

SHIFT IN SPECIES COMPOSITION AND DIVERSITY OF BEES IN A HIGHLY DYNAMIC AGRO-NATURAL LANDSCAPE AND ITS IMPACT ON CROP POLLINATION

**E.M.D. Ekanayake¹, W.A.I.P. Karunaratne^{1*}, K.M.G.G. Jayasuriya²,
K.S. Hemachandra³ and A.K. Karunarathna⁴**

¹Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

²Department of Botany, Faculty of Science, University of Peradeniya, Sri Lanka

³Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka

⁴Department of Agricultural Engineering, Faculty of Agriculture,
University of Peradeniya, Sri Lanka

*inokap@sci.pdn.ac.lk

Bee pollinators play a crucial role in agroecosystems. The present study investigated the impact of habitat and resource availability on shifts in species composition and diversity of bees and crop yield. The research was conducted in a 16 × 16 m weedy area at the Meewathura Farm, Peradeniya, where no agrochemicals were applied. Within the central 10 × 10 m area, 76 plots (1 × 1 m) were demarcated for planting chili and eggplant, while the remaining 24 plots were planted with ornamental species. Each sampling plot was examined for 10 min from 0830 to 1130 hr to record bee species visiting flowers, their abundance and the number of open flowers. The observations were made weekly in the three areas; peripheral weedy, crop, and ornamental areas from June 2021 to May 2023 before, during, and after “Yala” and “Maha” seasons. Pollination experiments involving 25 sets of open and covered flowers were conducted, pods were harvested upon maturity, and yield was measured. Bee species richness increased from “Yala” to “Maha” 2021, remained stable from “Maha” 2021 to “Yala” 2022, and increased gradually from “Yala” to “Maha” 2022. Bee abundance differed significantly among the three areas ($p = 0.03$). The relative abundance was higher in peripheral areas than in crop or ornamental areas over seasons and years. The pairwise comparison revealed a significant difference in the relative abundance of bees among peripheral and crop areas ($p < 0.001$) and peripheral and ornamental areas ($p < 0.001$) but not among crop and ornamental areas ($p = 0.63$). *Ceratina binghami*, *Tetragonula iridipennis*, and *Hoplonomia westwoodi* were the most common bees in peripheral, ornamental, and crop areas, respectively. Bee species richness and abundance positively correlated with the number of open flowers ($r^2 = 0.125$, $p = 0.007$ and $r^2 = 0.887$, $p < 0.001$). *Hoplonomia westwoodi* and *T. iridipennis* were the most abundant floral visitors of both chilli and eggplant flowers. Bee-visited crop flowers produced significantly heavier and bigger fruits with higher numbers of germinated seeds ($p < 0.001$). This study highlights the importance of diverse flowering weed species and eco-friendly inter-cropping agricultural practices to enhance bee diversity, ultimately enhancing crop production in an agro-natural landscape.

Financial assistance from the National Research Council, Sri Lanka (Grant No. 20:010) is acknowledged

Keywords: Agro-natural landscapes, Bee pollinators, Crop pollination, Floral resources