

HELLIER, BARBARA C.^{1*}, LEE PANELLA², YASMINA EL BAHLOUL³ and NAIMA QARIOUH⁴, ¹USDA-ARS Western Regional Plant Introduction Station, 59 Johnson Hall, Pullman, WA 99164, ²USDA-ARS Sugar Beet Breeding Unit, Fort Collins, CO, 80526, ³National Institute of Agronomy Research, Genetic Resources and Plant Breeding Unit, Rabat, Morocco and ⁴National Institute of Agronomy Research, Setatt, Morocco. **New additions to the National Plant Germplasm System's *Beta* collection: Southern Morocco expedition.**

ABSTRACT

The USDA Agricultural Research Service's National Plant Germplasm System's (NPGS) *Beta* collection is comprised of 2,541 accessions from 14 species. The largest number of accessions is from *Beta vulgaris* ssp. *vulgaris*, (domesticated beet crops – table, leaf (Swiss chard), fodder and, primarily, sugar beets) and *Beta vulgaris* ssp. *maritima* (sea beet, the progenitor and wild relative of domesticated beet). *Beta* accessions in this collection originate from 54 countries worldwide. Accessions of wild sea beet, *Beta vulgaris* ssp. *maritima*, a source of resistance genes for cultivated beet, are well represented from locations along the northern Mediterranean coast and up the Atlantic coast into Norway. Collections from wild populations along the southern Mediterranean coast and down the northern African Atlantic coast are not well represented, and were completely lacking from Morocco. Additionally, there were no sugar beet or leaf beet landraces from Morocco in the NPGS *Beta* collection. Although *Beta vulgaris* subsp. *maritima*, *Beta macrocarpa*, and *Beta patellaris* are endemic to Morocco, very little was known about the extent of their distribution.

The Moroccan coast represents an area isolated from the rest of the wild *Beta* range except for the islands of the Macaronesia ecoregion (which includes the Azores, Canary Islands, Cape Verde, Madeira, and the Savage Isle). This island ecoregion contains a diversity of *Beta* species and there are many questions about gene flow among and between Macaronesia and the coast of Northwestern Africa. In Morocco, *Beta* species are threatened by genetic erosion and habitat degradation due to grazing pressure and urbanization.

In the 2010 National Plant Germplasm System funded Southern Morocco plant collecting mission the coast of Morocco was explored from Rabat to Laayoune and 16 new accessions of *Beta vulgaris* ssp. *maritima* and 15 of *Patellifolia patellaris* (previously *Beta patellaris*), which is part of the tertiary gene pool for sugar beet, were collected. In addition to seed, habitat data, geographic coordinates, images, and herbarium samples were collected to document the new accessions. This was a joint mission of the USDA-ARS and the Moroccan National Institute of Agronomy Research (INRA). The exploration party consisted of two US participants, Barbara Hellier and Dr Lee Panella, two Moroccan participants, Dr. Yasmina El Bahloul and Naima Qariouh, and our invaluable driver. Over 2400 km were covered. *Beta vulgaris* ssp. *maritima* occurred from Rabat to Plage Blanche (on the coast west of Guelmim) (Figure 1). *Patellifolia patellaris* (formerly *Beta patellaris*) was found from Safi to El Marssa, on the coast west of Laayoune (Figure 2). The distribution of *P. patellaris* roughly coordinates with the Moroccan coastal Haouz-Argana Mediterranean shrubland ecoregion, as defined by the World Wildlife Fund (Olson 2001). *B. v.* ssp. *maritima* mostly occurred in the Mediterranean woodland and shrub ecoregion but also extended down into the northern Haouz-Argana Mediterranean shrubland region. All sites where these two species were found were disturbed: new or old construction sites, garbage dumps, fallow fields, abandoned city lots, eroded/eroding rocky beaches. Many sites were surveyed where no beet was found. These included heavily grazed

areas that appeared to be the appropriate habitat, undisturbed sites with a dominant shrub layer, and in the south, sites without supplemental water. All seed samples collected were split equally between the US NPGS and the INRA Morocco genebank. After seed increase, the material will be used in diversity studies and screened for disease resistance and salt tolerance and is of interest to US, European, and Moroccan breeders and scientists.

Morocco is very rich in *Beta* genetic diversity, which is valuable in beet breeding programs. This plant exploration will help Morocco in implementing FAO's Global Plan of Action for Plant Genetic Resources for Food and Agriculture in a very specific area. After genetic analysis of the collected material in a collaborative effort between Moroccan and USDA-ARS scientists, information on the genetic diversity within and between *Beta* populations will become available to be used by Morocco, as will all the monitoring data collected during the mission. The exploration and the database work will help Morocco to assess the threat of genetic erosion to the species and provide a baseline to monitor potential future genetic erosion. Without a doubt, this project has strengthened the professional ties between the U.S. and Moroccan genebanks, as well as between the USDA-ARS and Moroccan scientists.

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Figure 1. This site was the southernmost collection site for *Beta v. ssp maritima*. It was west of Guelmim surrounding a farmer's corn field on the road to Plage Blanche (left). A seed bearing *B.v. ssp maritima* plant is shown at the site (right).



Figure 2. This site was the southernmost collection site for *Patellifolia patellaris* in El Marssa (left). A *P. patellaris* plant is shown at the site (right).

Literature Cited:

Olson, D.M. et al. 2001. Terrestrial Ecoregions of the World: a new map of life on earth. *BioScience*, 51:11, p 933-938.