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Geographical, cartographic aspect and the location of *Malva subovata* (DC.) Molero & J.M. Monts. (Malvales Malvaceae) in the North West of Algeria

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ABSTRACT *Malva subovata* (DC.) Molero & J.M. Monts. (= *Lavatera maritima*) (Malvales Malvaceae) is considered a plant resistant to ecological stress and also to human action. The objectives of the present study were to characterize the biogeography and localization of *M. subovata*. The maps which have been drawn up show us the different formations inventoried and which are dominated by lawns with perennial and annual species and which are due to the degradation of the tree formations. The map we produced shows that our species is located in six large regions and it allowed us to have a global idea of its current distribution.

KEY WORDS Malvaceae; *Malva subovata*; biogeography; localization.

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INTRODUCTION

The cartographic representations of the vegetation cover are essential working documents for many studies. Vegetation mapping is used in various fields, helps in planning non-agricultural land use, contains information that can assist in planning and protection forecasts, etc. provides an inventory and representation of existing, natural and artificial vegetation. It allows to determine the evolution of groups of plants (Babali et al., 2013).

Botanical geography (phytogeography or geobotany) will include not only the geography of plants taken in isolation and different types of vegetation, but also the causes of their distribution (Polunim, 1967).

The study of phytogeography is also a real model for interpreting regression phenomena (Olivier et al., 1995). For Quezel (1991), the phytogeographic study constitutes an essential basis for any attempt to conserve biodiversity.

The aim of this study is, therefore, to develop a physiognomic map of vegetation in our study area. The map we produced covers the study stations in the northwest region of Algeria and gives us an overview of the different existing taxa, and, particularly, it shows the exact location and the current state of the distribution of *Malva subovata* (DC.) Molero & J.M. Monts. (= *Lavatera maritima*) (Malvales Malvaceae) in the study area (see also Ghalem et al., 2021).

MATERIAL AND METHODS

Study area

For the purpose of this study, we chose the six stations considered representative: Djbel Fellaou-

cen, Hammam Boughrara, Bousdra, Hammam Boughrara, Arbouz and Bouhlou motorway.

Given the large number of species, maps were elaborated according to the biogeographic types and another with the inventoried species.

Arbouz Station is located 95 km northwest of Tlemcen, 50 km northwest of Maghnia and 19 km in a straight line east of the Moroccan city of Saïdia.

The Bousdra station belongs to the village of Tafna, which in turn belongs to the Sabra Daïra. It is limited: to the North by the municipality of O'Oued Riah; to the East by the municipality of Terny Beni Hdiel; to the South through the city of Sidi Medjahed; to the West by the municipality of Maghnia. The station has a 30% recovery rate.

Automatic routes from Hammam Boughrara and Hammam Boughrara. Hammam Boughrara is located northwest of Wilaya de Tlemcen, east of the municipality of Maghnia. The recovery rate is around 60%. The vegetation is composed of herbaceous and shrub species that are the most dominant. It is limited: to the North by the communes of Djebala, Nedroma, Ain Kebira and Ain Fettah; to the East by the commune d'Oued Riah; to the South by the municipality of Maghnia, Bouhlou and Sebra (Anonymous, 2000).

Bouhlou station, or Bouhlou, is a city in the Tilcen wilaya, in Algeria; it is located in the mid-west of the Tlemcen wilaya. It is limited: to the Northeast by Hammam Boughrara; to the South by Sidi Medjahed and Beni Bahdel; to the West through Maghnia and East through the municipality of Sabra.

The commune of Fellaoucen is located in the northern part of the wilaya of Tlemcen. It covers a total area of 6,870 ha. It is limited: to the Northeast by the commune of Beni Ouarsous; to the Northwest by the municipality of Ain Kebira; to the South by the municipality of Ouled Riah; to the West through the commune of Ain Fetah; to the East through the city of Zenata.

Samples

For mapping the types of plant groups in *Malva subovata* for this area, vegetation formation maps, the bioclimatic map of Wilaya de Tlemcen and recent climatic data were used.

To develop this map, we asked for help from a cartographer from the University of Tlemcen who used several cartographic supports:

- Floristic surveys carried out in the field, we take into consideration the percentage of biogeographical types and also the floristic composition of the species.
- Map.info 7.5 data processing software.

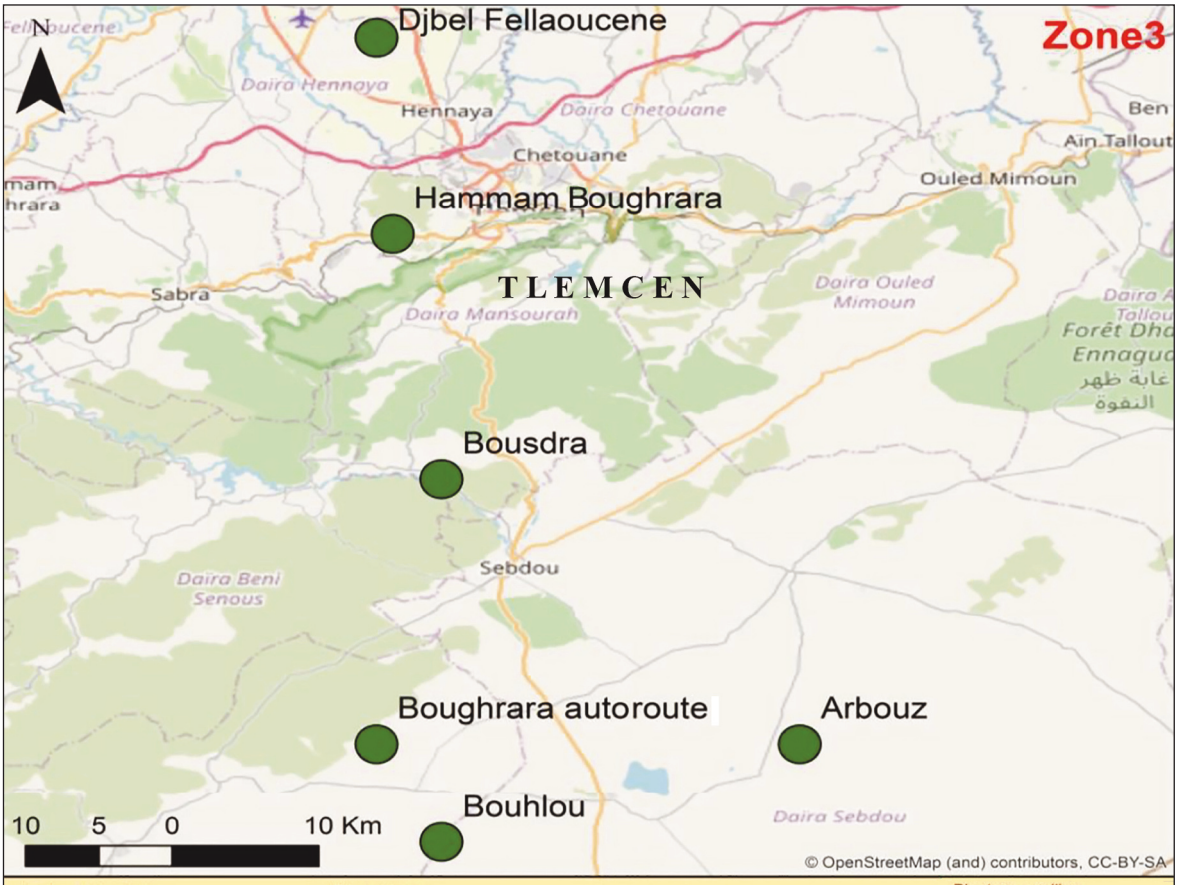
The determination of the listed species was done in the laboratory using the following determination keys: Maire (1952), Ozenda (1957) and Quézel & Santa (1962, 1963).

RESULT AND DISCUSSION

This zone is essentially composed of various species of plants (see Fig. 1) as: *Malva subovata, Bromus rubens, Reseda alba, Sedum acre, Ballota hirsuta, Avena alba, Chamerops humilis, Lavandula dentata, Hordeum vulgare, Calendula arvensis, Ferula communis, Papaver rhoeas, Phalaris paradoxa, Scolymus hispanicus, Briza minor, Arisarum vulgare, Convolvulus tricolor, Plantago lagopus, Pistacia lentiscus, Rhamnus alaternus,* etc.

Station	Longitude	Latitude
Arbouz	1°15'00.00'' W	34°52'00.00'' N
Hammam Boughrara auto-route	1°41'00.00'' W	34°52'00.00'' N
Djbel Fellaoucene	1°41'00.00'' W	35° 00'00.00'' N
Bousdra	1° 37'00.00'' W	34° 42'00.00'' N
Bouhlou	1° 37'00.00'' W	34°45'00.00'' N
Hammam Boughrara	1° 40'00.00'' W	34° 52'00.00'' N

Table 1. Geographical data for zone 3.



Aegilops triuncialis
Arisarum vulgare
Artemisia herba alba
Asteriscus maritimus
Asparagus acutifolius
Asparagus albus
Asparagus stipularis
Aspérula hirsuta
Asphodelus microcarpus
Avena sterilis
Avena alba
Anacamptis coriophora
Anagalis arvensis
Anagalis arvensis subsp phonicea
Anagalis arvensis subsp latifolia
Anthyllis tetraphylla
Antirrhinum majus
Anarrhinum fruticosum subsp. fruticosum
Ammoides verticillata
Ampelodesma mauritanicum
Atractylis humilis
Atractylis carduus
Atractylis concellata
Ajuga chamaepitys
Ajuga iva
Allium roseum
Allium subvillosum
Allium porrum L. subsp. Polyanthum
Acacia cyanophylla
Ballota hirsuta
Brachypodium sylvaticum
Bromus scoparius
Bituminaria bituminosa
Bellis annua
Brachypodium distachyon
Bromus rubens
Bromus madritensis
Briza minor
Campanula dichotoma
Carduus pycnocephalus
Carthamus coerulus
Cakile maritima
Calycotome intermedia
Chamaerops humilis
Catananche caerulea
Convolvulus cantabrica
Convolvulus althaoeïdes
Convolvulus tricolor
Calendula arvensis
Calendula suffruticosa
Calendula bicolor subsp faurelii
Centaurea solstitialis
Centaurea involucrata
Centaurea pullata
Ceratonia siliqua
Cistus villosus
Coronilla scorpioides
Chrysanthemum coronarium
Chrysanthemum segetum
Clematis cirrhosa
Clematis flammula
Cynodon dactylon
Cytisus villosus
Daucus carota subsp. maximus
Daucus carota
Dactylis glomerata
Echinophora spinosa
Echium vulgare
Echium plantaginum
Echinops spinosus
Erodium ciconium
Euphorbia nicræensis
Fedia cornucopiae
Fumaria capreolata
Eruca vesicaria
Fagonia cretica
Ferula communis
Ferula lutea
Fumana thymifolia
Galactites duriae
Genista tricuspidata
Gladiolus italicus Mill. = *G. segetum*
Helianthemum apertum
Helianthemum hirtum
Hibiscus sp.
Hordeum murinum
Hordeum vulgare
Inula crithmoides
Iris xiphium
Lagurus ovatus
Lavendula multifida
Lavendula dentata
Lavandula stoechas
Leucanthemum paludosum
Limonium sinuatum subsp.eusinuatum
Lobularia maritima
Malva subovata
Marrubium alysson
Nerium oleander
Nepeta multibracteata
Olea europea
Ononis pubescens
Opuntia maxima = O. ficus-indica
Papaver rhoeas
Pallenis spinosa
Paronychia argentea
Phagnalon saxatile
Phalaris paradoxa
Phylleria angustifolia
Plantago albicans
Plantago lagopus
Plantago psyllium
Plantago psyllium
Pistacia lentiscus
Pistacia terebinthus
Poa annua
Quercus coccifera
Quercus ilex
Rhamnus alaternus subsp alaternus
Ranunculus spicatus
Rosa canina
Reseda alba
Rumex bucephalophorus
Ruta chalepensis
Scolymus hispanicus
Sonchus asper
Sinapis arvensis
Sinapis alba
Silene vulgaris
Sedum acre
Sedum sediforme
Stipa parviflora
Stachys ocymastrum
Sedum album L subsp. gypsicolum
Silene gallica
Thapsia garganica
Thymus ciliatus
Trifolium campestre
Tetraclinis articulata
Thapsia villosa
Umbilicus rupestris
Urginea maritima
Vicia angustifolia
Verbascum sinuatum
Valeriana tuberosa
Vicia faba
Viburnum tinus subsp. tinus

Figure 1. Presence map of *Malva subovata* in Zone 3.

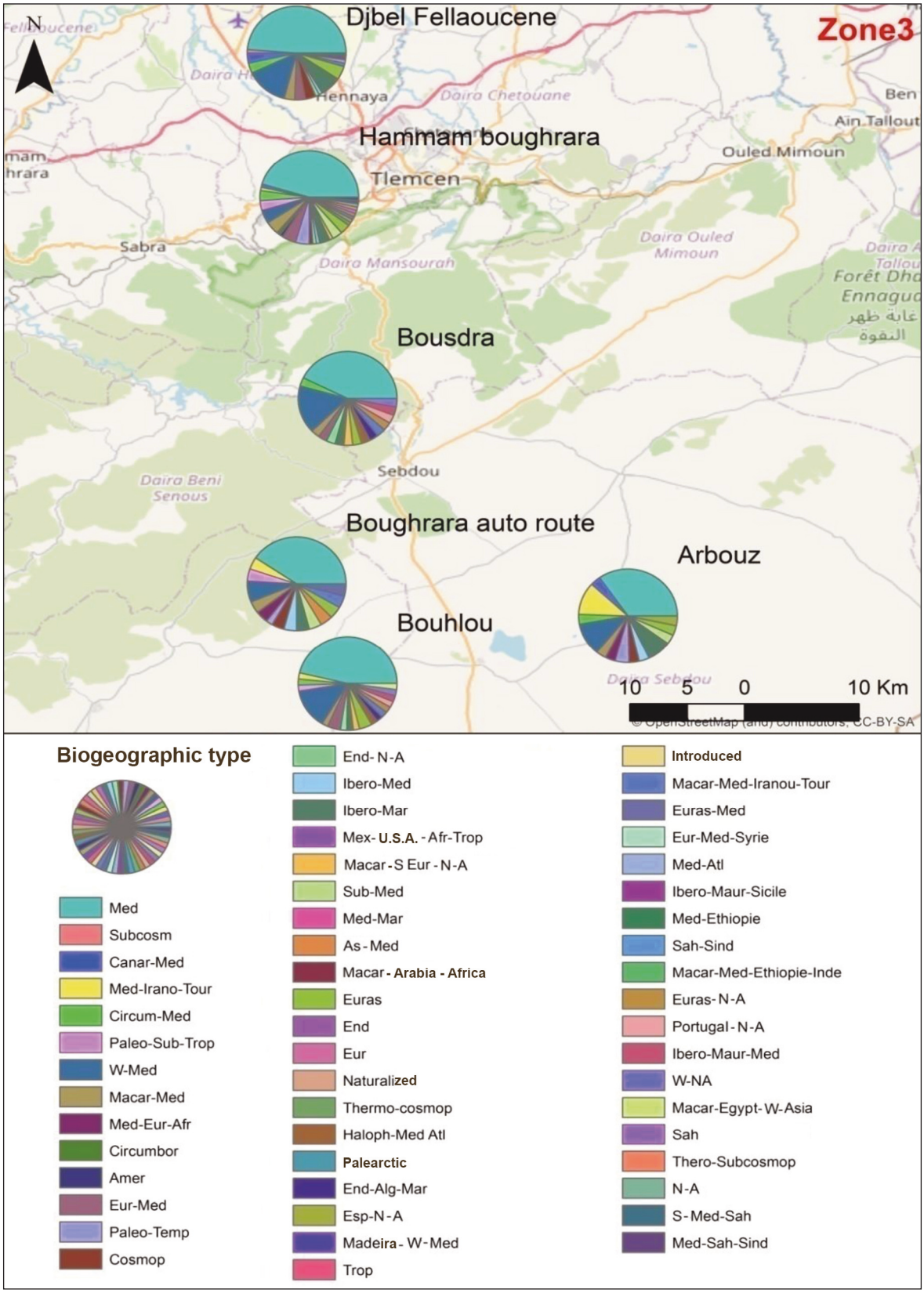


Figure 2. Map of the biogeographic type of zone 3.

A test of a distribution map of the groups in *Malva subovata* was also carried out according to the biogeographic types of each station.

Figure 2 shows the distribution of the *M. subovata* clusters in zone 3 according to the biogeographic types. We notice that the Mediterranean chorotype is dominant in all seasons and, therefore, also in zone 3.

Figure 2 shows the distribution of the *L. maritima* groups according to the biogeographical types of zone 3. We note that the Med type is dominant in all seasons and, therefore, also in zone 3.

The presence of species such as *Chamaerops humilis* and *Calycotome intermedia* indicates the degradation of these groups. Anthropogenic action is marked by the presence of geophytes; *Urginea maritima* and *Asphodelus microcarpus*. In fact, the dense formations regress and give way to a light vegetation cover where we see outcrops of mother rock in some seasons (Barka, 2016).

The inventoried species are divided into families and corresponding biogeographical types.

The biogeographic analysis of the species shows that it is always the taxa of Mediterranean lineage that dominate, which can be explained by the structural changes caused by the anthropic action and by the aridification of climatic conditions. In fact, a replacement of forest and pre-forest elements by species much more adapted to toxicity (Medjati, 2013–2014).

CONCLUSIONS

The purpose of developing these maps is to show the exact location of our species and also to help us assess the current state of the natural distribution of this taxon.

The vegetation of the Tlemcen region offers a captivating and very diverse botanical landscape. It presents a good example of the study of plant diversity and, above all, an interesting synthesis about the natural dynamics of ecosystems from the coast to the steppes. However, this region is not far from such a regressive change in vegetation cover experienced worldwide (Madjati, 2013).

The results obtained by a floristic approach to *M. subovata* applied in the study area showed a change in the structure of the vegetation and a general invasion of these formations by therophytes.

At the end of this work carried out in the various study stations in the Northwest region of Algeria, we can conclude that our studied species *M. subovata* is almost present in the entire region of Tlemcen with a predominance at the level of six stations Arbouz, Bouhlou, Bousdra, Hammam Boughrara auto-route, Hammam Boughrara and Djbel Fellaoucen.

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