THE CURIOUS CASE OF *DIPLOTAXIS TENUIFOLIA*:

PRELIMINARY STUDIES IN A HOT AND DRY CLIMATE

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Introduction

The Plant:

Diplotaxis tenuifolia (L.) DC (Yellow Wall-Rocket; fam. Brassicaceae) is a segetal species tolerant of hot and dry conditions.

The Habitat:

Derelict fields during the summer period, where shade temperatures often exceed 40°C and topsoil temperatures may exceed 45°C.

The 'Curious Case':

Lack of visible morphological/anatomical adaptations (succulence, pubescence, spines, waxy cuticles, life-cycle adaptations) typical of xerophytes.

How and Why:

How does it grow and reproduce in such stressful climatic conditions?

Understanding the responses of this and similar species becomes particularly relevant in the context of predicted climatic warming.

Aim and Method

We wanted to:

Unravel any structural and ecophysiological characteristics of *D. tenuifolia* that permit survival in such harsh conditions.

Use this data to inform predictive models of plant community dynamics under a warmer climate.

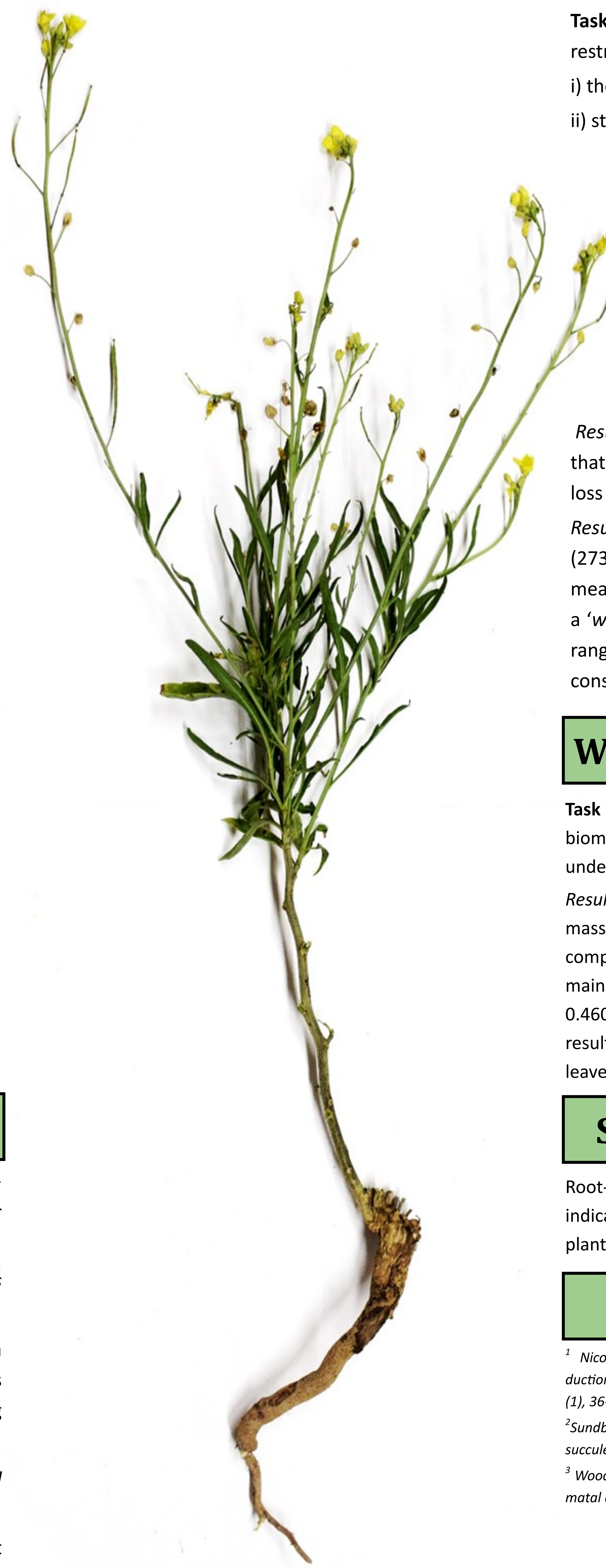
We used:

Eight plants from Malta (Central Mediterranean). A second-stage study will have a much larger sample size.

Analysis of leaf anatomy **(Task 1)** and water content **(Task 2)** of the selected plants.

Conclusions/Questions

- Deep root systems are probably crucial for survival—requires comparison with syntopic plants from other species.
- *Individual plants that were transplanted during tests died almost immediately? What is the cause of this?*
- Allelophatic mechanisms have been reported in literature[1] and this may partly explain higher access to water during summer (e.g. by eliminating competitors it might have more water availability).
- *Further studies should be done on the stomatal density—is this correlated with water stress?*
- Physiological adaptations promote efficient photosynthesis and therefore efficient water use.



Leaves

Task 1: In order to assess if the plant is somehow restricting transpiration from the leaf, we investigated:

i) the existence of sunken stomata in leaves, and

ii) stomatal densities through epidermal impressions

Epidermal cells (x640)

Results i): No sunken stomata were observed, suggesting that the plant is using other mechanisms to restrict water loss from leaves, if at all.

Results ii): The high number of abaxial stomata (273 mm^{-2}) places this species as a non-succulent[2], meaning that it tends to be a '*water-spender*', instead of a '*water-conservator*'. This value fits comfortably into the range of variation of any of the types and climates considered in a broad study[3].

Water in roots, shoots & soil

Task 2: Comparison of water content of underground biomass, above-ground biomass, and soil, in order to understand where the plant mainly stores water, if at all.

Results: Even in this dry climate, an average of 82% of the mass of the shoots and 63% of that of the roots is water. By comparison, soil water content was 10% by mass. The plant mainly stores water in unprotected above-ground parts (t=-0.4607, P=0.002), suggesting that the store is transient. These results pointed to a direction allowing us to focus studies on leaves (Task 1).

Subterranean investment

Root-Shoot biomass ratio ranged from 0.64 to 1789 (n=8), indicating much investment in root systems. Roots of some plants reached bedrock, accessing deeper water reserves.

References

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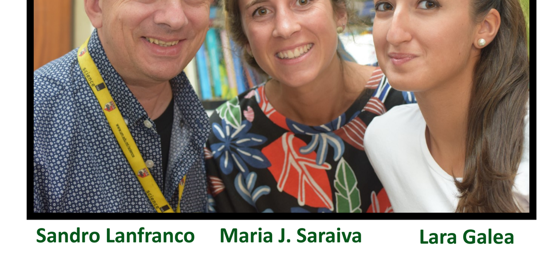

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