Leveraging Plant Traits for Hedgerow Selection to Reduce Insect Pests in Southern California Citrus and Avocado

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Background

- Integrated pest management (IPM) programs offer viable alternatives to pesticides by boosting natural biocontrol

- Hedgerows are a component of IPM programs that can attract natural enemies of targeted pest species. However, the species selection process for hedgerows is uncoordinated due to a lack of knowledge on the functional drivers of its success

Objective: Using preliminary data, our objective is to assess the relationship between plant functional traits and arthropod abundances to provide insight into hedgerow selection in California orchards

Methods: Study Site and Data

- Location: Hedgerows in Santa Clara River Valley, Ventura County

- Species: *Acmispon glaber*, *Salvia mellifera*, *Eriogonum fasciculatum*, *Verbena lasiostachys*, *Isocoma menziesii*, *Baccharis pilularis,* and *Artemesia californica*

- Data: Nine plant traits, pest abundance, and natural enemy abundance collected from 57 individuals across two avocado and one citrus site. Number of species per site varied due to mortality

- Analysis: Generalized linear mixed models with abundance as response, traits as predictors, and both species and site as random effects. All continuous predictors were standardized (z-scored) using the scale() function in R


Figure 1: Hedgerow at Avocado site 1

Methods: Arthropod Sampling and Trait Groups

Visual Surveys
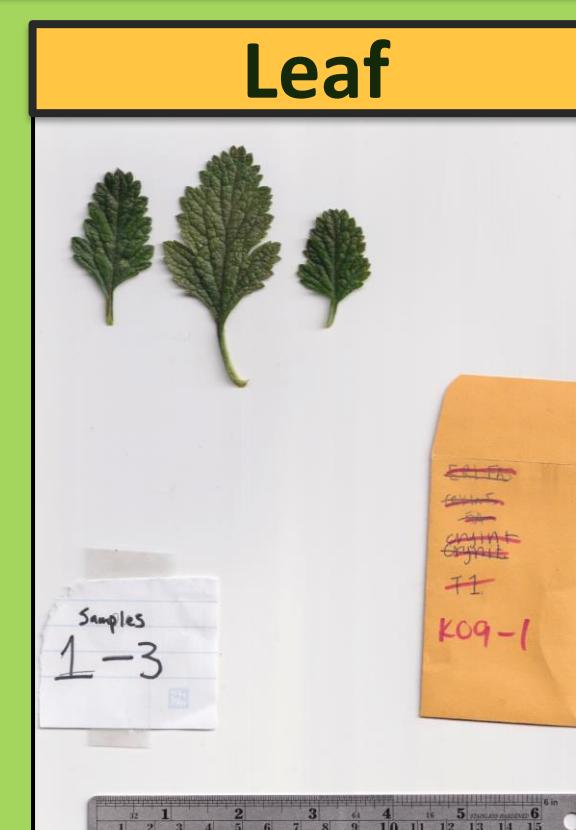
Leaf

Flower
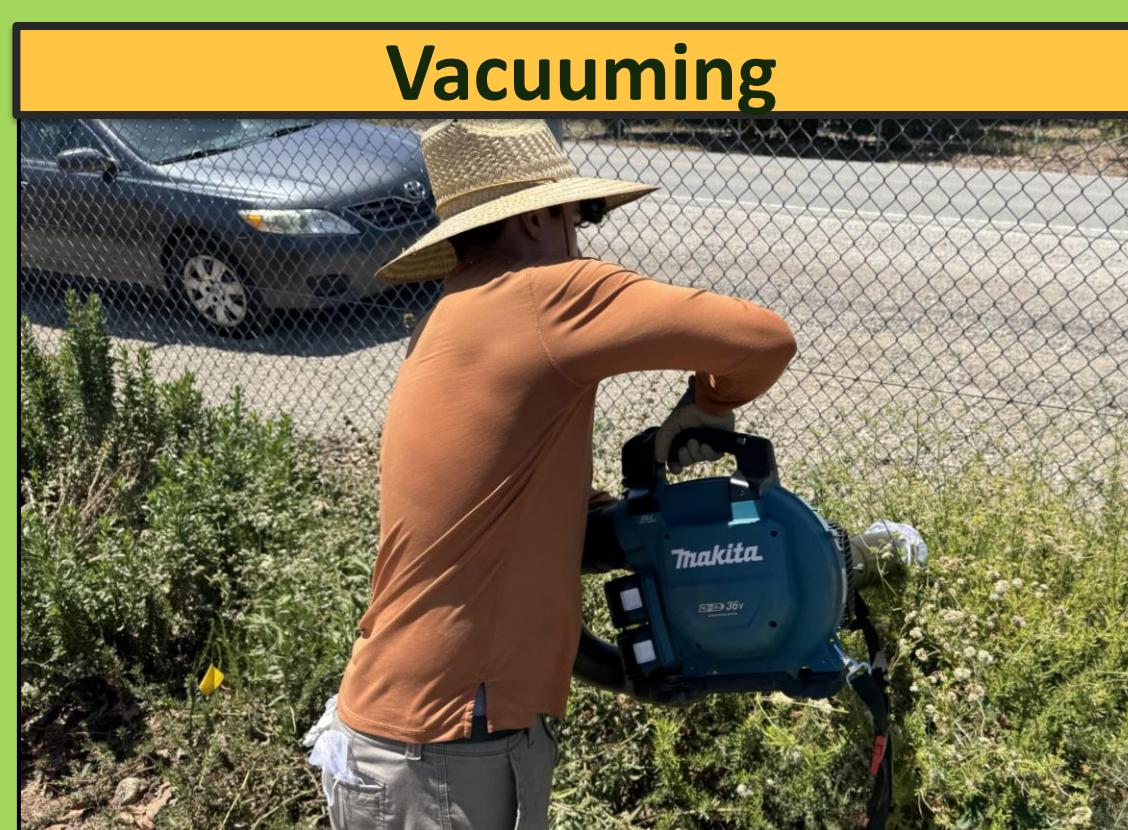
Vacuuming

Water Potential

**Morphology**

Results
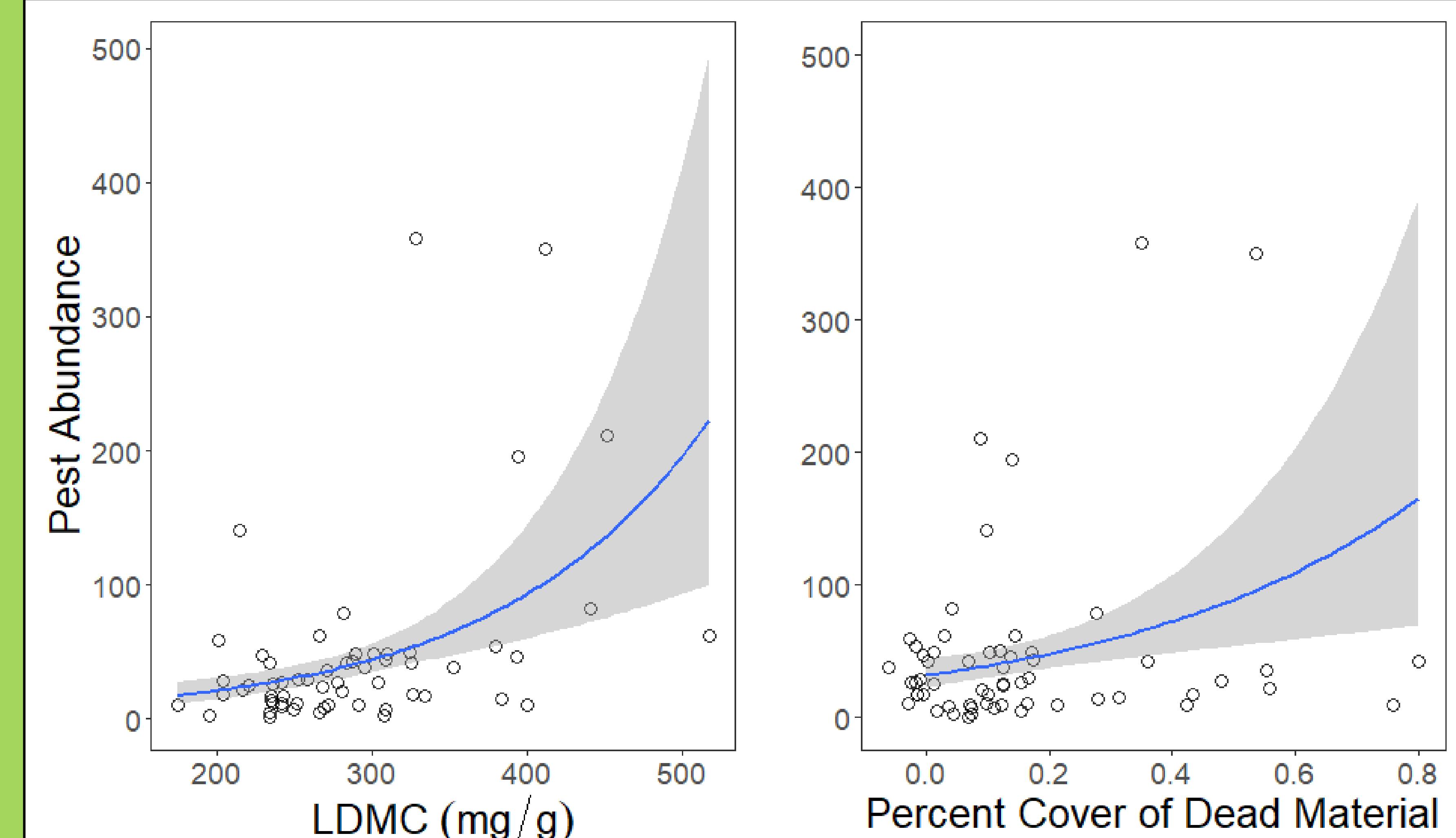
Figure 2. Relationships between pest abundance and plant traits.
- **Pest abundance increased significantly with both leaf dry matter content (LDMC; coefficient = 0.515 ± 0.15 SE, $z = 3.373$ $p < 0.001$) and percent cover of dead plant material (coefficient = 0.231 ± 0.12, $z = 1.967$, $p = 0.049$)**
- **Slow, resource-conserving plants with more dead material (e.g., dried leaves or wilted flowers) promote pests, potentially acting as a reservoir**
- Circles represent observed pest abundance (number of pests per plant) across site and species
- Lines show fitted relationships from generalized mixed models (negative binomial; n = 57, df = 44) with 95% CI
- Site random effect variance was 0.192 (SD = 0.44), while species variance was non-existent (variance = 0, SD = 0)

Major Pest Groups

Psyllids

Leafhoppers

Thrips

Discussion

- Preliminary data shows that LDMC and percent cover of dead plant material are strong predictors of pest abundance

- No plant trait strongly predicted natural enemy abundance

- **Slow, resource-conserving plants with more dead plant matter are attractive to pests**

- Local environmental conditions or unmeasured site-level factors, like management and irrigation regime, contributed moderately to differences in pest abundance

Significance

- **Hedgerows may be able to attract pests from neighboring orchards if they are selected with slow, conservative traits and are allowed to maintain their dead plant material**

- Management strategies like pruning or weeding may influence hedgerow-pest relationship by shifting the cover of dead material on and around the plant, respectively

Acknowledgements