. 3) (overall: $p = 0.61$; natural enemies: $p = 0.87$; pests: p = 0.63, spiders: p = 0.94).
- Across sites, soil soundscape activity and complexity were comparable between chamomile-seeded and control rows during August 2025. While some sites showed slightly higher acoustic complexity in chamomile rows, differences were modest and non-significant, indicating similar levels of belowground biological activity (Fig. 2e).

Discussion and conclusions

- Short-term benefits of companion plant addition to vineyard rows include a rapid boost in flower visitor and natural enemy activity in the row vegetation, and increases in soil invertebrate activity-density.
- The small changes in soil invertebrate activity may also be due to the cultivation process needed to establish the companion plants.
- There is little evidence of an equivalent increase in beneficial invertebrates on the vines themselves within a 3 month window after sowing; invertebrate populations can take years to build up even when suitable resources are provided (Albrecht et al. 2020).

References

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