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# Modern pollen and non-pollen palynomorphs from sub-tropical central India: discerning anthropogenic signal in surface pollen assemblages

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**Abstract**
Interpretation of past vegetation using pollen analysis depends on our understanding about the relationship between the modern vegetation and surface pollen assemblages. In the present study, we sampled the modern pollen-rain in a mixed environment of cultivated land and dry and wet tropical forests in central India. We established to which extent modern vegetation types are reflected in the pollen-rain and explained biases in the modern pollen spectra. Our study revealed that the modern pollen assemblages do not fully represent the extant regional vegetation, as many of the forest components, especially trees and shrubs, are either under-represented or remained palynologically silent in the pollen records. Low pollen productivity of most of the tropical deciduous taxa, owing to entomophily, as well as low preservation potential of some tree pollen are primarily responsible for this irregularity in their representation in the pollen spectra. Moreover, *Shorea robusta* and *Tectona grandis* pollen, despite being high pollen producers, are not encountered in any sample, which could be further attributed to their poor preservation in surface soil samples, as well as to their low (pollen) dispersal efficiency. Cerealia, Amaranthaceae, Caryophyllaceae, Brassicaceae, *Cannabis sativa*, *Artemisia* spp. and *Alternanthera* spp. indicate agricultural practices and other human activities around the respective study areas. Moreover, the consistent presence of Asteroideae pollen indicates pastoral activities, whereas *Sporormiella* spp., *Sordaria* spp., *Podosora* spp., *Delitschia* spp., and *Cercophora* spp. indicate local grazing and herbivory.

**Keywords:** *palynology, tropical deciduous forests, modern analogue, human impact, coprophilous fungi, central India*

Pollen analysis is one of the most important tools for the reconstruction of past vegetation (Faegri & Iversen 1989; Birks & Berglund 2018; Kar & Quamar 2019, 2020; Mohanty et al. 2024; Quamar 2022, 2024; Quamar et al. 2023, 2024, and references cited therein). Reconstruction of modern vegetation, through the palynological records of surface soil samples, requires thorough data of how the vegetation in the vicinity of the sampling sites is reflected in the pollen assemblages (Wright Jr 1967; Wright Jr et al. 1967; Moore & Webb 1978; Jackson 1990; Bottema 1975, 1992; Birks & Berglund 2018). Since the inception of pollen analysis as a tool for reconstructing the past vegetation dynamics (Von Post 1916), the relationship between the extant vegetation and modern pollen-rain has been explored worldwide, both theoretically and empirically (Prentice et al. 1987; Jackson 1990; Sugita 1994; Bunting et al. 2005; Birks et al. 2016; Felde et al. 2016; Quamar & Kar 2020a; Kar et al. 2022; Mishra et al. 2022; Prasad & Quamar 2023, and references cited therein). However, owing to some taphonomic issues (actual preservation of pollen-spores in the sediments), such as bioturbation, erosion, sorting destruction (Moore & Webb 1978; Birks & Birks 1980), as well as differences in pollen production and dispersal amongst the various taxa, the pollen percentages do not directly represent the

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