Reconstructing environments of medicinal plants of the ancient Mediterranean

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Introduction:

The ancient Greek physician, Dioscorides, catalogues thousands of medicinal plants from across the Mediterranean in his *De materia medica* and identifies the regional sources of the most potent varieties. This study investigates the paleoenvironmental conditions of several regions identified by Dioscorides and other contemporary authors like Pliny the Elder, as particularly notable for their cultivation of iris (*Iris* ger.) and saffron (*Crocus* sat.) in the 1st century AD. The analysis focuses on the paleoenvironments of iris in the Roman Regions of Smooth Cilicia (in SE Turkey) and Illyria (in modern Croatia) and saffron at sites in Rough Cilicia (in SE Turkey) and Lycia (in S Central Turkey) (see map here Map of Iris and Saffron Growing Regions). A comprehensive list of regions noted by Dioscorides for iris production includes Pamphylia, Illyria, Macedonia, and Libya. Pliny the Elder affirms these locations and adds Lucas, Elis, Mysia, and Cilicia. Dioscorides also identifies Mount Corycus, Mount Olympus of Lycia, and Mount Aigai with high quality saffron, which Pliny the Elder concurs with, while the authors differ in their assessments of Sicilian saffron. By surveying ancient texts, archeological, geological, palaeobotanical, and hydrological studies I seek to understand if environmental similarities existed between these regional pairings during the 1st century AD. Secondarily, this study assesses whether those variables contributed to increased concentrations of desirable medicinal and aromatic bioactive compounds.

Methods:

Specific species of iris and saffron addressed by this study include *Iris germanica, I. pallida, I. florentina* and *Crocus sativus* as these species are directly associated with medicinal properties and the writings of Dioscorides and Pliny the Elder. I used archaeological site reports and historical sources to identify specific locations and geographic boundaries noted by Dioscorides. These sources provided a dateable stratigraphic sequence through which to interpret later findings. This core of textual and archaeological data framed further geological, palaeobotanical, and hydrological studies that contributed to each paleoenvironmental reconstruction. Ancient and modern soil salinity studies, sediment cores, palynological data, and geomorphological maps contributed to a more granular understanding of present environmental conditions as well as those of the 1st century AD.

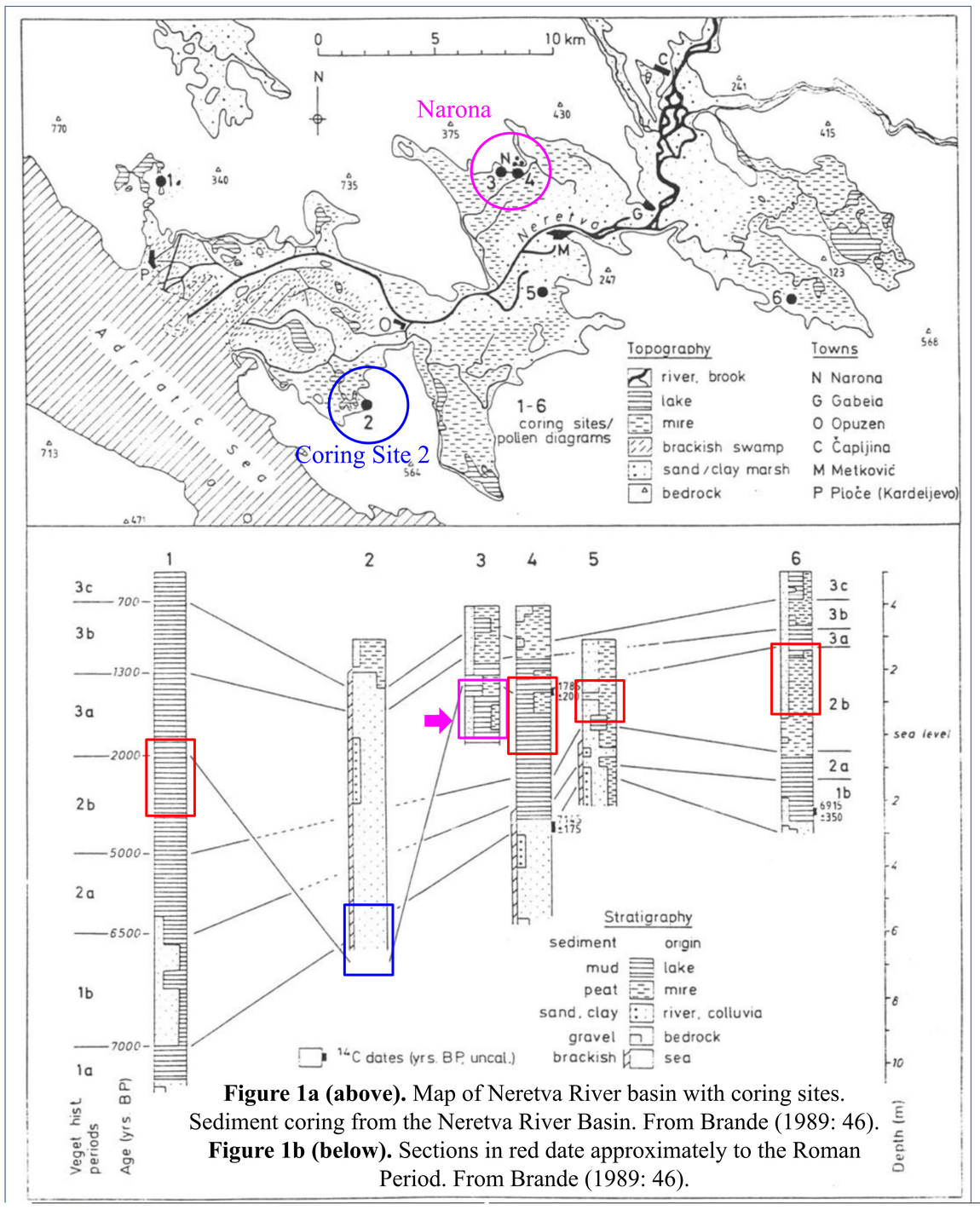

Figure 1a (above). Map of Neretva River basin with coring sites. Sediment coring from the Neretva River Basin. From Brande (1989: 46).
Figure 1b (below). Sections in red date approximately to the Roman Period. From Brande (1989: 46).

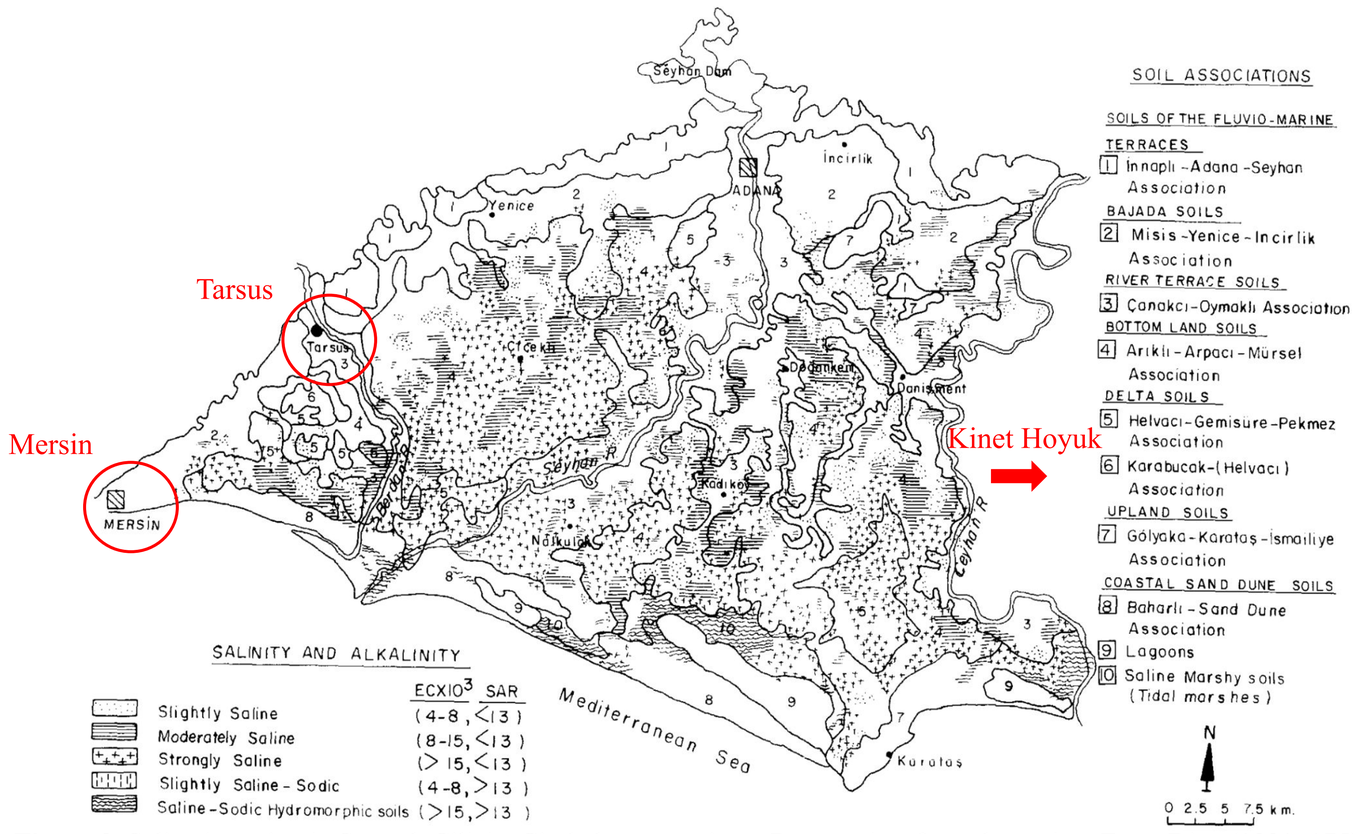

Figure 2. Saline intrusion in Smooth Cilicia. Circled are prominent Roman sites from the region. From Dinc (1991: 175).

Results/Discussion:

Table 1. Paleoenvironmental conditions of iris-producing and saffron-producing regions

Environmental Conditions	Illyria	Smooth Cilicia	Lycia	Rough Cilicia
Soil Characteristics	Soil saline intrusion, salt wedge, sandy and calcareous soils, well-drained	Soil saline intrusion, sandy and calcareous soils, well-drained	Calcareous, rocky, friable soil	Calcareous, rocky, friable soil
Elevation and UV Exposure	0-58m, 1400-1600 kWh/m2	0-100m, 1400-1800 kWh/m2	1,000-2,366m, 1700-1900 kWh/m2	1,500-3000+m, 1800-1950 kWh/m2
Average Annual Temperature and Rainfall	15.6°C, 1350mm	13.8-25.3°C, Mean of 19.1°C, 700-1000mm	18.9°C, 12.9°C, 461.3mm, 961.4mm, >1000mm (temp. and rain averages variable)	Comparable to Smooth Cilicia, though more variable
Geomorphology	Alluvial plain, karst, limestone mountains, colluvial sediments	Alluvial plain, karst, limestone mountains, colluvial sediments	Karst formations and limestone mountains, colluvial sediments	Karst formations and limestone mountains, colluvial sediments

Information from Beach and Luzzadder-Beach (2008), Brande (1989), Ozturk et al (2018), and https://globalsolaratlas.info/map

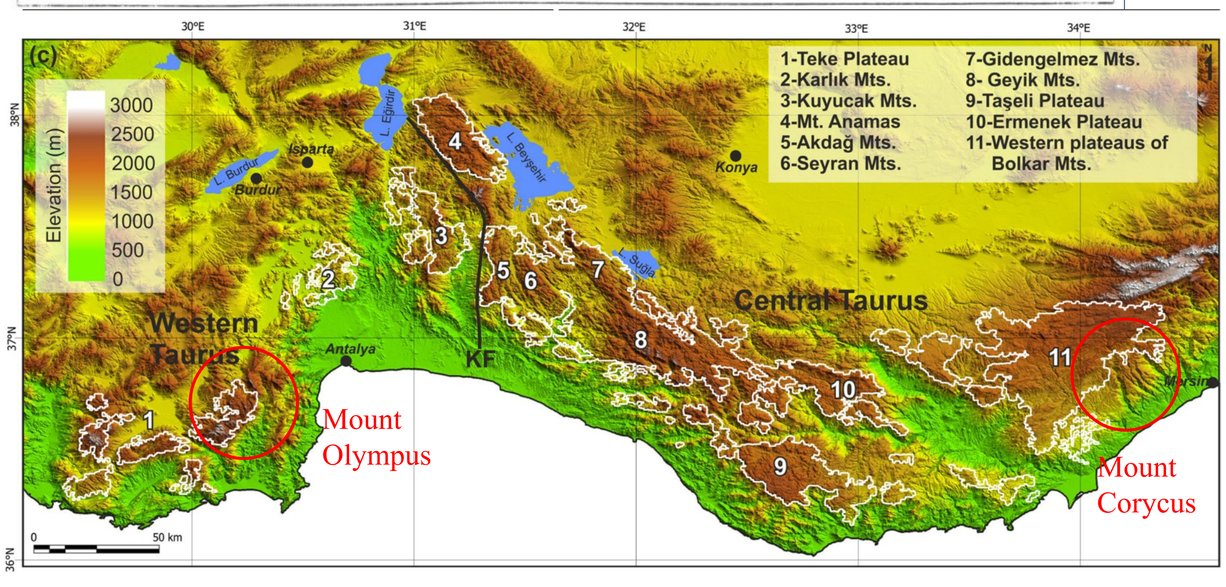

Figure 3. Elevation map of Lycia and Rough Cilicia. From Ozturk (2018: 536).

Conclusion:

The survey of 1st c. A.D. paleoenvironments indicate similarities within each group: Environments of iris growth were characterized by salinity and karstic, calcareous soils. Saffron environments exhibited traits of high altitude, direct sun exposure, and karstic, calcareous soils. Respectively, their traits also appear to correlate with the favorable plant niches of iris and saffron for the production of medicinally and aromatically desirable bioactive compounds. The environmental conditions present in Illyria and Smooth Cilicia, notably salinity, would likely increase concentrations of flavonoids in iris plants, while variables such as altitude and sun exposure present in Lycia and Rough Cilicia would likely heighten levels of crocin, safranal, and picrocrocin in saffron (Lage and Cantrell, 2009, p. 372; Zhao et al, 2021, p. 3-4). This study demonstrates that local environments described by Dioscorides and Pliny the Elder may have contributed to increased concentrations of bioactive medicinal and aromatic compounds in both iris and saffron.

Acknowledgments and Works Cited:

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