# Tunisian Cucurbits: A Reservoir of Genetic Diversity for Sustainable Agriculture

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The members of the Curcurbiteae family, known as cucurbits, encompass a vast group of around 130 genera and 800 species (Chomicki et al. 2019). These versatile plants can be cultivated in warmer regions across the globe. In Tunisia, watermelon (*Citrullus lanatus* (Thunb.) Matsum. and Nakai), melon (*Cucumis melo* L. var. *reticulatus*, var. *inodorus*, and var. *cantalupensis*), snake melon (*C. melo* L. var. *flexuosus*), pumpkins (*Cucurbita pepo*, *C. maxima*, and *C. moschata*), sponge gourd (*Luffa cylindrica*) and bottle gourd (*Lagenaria siceraria*) represent the most commonly grown cucurbits. The landraces within these cucurbit species serve as a vital source of genetic diversity, offering substantial value to plant breeders.

Tunisia boasts a rich repository of cucurbit landraces (Figure 1) that have been subject to extensive phenotyping for agro-morphological and quality traits. Studies have been conducted on various Tunisian cucurbit landraces, including melon (Chikh-Rouhou et al. 2023a; Chikh-Rouhou et al. 2021a), watermelon (Chikh-Rouhou and Garcés-Claver, 2021), pumpkins (Chikh-Rouhou et al. 2023b; 2023c), and bottle gourd (Chikh-Rouhou and Garcés-Claver, 2023). These studies revealed a high level of diversity for the evaluated characteristics with the identification of several sources of resistance and promising fruit quality traits. These findings underscore the significance of Tunisian cucurbits as a genetic resource with the potential to bolster traditional agriculture, particularly in the face of climate change.

In addition to agro-morphological and quality traits, research has examined the rhizosphere microbiome composition associated with Tunisian cucurbit landraces, including melon (Aydi-Ben Abdallah et al. 2021), watermelon (Aydi-Ben Abdallah et al. 2023), and pumpkins (Aydi-Ben Abdallah et al. 2024). These studies demonstrated that the composition of the soil microbial community has been shaped by cucurbit landraces, i.e. the differences in the composition of the soil microbial community resulted in differences in yield components and fruit quality. Indeed, symbiotic interactions between the cucurbit plants and their microbial counterparts in the soil were detected for some agronomic traits.

Studies have also examined the resistance of Tunisian cucurbit landraces to fungal diseases (Table 1) including powdery mildew (Chikh-Rouhou et al. 2022, Kacem and Chikh-Rouhou, 2022, Chikh-Rouhou et al. 2020), fusarium wilt (Chikh-Rouhou et al. 2021b; 2018; 2013), and to pests such as the aphid (Chikh-Rouhou et al. 2019). In these studies, several Tunisian landraces exhibited resistance to one or two fungal diseases based on their genetic makeup. These investigations contributed to a greater understanding of the value of Tunisian cucurbit landraces and highlight their adaptability and resilience.

A preliminary evaluation for a low watering regime (drought stress) was conducted at the experimental field of the Regional Research Centre on Horticulture and Organic Agriculture (CRRHAB) and the results were promising for the pumpkin accessions (Unpublished). The information gained from this study could prove valuable in efforts to select landraces capable of thriving in diverse and stressful agroclimatic conditions. The use of climate-resilient crops is emerging as a highly effective and sustainable practice contributing to crop productivity resilience.

The genetic diversity identified within these landraces calls for the development of a strategy for their conservation and utilization in breeding programs. Such initiatives are crucial for the safeguarding of these plant materials as a valuable gene pool, but also to utilize them as a means to fortify traditional agricultural methods. Planning for the sustainable management and propagation of these genetic resources is essential to address the challenges posed by climate change while maintaining agricultural productivity.

In conclusion, Tunisian cucurbits offer a wealth of genetic diversity. This has far-reaching implications for the sustainability of agriculture under evolving climate

conditions. This resource-rich germplasm is a testament to nature's adaptability and resilience, and strategic efforts for its conservation and utilization are essential for the future of agriculture in Tunisia and beyond.

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**Figure 1. Diversity of some cucurbits (watermelon, pumpkin and melon) collected at the Regional Research Centre on Horticulture and Organic Agriculture (CRRHAB), Tunisia**

**Table 1. Resistance to biotic stress identified in Tunisian cucurbit landraces.**

| | FOM* Resistance | FON* Resistance | Resistance to *Aphis gossypii*[c] | Powdery mildew resistance[d] |
|---|---|---|---|---|
| Melon landraces[a] | Maazoun Ch.M | | Chamem (Ananas type) | Dziri |
| | Maazoun M. Chaker | | | Sarachika |
| | Maazoun Mahdia | | | Rupa |
| | FL | | | Chamem |
| | Dziri | | | Asli |
| | Lobneni | | | |
| | Horchay | | | |
| | Stambouli | | | |
| | Chamem (Ananas Type) | | | |
| Watermelon landraces[b] | - | Arbi Sahline | - | - |
| | | Arbi Mahdia | | |
| | | Arbi Echamekh | | |
| Pumpkin landraces[b] | - | - | - | Arbi Ch.M<br>Arbi |
| Lagenaria[b] | In all collected accessions | In all collected accessions | - | - |

* FOM resistance: *Fusarium oxysporum* f. sp *melonis* ; FON resistance: *Fusarium oxysporum* f. sp *niveum*
[a] Chikh-Rouhou et al. 2021b
[b] Data not yet published
[c] Chikh-Rouhou et al. 2019
[d] Chikh-Rouhou et al. 2022; Kacem and Chikh-Rouhou, 2022