Intercropping

Impact: Pest and disease control

Reference 11

Koricheva, J; Hayes, D 2018 The relative importance of plant intraspecific diversity in structuring arthropod communities: A meta-analysis Funct. Col. 32, 1704-1717 10.1111/1365-2435.13062

Background and objective

Understanding how plant diversity influences higher trophic levels is important for predicting the consequences of global biodiversity loss. While early studies have focused on the effects of plant species richness, more recently a growing number of experiments have explored the effects of plant intraspecific diversity by manipulating the genotypic richness of plant communities. NA

Search strategy and selection criteria

We searched for relevant literature using keyword searches in Web of Science and Google Scholar, reference lists of recent reviews on the topic and reference lists of the obtained relevant studies on the topic. Combinations of the following keywords were used: “genetic diversity,” “genotypic diversity,” “varietal mixtures,” “plant,” “arthropod,” “herbivore,” “predator,” “parasitoid,” “omnivore,” “pollinator” and “detritivore.” Inclusion criteria: (1) plant genotypic richness was experimentally manipulated in such a way that replicated low and high genotypic diversity plant stands were available; (2) some measures of arthropod diversity (species richness, Shannon–Weiner index, evenness), abundance, performance (fecundity, biomass) or activity (e.g. herbivory, parasitism rates) were available; (3) data on means, SD and sample sizes for the above variables from low and high genotypic diversity treatments were available from the papers or provided by the authors. Behavioural responses such as arthropod movement were not included.

Data and analysis

Meta-analysis was conducted using OpenMEE software. Standardized mean difference (Hedges’ d) between measures of arthropod abundance, diversity or activity in genetically diverse and genetically poor monospecific plant stands was used as an effect size. Random-effects models were used to combine the effect sizes across studies. These models account for both sampling variance within studies and between-study variance. A restricted maximum likelihood approach was used to estimate the parameters of the meta-analysis model. Meta-regression was used to assess the effects of moderators (covariates) on the magnitude of the effect of plant genetic diversity.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
22	Multiple crops	Varietal mixtures	Pure stand	Metric: Predator abundance, herbivore abundance and damage; Effect size: Hedge d (standardized difference) comparing the considered metrics between intervention and control	75%

Results

- Genetic mixtures of crop varieties did not increase predator abundace compared to pure stands
- Genetic mixtures of crop varieties decreased herbivore abundace compared to pure stands
- No difference in the effects of plant genetic diversity on herbivore damage was found
- NA
- NA

Factors influencing effect sizes

- Type of herbivore pest : Crop genetic mixtures reduced damage by generalist herbivores but not for specialits
- NA : NA
- NA : NA

Conclusion

The results of the study provide limited support for the suggestion that genotypically diverse cultivar mixtures can be used as an effective pest management tool