PREDICTING ECOLOGICAL RESPONSES TO GLOBAL WARMING IN *IRIS PUMILA*: AN OPEN-TOPPED CHAMBER EXPERIMENT

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1.Introduction

In the face of a rapidly changing climate, it is of great importance to predict the ability of species and communities to persist under future climate scenarios. Global warming, an increase in average global temperatures, is expected to have an overall negative effect on plant fitness and survival (Nicotra et al. 2010).

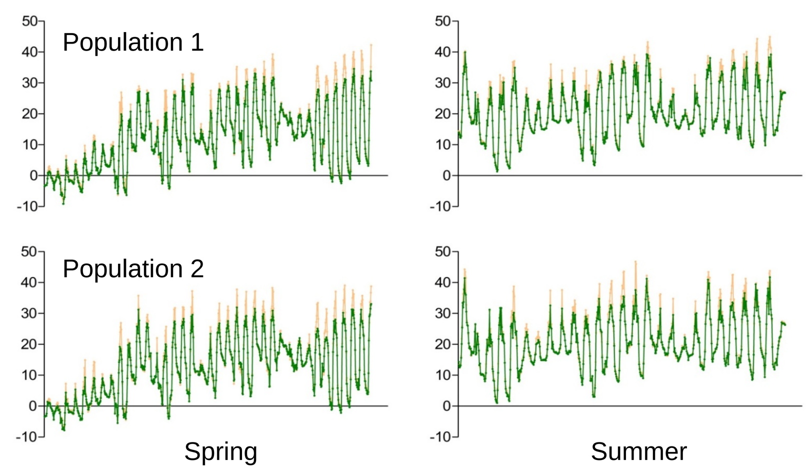
Phenotypic plasticity i.e. the capacity of a single genotype to produce a range of phenotypes under different environmental conditions is recognized to be a crucial determinant of plant responses to environmental variability, allowing them to cope with rapid environmental changes (Bonamour et al. 2019).

Plant functional leaf traits that signify various aspects of resource uptake and utilization are considered to be closely related to plant fitness. The observed variation in their phenotypic expression reflects different adaptive strategies that plants use to cope with fluctuating environmental conditions (Vendramini et al. 2002).

2.Objective

To predict the short-term responses of Iris pumila natural populations to global warming we assessed the temperature dependent variation of three functional leaf traits (SLA, LWC and LDMC) among clonal parts experiencing different temperature conditions (ambient and 1-2 ºC higher than ambient temperature).

3.Material and methods



In spring and summer of 2018 three functional leaf traits were recorded in two sun-exposed natural populations of *I. pumila* in Deliblato Sand. One half of all randomly selected clonal plants was experimentally warmed using a clear-sided, open-topped chamber (OTC), while the other half experienced the ambient temperature conditions. The air temperature within the OTCs was approx. 1-2 ºC higher than that outside of the OTCs in general.

SLA (leaf area per unit dry mass; $cm^2\ g^{-1}$), LDMC (the ratio of leaf dry mass to fresh mass; $g\ g^{-1}$) and LWC [(fresh leaf mass – dry leaf mass) / fresh leaf mass; $g\ g^{-1}$] were measured for the ramets from each clone, growing inside and outside of the OTC.

Figure 1. Experimental setting and thermal data graphs (— temperature inside OTC, — temperature outside OTC).

4.Results

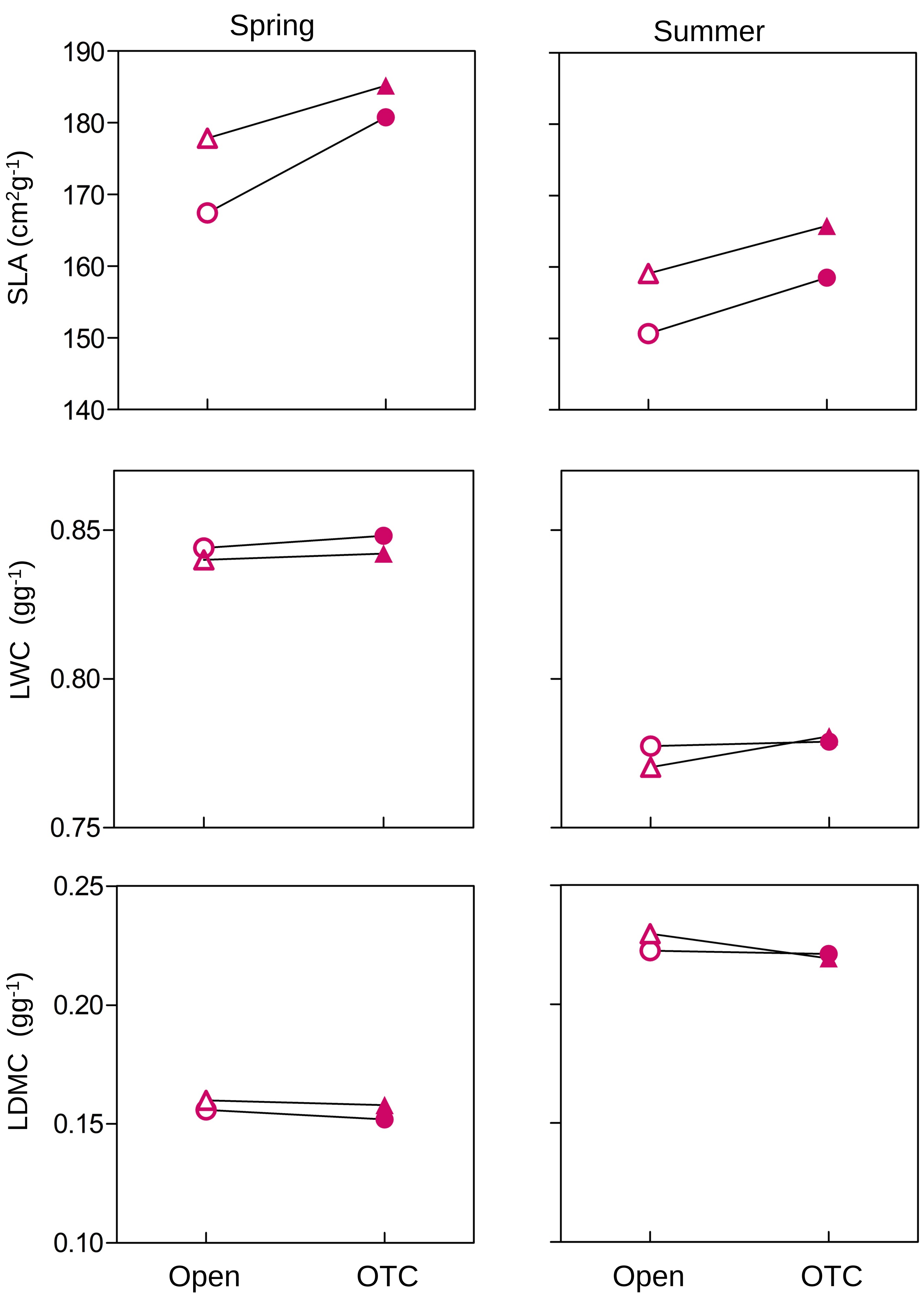


Figure 2. Mean values of reaction norms of analyzed functional leaf traits, inside (full symbol) and outside of OTC (open symbol), in two natural populations (○,△) of *I. pumila* during spring and summer.

Table 1. The results of the Wilcoxon Rank-Sum test.

Open	Spring			Summer		
Source of variation	SLA	LWC	LDMC	SLA	LWC	LDMC
POPULATION	*	*	*	*	ns	ns

OTC	Spring			Summer		
Source of variation	SLA	LWC	LDMC	SLA	LWC	LDMC
POPULATION	ns	**	**	ns	ns	ns

Spring	Population 1			Population 2		
Source of variation	SLA	LWC	LDMC	SLA	LWC	LDMC
TREATMENT	***	*	*	*	ns	ns

Summer	Population 1			Population 2		
Source of variation	SLA	LWC	LDMC	SLA	LWC	LDMC
TREATMENT	**	ns	ns	ns	ns	ns

* P<0.05, ** P<0.01, *** P<0.001, ns - nonsignificant

5.Conclusion

I. pumila plants have the capacity to cope with increasing temperatures by plastic responses of leaf functional traits.

Literature

Bonamour et al. (2019). Phenotypic plasticity in response to climate change: the importance of cue variation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 374(1768), p.20180178.
Nicotra et al.(2010). Plant phenotypic plasticity in a changing climate. *Trends in Plant Science*, 15(12), pp.684-692.
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ALFA GENETICS