



Integrating palaeo- and archaeobotanical data for a synthesis of the Italian fossil record of *Lycopus* (Lamiaceae, Mentheae)

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Abstract

Lycopus is a widespread herbaceous plant, currently part of European flora. Fossil remains of fruits (nutlets or mericarps) attributed to this genus are frequently found in European archaeological and palaeontological sites, being easily preserved in sedimentary deposits. In a worldwide context, the oldest fossils are from the early Oligocene (ca. 30 Ma) of West Siberia, but they become more common in Miocene (23.0–5.3 Ma) records, ranging from West Siberia to Central Europe. In the literature, the Oligocene and Miocene remains (plus a few Pliocene ones) were assigned to fossil-species, whereas the abundant Pliocene and Pleistocene occurrences (5–0.01 Ma) in Europe were mainly assigned to the extant species *L. europaeus*. The present work is conceived as the result of an *ad hoc* research team whose task was to revise and summarize the Italian fossil record of *Lycopus*, assembling palaeobotanical and archaeobotanical data. We herein report ca. 6000 *Lycopus* nutlets from 61 sites located in nine regions of Northern and Central Italy. Based on the available information on extant species, we detected nine morphological types of nutlets that can be used for the characterisation of fossils. Our analysis suggests that from 4 to 2.6 Ma a single taxon (*L. cf. pliocenicus*) with *L. americanus*-type of nutlets occurred in Italy. The first occurrence of the latter morphological type is from the early Oligocene of West Siberia. The available fossils mildly suggest that extant *L. americanus* could be the descendant of ancient Eurasian plants characterised by the *L. americanus*-type of nutlets, through