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Albrecht, M; Kleijn, D; Williams, NM; Tschumi, M; Blaauw, BR; Bommarco, R; Campbell, AJ; Dainese, M; Drummond, FA; Entling, MH; Ganser, D 2020 The effectiveness of flower strips and hedgerows on pest control, pollination services and crop yield: a quantitative synthesis *ECOLOGY LETTERS*, 23(10), 1488-1498. 10.1111/ele.13576

Background and objective

The lack of clarity about effects of flower plantings on ecosystem service provisioning and crop yield scattered in numerous case studies is a barrier to farmer adoption of such measures. The aim was to quantitatively assess the effectiveness of two of the most commonly implemented ecological intensification measures, flower strips and hedgerows, in promoting crop pollination, pest control services and crop production. Moreover, the authors aim to better understand the key factors driving failure or success of these measures to suggest improvement of their design and implementation.

Search strategy and selection criteria

The authors performed a search in the ISI Web of Science and SCOPUS (records published until 31.12.2017 were considered). To minimise potential publication bias and to maximise the number of relevant data sets they also searched for unpublished data by contacting potential data holders through researcher networks. 1) Pollination and/or pest control services in crops were measured in both crop fields adjacent to floral plantings and control fields without planting; 2) the replication at the field level was \geq six fields per study (three fields with plantings and three without; i.e. disqualifying small-scaled plot treatment comparisons within fields).

Data and analysis

The authors used a mixed effect-modelling approach to address the research questions. In all models, study was included as a random intercept to account for the hierarchical structure of the data with field measures nested within study. Effect sizes provided in the text and figures are model estimates of z-transformed response variables. For statistical inference of fixed effects log-likelihood ratio tests (LRT) were used. All statistical analyses were performed in R version 3.5.2 using the R-package lme4.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
35	Cropland	1) Flower strips; 2) Hedgerows	1) No flower strips; 2) No Hedgerows	Metric: Natural pest control service; Effect size: Fisher's Z-transformed r	62.5

Results

- The provisioning of pest control services in crop fields adjacent to flower strips was enhanced by 16% on average compared to fields without flower strips.
- On average, pest control services were also increased in crops adjacent to hedgerows, but effects were more variable and overall not statistically significant.

Factors influencing effect sizes

- Distance to field edge : Pest control services declined exponentially with distance from the field edge, but the slopes of the distance functions between fields with and without adjacent floral plantings did not differ.

Conclusion

This synthesis demonstrates enhanced natural pest control services to crops adjacent flower strips plantings but not adjacent to hedgerows, across a broad suite of regions, cropping systems and types of flower strips studied.