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Quaternary International xxx (2016) 1–14

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Taphonomic approach to the palynological record of burnt and unburnt samples from El Mirador Cave (Sierra de Atapuerca, Burgos, Spain)

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Fumier
Sedimentary facies
Pollen analysis
NPP
Taphonomy
Burning

ABSTRACT

An analysis of twelve samples from Bronze Age level MIR4 (3040 ± 40–3400 ± 40 BP), burnt to different degrees, has allowed to characterised the palynological content of the sedimentary facies generated by burning practices. The pollen and Non-Pollen Palynomorphs (NPP) remains have contributed to our understanding of the diagenetic factors that accompanied the accumulation dynamics. The taphonomic analysis has led to the detection of biases in the palynological record associated to diagenetic processes, mainly relating to burning activities, which would also have caused the variability in the NPPs. This alternative approach to archaeological samples has revealed the heterogenic nature of the taphonomic modifications found in samples with apparently the same origin.

1. Introduction

Human occupation has played a decisive role in shaping the present landscape. The palynological analysis of archaeological deposits gives us a clear opportunity to determine the effects of anthropic activities on the environment. Human influence has altered the composition of plant communities through deforestation, the use of fire, and livestock and agricultural practices. The application of pollen analysis to human contexts, which began over a half century ago, has certainly contributed to both archaeological and palaeoecological studies (Iversen, 1941; Faegri, 1944; Behre, 1981, 1986; Birks et al., 1988; Edwards and Macdonald, 1991; López-Sáez et al., 2014).

In archaeological deposits, alteration of the pollen spectra is usual. There is differential conservation of pollen grains due to oxidation, biological agents such bacteria or fungi, and mechanical processes like vertical transport (Bryant et al., 1994; Bryant and Holloway, 1996). Sensitivity to oxidation varies from one taxon to another and could be directly related to the exine structure (Lebreton et al., 2010). Processes such as burning, recycling, and bioturbation can relocate material within archaeological deposits and soils, significantly altering the pollen record (Edwards et al., 2015). Several taphonomic studies have explored the representativeness and reliability of palynomorph assemblages from caves (Weinstein-Evron, 1981; Coles et al., 1989; Diot, 1991; Weinstein-Evron, 1994; Genty et al., 2001; Simpson and Hunt, 2009).

The identification and quantification of Non-Pollen Palynomorphs (NPP), including microalgae, fungi, insects and the chitinous remains of arachnids, as well as plant debris and other organic palynomorphs of undetermined origin, can help characterise the original strata as well as the local environmental features that influenced deposit formation processes. Although the primary analyses were carried out on natural sequences from European palaeolakes and peat-bogs (Kuhry, 1985; van Smeerdijk, 1989; Ralska-Jasiewiczowa and van Geel, 1992; Carrión and Navarro, 2002), in recent decades they have emerged in archaeological contexts as a source of additional information on the local environment, the formation of deposits, and the intensity of anthropogenic activities (van Geel et al., 1989; López Sáez et al., 1998, 2000; van Geel et al., 2003; Zong et al., 2007; López-Sáez and Lopez-Merino, 2007; Cugny et al., 2010; Gauthier et al., 2010; McAndrews and Turton, 2010). The most commonly identified NPPs are fungal spores (van Geel, 1978, 2006). These fossilise at, or near, the place where sporulation took place (van Geel, 2001; van

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http://dx.doi.org/10.1016/j.quaint.2016.01.051
1040-6182/

Please cite this article in press as: Expósito, I., Burjachs, F., Taphonomic approach to the palynological record of burnt and unburnt samples from El Mirador Cave (Sierra de Atapuerca, Burgos, Spain), Quaternary International (2016), http://dx.doi.org/10.1016/j.quaint.2016.01.051

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Geel and Aptroot, 2006). The significant groups of fossil fungi analysed include saprophytes (found on decaying organic material, sometimes in combination with certain host plants or their remains), carbonicolous taxa, linked with burnt horizons, and coprophilous species (seen on herbivore dung).

This work focuses on the palynological analysis of twelve samples from the MIR4 layer from El Mirador Cave (Sierra de Atapuerca, Burgos). This archaeological deposit mainly originated from the *in situ* burning of animal and vegetal material, which has resulted in a typical *fumier* (Bergadà, 1997; Badal, 1999). This kind of infill is rich in archaeobotanical material because it comes from the repeated burning of waste generated after these caves had been used as a cattle fold (Brochier et al., 1992; Canti, 1999; Vergès et al., 2008). This phenomenon was common during the Neolithic and Bronze Age in Europe (Charles, 1998; Badal, 1999) and has been identified at many sites, such as Arene Candide in Italy (Maggi, 1997), Caune de Belesta in France (Brochier et al., 1998), Cova de les Cendres (Badal, 1999), Los Husos (Alday-Ruiz et al., 2003), and El Mirón (Peña-Chocarro et al., 2005) on the Iberian Peninsula.

The stratigraphic succession at El Mirador Cave has a high lateral and vertical variability due to the combined action of accumulation, weathering, alteration by thermal action, and human intervention (Vergès et al., 2002; Angelucci et al., 2009). The El Mirador Cave infill is very well preserved and there has been little impact by erosive processes. The good stratigraphic resolution is complemented by outstanding and coherent dating, which is essential for studying archaeological deposits (Hunt et al., 2015).

2. The studied area

El Mirador Cave is located about 1033 m a.s.l. at 42°20′58″ N and 03°30′33″ W, on the southern slope of the Sierra de

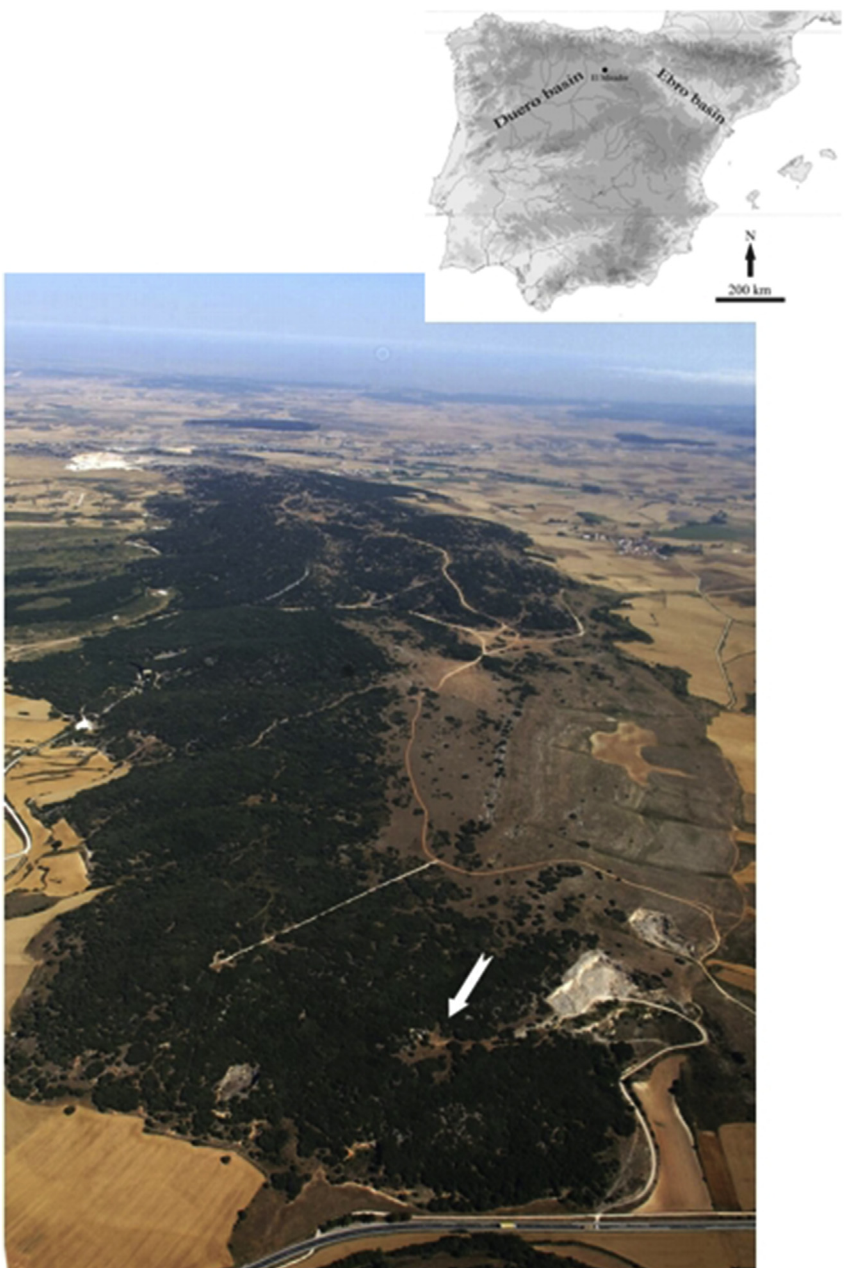

Fig. 1. Location of El Mirador Cave. The arrow in the picture shows the location of El Mirador Cave with respect to the Sierra de Atapuerca.

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