

The origin of date palm (*Phoenix dactylifera* L.) – methods to distinguish between putatively wild and domesticated populations

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Introduction

Date palm (*Phoenix dactylifera* L., Arecaceae) is a widely recognised keystone species of arid and semi-arid ecosystems across North Africa, Cape Horn, the Middle East, and the Indus Valley. According to FAO, date palm accounts for roughly 1% of the global fruit production and is therefore an important agricultural commodity. It belongs to the few perennial and intensively domesticated species, whose wild relative(s) and putative centre(s) of domestication are not yet recognised. Hence, date palm's domestication process is considered one of the most difficult issues in agrobiodiversity contexts, but the search for its wild relative(s) has gained momentum in recent years. It is driven by (i) the need to increase the genetic pool necessary for selection and adaptive management to mitigate climate change and (ii) scientific interest in the likely complex evolutionary process of this species.

Materials & Methods

In this study we review current trends in date palm research, look at varietal diversity per country (based on Vavilov's centre of origin theory), consider climatic conditions between 130.000 BCE and today by applying species niche modelling (with coordinates of putatively wild accessions of date palm - own and literature), and use archaeobotanical (such as pyhtoliths and pollen) as well archaeological (such as cave paintings and reliefs) records to unravel date palm's evolutionary process. We integrate data obtained from studies of other domesticated plants and propose approaches that allow to better predict putative regions of wild date palm.

Results

Number of date palm varieties per region/area is very different with the highest concentration of varieties in Middle East and northwest African regions (Fig. 1). Species niche modelling reveals three centres of date palm origin across all available climatic periods that are: Morocco, the Levant, and Persian Gulf coastal regions (Fig. 2).

Conclusions

Despite many methods used and studies known, potential centres of date palm origin remain unidentified. By using a new approach that integrates several presented here methods we tentatively identified likely regions of putatively wild accessions supporting the theory of three domestication centres. It indicates the necessity to reconsider regions with low accessibility such as the Arabia Deserta. Furthermore, the study underlines the need for a more structured and collaborative research program and offers potential approach to study other domesticated species of interest.

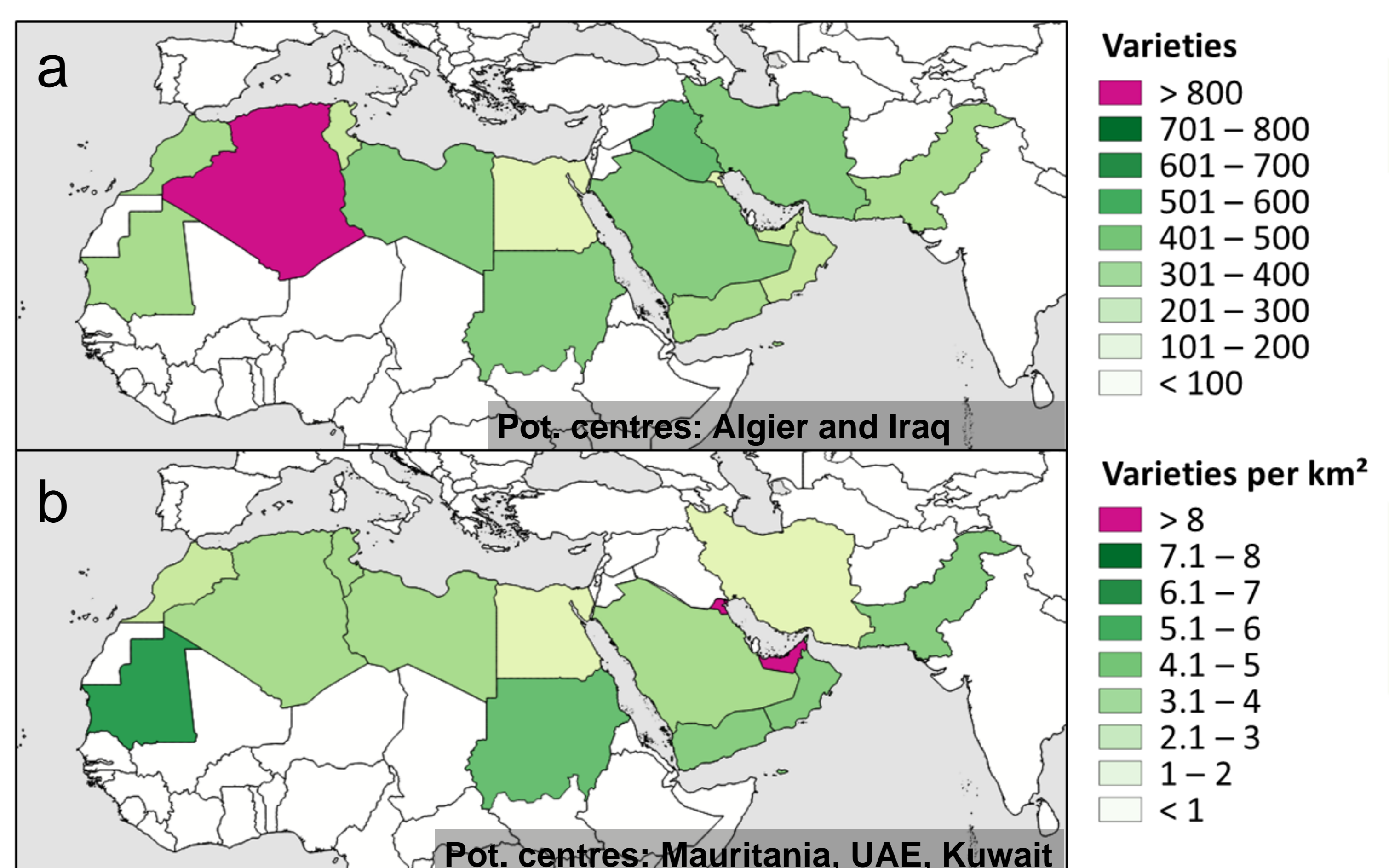


Fig. 1: Varietal richness based on a number of cultivated varieties per country (a) and per cultivation area (b)

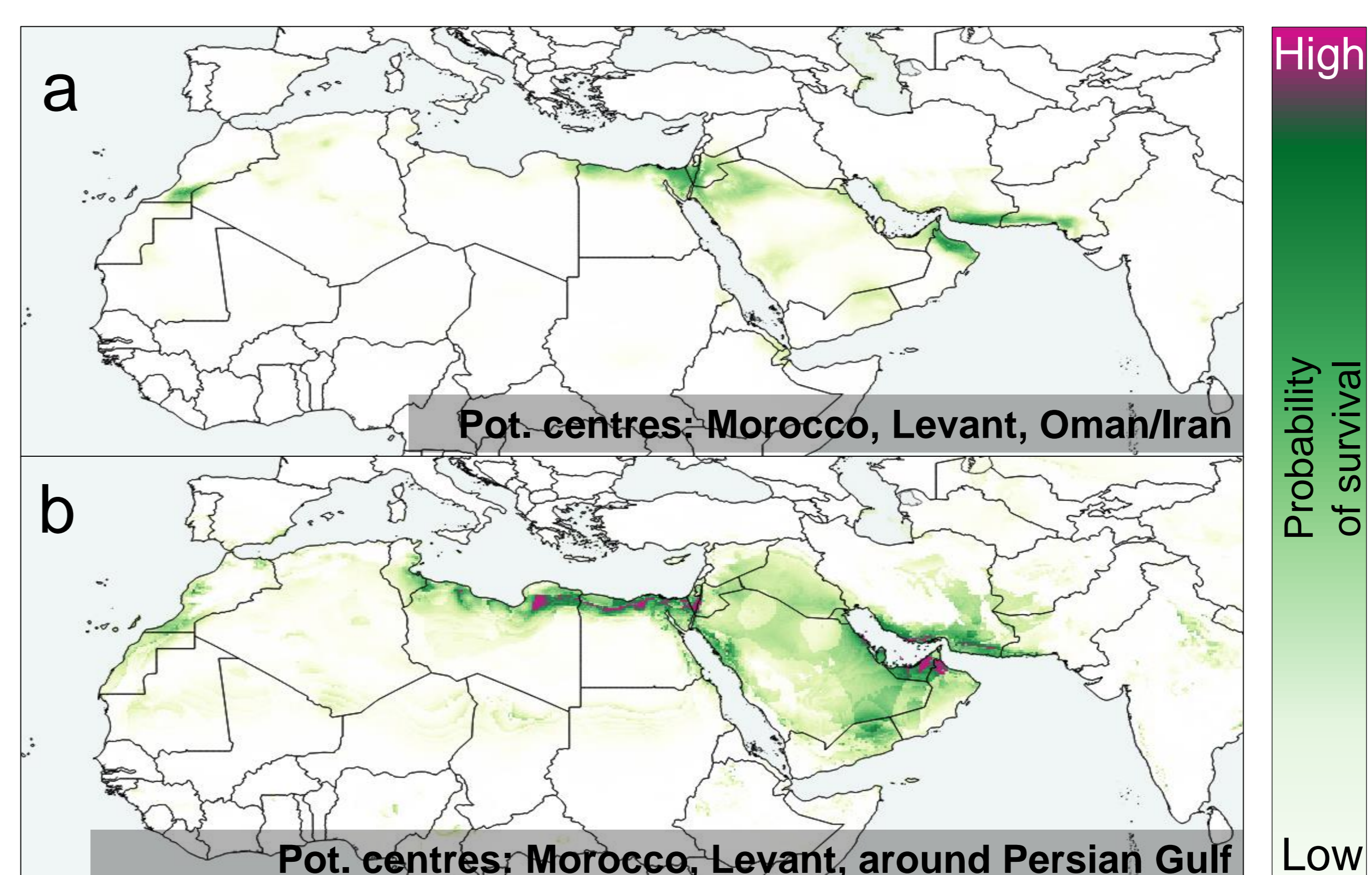


Fig. 2: Species niche modelling based on coordinates of potentially wild date palm accessions for the Last Interglacial Maximum (~130.000 BCE) (a) and today (1970-2000) (b)