



Phytoliths as indicators of Quaternary vegetation at the Paleolithic site of Attirampakkam, India



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A B S T R A C T

The paleoecological context of hominin occupation in South Asia during the early and middle Pleistocene is virtually unknown. Attirampakkam, India, is an archeological site of global importance, with an early Acheulian occupation (age bracket of ~1.07–1.77 Ma) succeeded by Middle Paleolithic levels. Here we report on the recovery of phytoliths from artifact-bearing Quaternary deposits in excavated trenches. We focus on the reconstruction of past vegetation during hominin occupation of the site. The present study provides information on hominin microenvironments and local habitats in South Asia, situating them in a more tangible ecological context than so far achieved. Results show that this region was arid during the earlier stages of the early Pleistocene, and was occupied by hominins living in a landscape locally lacking woody plants. Herbaceous vegetation was dominated by C₄ Chloridoid grasses. In the later phase of the early Pleistocene, the landscape was wooded and dominated by C₄ Panicoid grasses, with a significant reduction of C₄ Chloridoid grasses indicating a shift from a drier to a relatively more humid climate. A diverse husk and leaf phytolith assemblage of wild *Oryza* spp. (rice) occurring as natural annual or perennial components of the vegetation in the area, other herbaceous plants such as Cyperaceae (sedges), and the continuous presence of blackened phytoliths, suggest the establishment a grassland landscape with enclaves of wetland habitat affected by seasonal flooding and frequent fires. The transition from the early to the middle Pleistocene was marked by a moderately humid climate, with a shift toward aridity during the late Pleistocene, during which we note an environment dominated by C₄ Chloridoid grasses, by a sharp reduction of C₄ Panicoid grasses, and by a rise in woody taxa. During the middle to late Pleistocene, Middle Paleolithic populations would have witnessed water bodies near the site, as reflected by the presence of plants adapted to swamplike conditions such as Cyperaceae and *Oryza* spp. The archeological record terminates in Layer 1, when human occupation decreased drastically, possibly because of increased aridity and/or greater environmental variability. The phytolith fingerprint at ATM sheds light on the co-occurrence of vegetation, fire and early prehistoric land occupation. An important aspect is the evidence of *Oryza* spp., suggesting that wild rice occurred in the environment frequented by these early hominins.

1. Introduction

One of the key research gaps in the Paleolithic archaeology of India is the reconstruction of paleovegetation. This can be achieved through the meticulous study of multiple botanical proxies such as phytoliths, pollen, charcoal and seeds in the context of well-studied archeological sites. At Lower and Middle Paleolithic sites, hominin modification of local vegetation through environmental manipulation was minimal,

providing an excellent context for reconstructing primary paleovegetation signatures and for detecting divergences from those reference states. The Paleolithic site of Attirampakkam (henceforth ATM), in southeast India, displays a well-preserved, 9 m-deep stratigraphic record of artifact-bearing sedimentary deposits. These indicate recurrent hominin occupation since the early Pleistocene (age bracket: ~1.07–1.77 Ma, weighted mean: ~1.5 Ma: Pappu et al., 2011), currently making it the oldest known Acheulian site in South Asia. The site

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