



# Implications of phytolith records from an Early Historic megalithic burial site at Porunthal in Southern India



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## ABSTRACT

Collateral phytolith records from four megalithic burials uncovered at Porunthal on the foot hills of the Western Ghats, Tamil Nadu, are presented. This has contributed to the current knowledge of the landscape in association with the flora and megalith culture that prevailed in South India during the Early Historic time at 540–410 cal BCE. Evidence shows that Early Historic megalithic people engaged less in pastoral activities on the open landscape, dominated by herbs e.g., Cyperaceae and Poaceae, and also by *Palmae* species in semi-arid environment. The presence of strong mode of settled-paddy and millet farming cultures, cereal-processing activities and grazing in association with the burial practices were significant as early as 6th century BCE. Seeds, leaves and sheath from domesticated rice, millet and some materials from sedges and *Palmae* species were deliberately deposited indicating variable burial rituals in each grave. Burial tradition indicates that Iron Age and Early Historic megalithic people of southern India may have carried out burial rituals with more rice than millets. Evidence for the early appearance of Brahmi writing as part of the ‘complex’ megalithic social life marks the beginning of Early Historic Period, previously not reported in southern Asia. Phytolith evidence also provides new insight into the transformation of urban-fringe landscapes with possible irrigated agriculture in those broad ecological and cultural contexts.

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## 1. Introduction

Phytoliths - minute silicate bodies from the cellular environments of plants are known to scientists since the middle of the nineteenth century (Piperno, 2006). Phytolith analyses had a wide range of applications in fields e.g., archaeology and palaeoecology, mostly in Europe, USA, East, West and Southeast Asia after 1970s (Bryant, 2003; Pearsall, 2010). Research questions relevant to the origins and intensification of agriculture (Pearsall, 1978, 1982; Fijiwara, 1993; Kealhofer and Piperno, 1994; Chen and Jiang, 1997; Zhao and Pearsall, 2000; Davey et al., 2007; Piperno et al., 2008; Piperno and Stothert, 2003; Zhijun, 1998), reconstruction of past environment e.g., vegetation, climate, landscape (Rovner, 1971; Lewis, 1981; Piperno, 1993a,b; Donohue and Dinan, 1993; Fredlund, 1993; Dinan, 1993; Madella, 1997; Kealhofer and Penny, 1998; Runge, 1999; Barboni et al., 1999; Carter and Lian, 2000; Clarkson and Wallis, 2003), irrigation (Rosen and Weiner, 1994;

Rosen, 1999) and food habits (Renfrew, 1973; Middleton and Rovner, 1994) have widely been addressed using phytolith proxy evidence.

In South Asia too, phytolith records describe the late Quaternary vegetation and climate changes and anthropogenic impact on environment (Risberg et al., 2002; Saxena et al., 2002; Premathilake and Epitawatta, 2001; Kajale et al., 1997; Kajale and Eksambekar, 2001, 2007; Madella, 2003; Premathilake and Risberg, 2003; Premathilake, 2003, 2006, 2012; Weiskopf, 2005; Weiskopf et al., 2015a, 2015b; Singh et al., 2007; Prasad et al., 2007; Fuller and Madella, 2009; Premathilake and Gunatilaka, 2013; Ghosh et al., 2014; Premathilake and Seneviratne, 2015; Noguè et al., 2015). These works show that phytolith investigations in Southern Asia and particularly in the red soils of were very relevant given the poor preservation of organic walled microfossils (e.g., pollen), due to highly ferruginous materials and oxidizing conditions prevailing (Lewis, 1981; Runge, 1999; Piperno, 2006). However, phytolith analyses have so far not been used in understanding the context of material cultures and symbols largely accumulated in megalithic burials preserved in the areas dominated by red soils (Rajan and Yatheeskumar, 2014).

The transition from Iron Age to Early Historic is of great significance in Southern Asian archaeology and history (Possehl and Gullapalli, 1999; Gullapalli, 2009; Deraniyagala, 1992; Coningham et al., 1996; Deraniyagala and Abeyratne, 1997; Coningham, 2006; Rajan, 2012,

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2014; Rajan et al., 2007, 2009, Park and Shinde, 2013; Rajan and Yatheeskumar, 2014; Allchin, 1995; Ganesh, 2014). The conventional image of Iron Age societies of Southern Asia is linked with circulations of iron metallurgy, agro-pastoral activities, distribution of black-and-red ware, cereal cultivation, rituals, cattle breeding, horse riding and sepulchral monuments, popularly called megalithic monuments (Leshnik, 1974; Narasimhaiah, 1980; Srinivasan and Banarjee, 1953; Sundara, 1975; Moorti, 1994; Rajan, 1997; Basa et al., 2015). However, the evidences embedded in epigraphic, numismatic, literary and archaeological finds such as inscribed coins, punch marked coins, beads, terracotta objects, metal objects, pots engraved with graffiti marks, cave inscriptions engraved with Prakrit-Brahmi and Tamil-Brahmi scripts, large number of brick structures, russet coated ware, polished red ware, polished black ware, black-and-red ware, rouletted ware, pottery of north Indian origin like Northern Black Polished ware, amphora, terra sigillata and glass of Roman origin, Turquoise Glazed pottery and Torpedo jar sherds of West Asian origin suggest that formation of new social order appears to have emerged towards the Early Historic (Deraniyagala, 1992; Krishnamurthy, 1997; Shanmugam, 2003; Begley, 2004; Rajan and Yatheeskumar, 2007; Rajan and Yatheeskumar, 2007; Rajan and Yatheeskumar, 2013; Falk, 2014; Subbarayalu, 2008, 2014; Gurukkal, 2012; Gilliland et al., 2013; Rajan and Yatheeskumar, 2014).

To some extent, radiocarbon dating on macro botanical remains, burial architecture and analysis of material culture from more than 50 Iron Age and Early Historic megalithic monuments have provided a synthesis for understanding the transformation in subsistence pattern, technology, trade exchange network, social organization, religious beliefs and practices, polity and legacy (e.g. Deraniyagala, 1992; Morrison et al., 2012; Rajan and Yatheeskumar, 2014). However, this complex issue has not yet been understood in the detailed archaeological context using adequate methodological constrains. In this regard, understanding changes in cultural chronologies, subsistence patterns, symbols and material diversities largely accumulated in southern Asian burials is crucial (Beauclair et al., 2009). For this purpose, systematic investigations on a wide range of data sets from every burial site, and its associated habitation mounds are required (Shetty, 2003; Satyamurthy, 1992, 2007; Subbarayalu, 1985, 1992; Park and Shinde, 2013; Rajan and Yatheeskumar, 2014). The aim of this paper is to provide one such powerful collateral evidence, using phytolith analysis of sediment samples associated with the cultural assemblages from the Porunthal, megalithic burial context for understanding the relationship between megalith people, landscape and the use of plant materials for rituals at the time of burials were constructed.

## 2. Study site

### 2.1. Modern environment

The study site, Porunthal (77° 28' 38" E; 10° 22' 58" N and ~300 m asl) lying between the semi-arid zone of mid-Amaravathi river valley and the hilly tracts of Western Ghats, is situated on the bank of the river Porunthalaru, about 12 km southwest of Palani in Dindugal district, Tamil Nadu (Fig. 1). The river Porunthalaru joins with Amaravathi (ancient An-porunai) near Dharapuram town in Erode district. The geology of the study area is characterized by pre-Cambrian basements and relatively younger alluvial sediments. Crystalline rocks dominate while some other rocks e.g., syenites and carbonatites and ultramafic bodies occur (Subramanian and Selvan, 2001). Red sandy soil, high in iron content, is the most dominant type as a result of weathering of metamorphic and igneous rocks. Mixed red and black soil type is found here, which varies from being clay, sand, cobbles and gravels with moderate areas of loam soil. In general, soil depth is shallow and somewhat rich by the wash from the uplands. Organic carbon content is around 2–5% (Bhattacharyya et al., 2006). C<sub>4</sub> species dominated grassland and savanna like vegetation composed of

*Chrysopogon orientalis*, *C. zeylanicus* and *Terminalia* spp occur in the modern landscape. Species of dry deciduous forest e.g., *Hardwickia binata* and dry evergreen forest e.g., *Diospyros ebenum* are associated with the grasses. Species from arable lands e.g., *Senna auriculata* occur commonly. Apart from this flora, few other species e.g., *Terminalia arjuna* and *Lannea coromandelica* (Odiyamaram) are also reported (Matthew, 1999). Faunal community including elephants was relatively rich and included carnivores too e.g., *Panthera* sp. and *Canis aureus* especially in the dense forests located near the Palani Hills. Extremely dry climate conditions predominate from April to June, and mean annual rainfall is about 600 mm from the southwest monsoon (Baliga, 1966; Sampathkumar, 1991).

### 2.1.1. Palaeoenvironment

OSL dating from red sandy soil at the foothills of Western Ghats shows a break in deposition ca. 4000 BCE, most possibly due to the declining of south west monsoon rains (Alappat et al., 2013; Premathilake, 2003; Premathilake and Risberg, 2003; Premathilake and Gunatilaka, 2013). Premathilake and Seneviratne (2015) suggested that step-wise strengthening of monsoon rains in the southern Asia was re-established after the middle Holocene aridity by 1400 BCE which may have supported the establishment of alluvial conditions and the expansion of semi-dry evergreen forest elements e.g. *Diospyros* sp., Combretaceae and Euphorbiaceae, together with Panicoid and Chloridoid grass species (Veena et al., 2013). Aggradation processes appear to have optimized when monsoon rains in the area strengthened since the first century CE (Alappat et al., 2013).

### 2.2. History and archaeology

Porunthal lies on the left bank of the river Porunthil-aru, a tributary of Amaravathi, at the foothills of the Western Ghats about 12 km southwest of Palani, the taluk head quarters. This village lies close to the major trade routes connecting Madurai, the capital of Pandiya empire, on the south and Vanji, the Chera capital on the west. The inscriptions engraved on the Cholesvara temple at Kolumam issued during the 21st regnal year of Vira-choladeva (1189 CE) refer to this highway as *Ceranaimenkonda-cholan-peruvali*. Several Jain beds with Tamil-Brahmi inscriptions and medieval trade guild inscriptions issued by the celebrated trade guilds like *Ainurruvar/Tisai-ayirattu-ainurruvar* were reported on this route. The famous Roman coin hoard site Kalayamuttur lies on the Porunthil-aru river bank 6 km north of Porunthal village. Historically, Porunthal was part of the territorial division known as Vaikavur nadu, named after the main village Vaikavur or Aviyur). The archaeological explorations conducted in Amaravathi river valley provided considerable data in the form of Iron Age and Early Historic megalithic monuments, habitation mounds, memorial stones, trade guild inscriptions, oil-mill inscriptions and temples which substantially supplemented the existing knowledge (Rajan and Yatheeskumar, 2014).

## 3. Materials and methods

### 3.1. Fieldwork

#### 3.1.1. Habitation cuttings

Three trenches (A1, B1 and XN7) were laid in the 5.5 ha habitation mound as described in detail by Rajan and Yatheeskumar (2014). They yielded important evidences of glass working furnace. Out of 2441 antiquities recovered from the limited area of digging, nearly 2275 were of glass beads. Other important antiquities were human terracotta figurine, terracotta humped bull, a terracotta female head, ivory dice, gold pendant, copper coin and beads made of glass, paste, quartz, shell, garnet and terracotta. Sediment samples for various analyses to understand the physical environment of such a rich cultural context were collected in all trenches and a preliminary study of pollen and phytoliths from trench XN7 is reported elsewhere (Anupama et al., 2014).

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