Pollen assemblage differences of northern and central Greece grasslands: some notes on grazing

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Abstract

Vegetation and pollen trap data, obtained from 'open' areas and subalpine grasslands of Mts Pieria (north-central Greece) and Mt Tymfristos (central Greece), are compared. The highest achievable pollen taxonomic resolution is implemented in both pollen and vegetation taxa. Signs of previous intense human impact are still evident in both areas as indicated by the presence of various ruderal species. A number of local pollen taxa e.g. *Daphne*, *Marrubium*, *Astragalus*, *Scleranthus*, *Eryngium*, *Herniaria*, *Centaurea jakea* differentiate the pollen assemblages of Tymfristos traps from those of Pieria. The different dominant forest vegetation of the two sites diversifies further the pollen assemblages of their traps. Indicators of local (around the traps) grazing e.g. *Ranunculus acris*- type *Crepis*-type, *Cirsium*/*Carduus*, Rubiaceae, are recorded in all traps. Other pollen types like *Plantago lanceolata*- type, *Artemisia*, *Rumex acetosa*, *Urtica*, Chenopodiaceae indicate human activity (forest clearings/human settlements and grazing) in a regional scale.

Key words: pollen, vegetation, Tymfristos, Pieria, grazing

Introduction

The Pollen Monitoring Programme (PMP) aims at 'monitoring pollen deposition across vegetation from closed forest to open situations as a basis for interpreting fossil pollen spectra' (http://www.pollentrapping.net/). Pollen trap transects in that respect have been established in Mts Pieria (7 traps, P1-P7) in north-central Greece and Mt Tymfristos (5 traps, TIM1-TIM5) in central Greece. Several of the traps are located near and above the forest limits, in the subalpine grasslands (P1, P2, TIM1, TIM2 and TIM3) as well as in openings in forested areas (P4 and P5).

The vegetation of both sites has been subjected to human impact and especially grazing pressure which is taking place in the subalpine grasslands and forest openings. In 2008 vegetation data were collected around the traps in both Pieria and Tymfristos.

In this study an attempt is made to compare the pollen assemblages of traps situated in 'open' areas of both sites and trace the influence of local

vegetation as well as of grazing on the pollen assemblages of the different traps.

Materials and Methods

Pollen data in this study cover the period 2005-2009 in Mts Pieria (P1, P2, P4 and P5) and 2006-2010 in Mt Tymfristos (TIM1, TIM2 and TIM3) respectively. TIM2 (06-09) and P2 (06-09) are the only traps with four consecutive years of pollen data collection during the period 2006-2009. For all other traps missing years of collection were replaced by data of years 2005 (P1, P4, P5) or 2010 (TIM1, TIM3). Moreover, trap P4 has a 3-year data collection covering the period 2005-2007. Standard pollen preparation and counting procedures were followed for all traps (Hicks et al. 1996). The program TILIA and TCView 2.0.2 (Grimm 2004) was used for calculating pollen percentage (PP) values and preparing the pollen percentage diagram. The unconstrained clustering of traps was based on square root transformation (SRT) of PP values of all pollen taxa with values> 1% resulted in the zonation of the pollen diagram.

A total of 25 square plots, 24 around each trap and one including the trap, with a side of 0.5 m, were used to score plant cover. Sampling plots were located on concentric rings of 3, 6 and 9 m distance from the trap and covered the four main aspects (N, E, S, W) and their midpoints (NE, SE, SW, NW). DCA was performed on SRT percentage values in vegetation and pollen data of both sites using the CANOCO PC program, ver. 4.5 (ter Braak and Šmilauer 2002).

Pollen taxonomic resolution was facilitated by reference material, published keys and photos (Reille 1992, 1995, Chester and Raine 2001, Beug 2004). Plant identification is adjusted to the highest achievable pollen taxonomic resolution for the majority of taxa participating in the analysis. Plants were identified using Flora Hellenica (Strid and Tan 1997, 2002), Mountain Flora of Greece (Strid 1986, Strid and Tan 1991) and Flora Europaea (Tutin et al. 1968–1980, 1993).

Results- Discussion

Vegetation- pollen relationship

'Open' areas and subalpine grasslands of Mts Pieria are well separated from the subalpine grasslands of Mt Tymfristos for both vegetation and pollen data (Figure 1). Vegetation data show larger variability in relation to pollen data while trap P1 is clearly separated from the other traps in terms of surrounding vegetation.

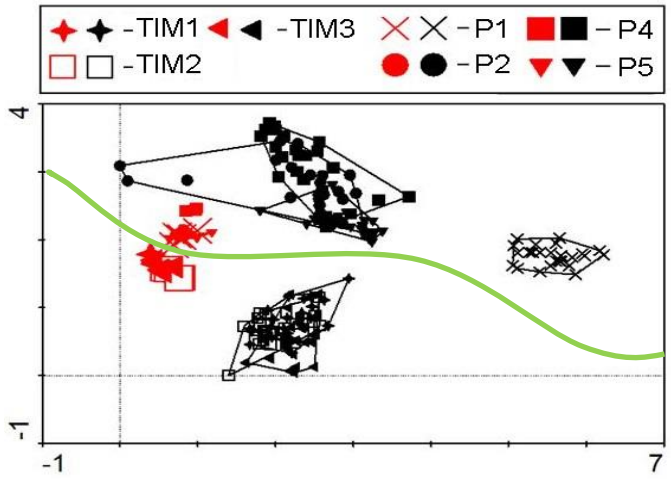

Figure 1. DCA of pollen and vegetation data of the seven traps. Black signs for pollen values, red signs for vegetation data. Taxa included in the analysis comply with the achievable pollen taxonomic resolution.

Arboreal and herbaceous pollen representation

The western flank of Mts Pieria, where the pollen traps are located, is dominated by forests of *Pinus nigra* and *P. sylvestris* while in Mt Tymfristos *Abies cephalonica* and *A. borisii-regis* are the dominant forest species. This is clearly seen in the pollen diagram where the corresponding pollen types dominate in the pollen assemblages (Figure 2). Shrubs of *Juniperus* spp. are found mainly on the subalpine grasslands, thus justifying the relatively larger values in the corresponding pollen traps (P1, P2, TIM1, TIM2 and TIM3).

Herbaceous pollen flora of the subalpine grasslands of Mt Tymfristos is more diverse than that of the subalpine and 'open' areas of Mts Pieria. Local, within the sampled vegetation, or extra-local found pollen taxa e.g. *Daphne*, *Marrubium*, *Astragalus*, *Scleranthus*, *Eryngium*, *Herniaria*, *Centaurea jacea* type, as well as regional pollen taxa e.g. *Spartium* differentiate the pollen assemblages of Mt Tymfristos pollen traps from those of Mts Pieria (Figure 2). A few pollen taxa are distinctive of the local (e.g. *Genista, Cuscuta, Bruckenthalia*) or regional (*Epilobium*) vegetation of the Pieria traps. Human impact, though not intense as in the past, is still manifested in both sites mainly as grazing pressure. Pollen taxa e.g. *Ranunculus acris*- type *Crepis*-type, *Cirsium*/*Carduus*, Rubiaceae, indicate grazing around the traps (Figure 2). The above mentioned pollen taxa together with *Stellaria* were considered indicators of local grazing pressure for sites with crystalline bedrock (Mazier et al. 2006). Mts Pieria have

similar bedrock and this combination of grazing indicators is clearly present in traps P4 and P5.

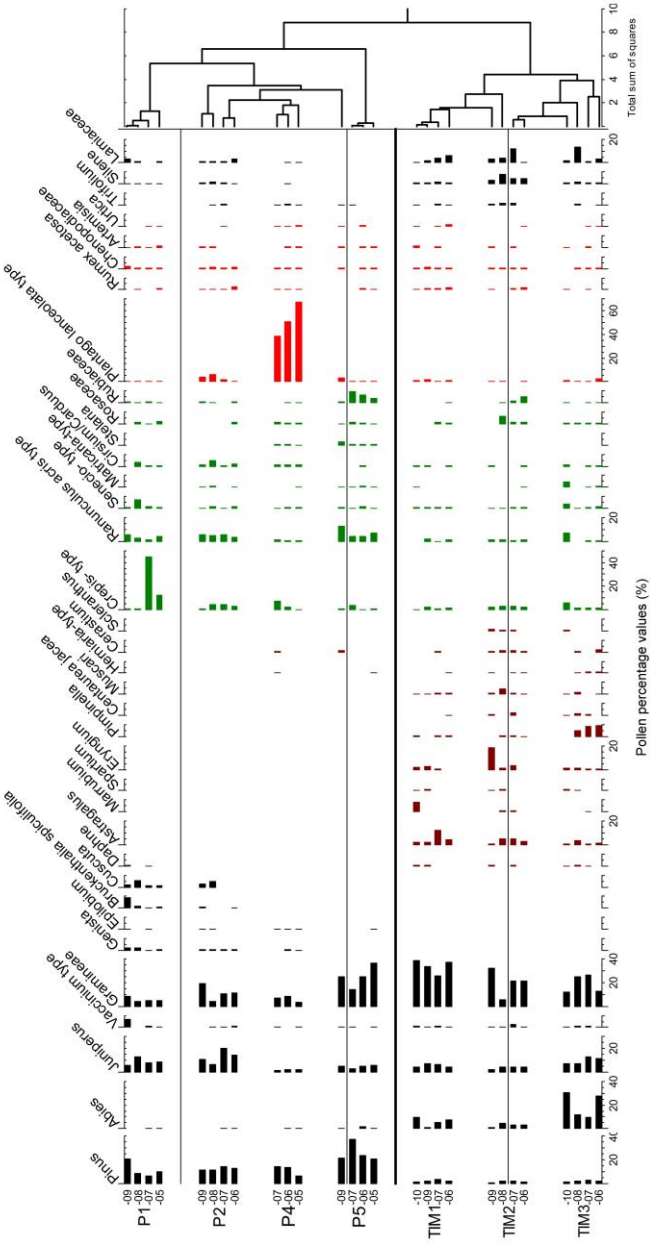

Figure 2. Pollen percentage diagram of certain pollen types recorded in Mts Pieria and Mt Tymfristos pollen traps.

Pollen taxa like *Plantago lanceolata*- type, *Artemisia*, *Rumex acetosa*, *Urtica*, *Chenopodiaceae*, indicate human impact which implies forest clearings, human settlements and/or grazing in a regional scale (Mazier et al. 2006). The local presence of *Plantago* around trap P4 is responsible for the corresponding high PP values of this taxon in the latter trap.

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