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Pollen diversity and protein content in differentially degraded semi-arid landscapes in Kenya

PAMELA OCHUNGO¹, RUAN VELDTMAN², RAHAB KINYANJUI³, ELFATHI M. ABDEL-RAHMAN⁴,
MICHAEL MUTURI⁴, MICHAEL LATTORFF⁴, TOBIAS LANDMANN⁴

¹Technical University of Kenya, School of Surveying and Spatial Science, Kenya

²Stellenbosch University, Dept. of Conservation Ecology and Entomology, South Africa

³National Museums of Kenya, Palynology and Palaeobotany Section, Earth Science Dept., Kenya

⁴International Centre of Insect Physiology and Ecology (icipe), Kenya

Abstract

In Africa there is a scarcity of information on how plant species that can provide forage for honey bees vary across differentially structured landscapes, and what are the implications of such variabilities on colony integrity. This research presents new insights into the diversity and richness of pollen collected by *Apis mellifera* scutellata, a subspecies of the Western honey bee native to sub-Saharan Africa, at six study sites of different degradation levels within a semi-arid landscape in Kenya. Ten colonies were established at each site and land cover characteristics were extracted using fused Sentinel-1 and Sentinel-2 satellite imagery. The sites differed by the proportions of natural vegetation, cropland, grassland and hedges within each site. Bee bread was collected five times, with three colonies in each of the six sites repeatedly sampled during the period from May 2017 to November 2018. Pollen identification and protein analysis within the study sites were thereafter conducted to establish the linkage between landscape degradation levels and abundance and diversity of pollen. Out of 124 plant species identified, *Terminalia* spp., *Cleome* spp. and *Acacia* spp. were identified as the most abundant species. Moreover, species richness and diversity were highest in the two sites located in moderately degraded landscapes. Pollen protein content showed statistically significant differences across season rather than geographical location. This study demonstrated that landscape degradation negatively affected the diversity and richness of pollen collected by honey bees. Consequently, this helps our understanding of native honey bees' forage resource usage and plant species preferences in landscapes with varying degrees of degradation.

Keywords: *Apis mellifera*, honey bee nutrition, landscape degradation, natural habitats, Sentinel