Charles University
Faculty of Science

Biology

Botany

Doubravka Požárová

The Role of Phenotypic Plasticity in Parallel Altitudinal Differentiation in *Arabidopsis arenosa*

Role fenotypické plasticity v paralelní výškové diferenciaci u řeřišničníku písečného (*Arabidopsis arenosa*)

Diploma thesis

Supervisor: Filip Kolář

Prague, 2021

I declare that I completed my diploma thesis independently. It documents my own work if not mentioned otherwise and I have properly acknowledged and cited all sources used. The thesis is not subject of any other defending procedure.

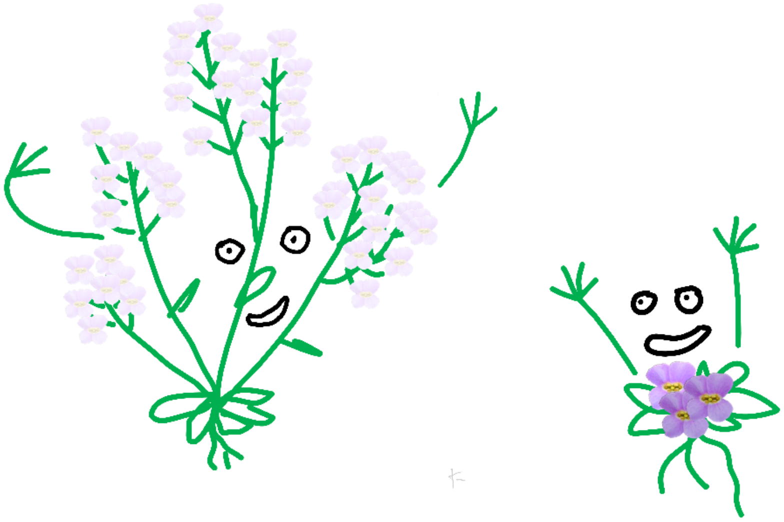
Prohlašuji, že jsem závěrečnou práci zpracovala samostatně a že jsem uvedla všechny použité informační zdroje a literaturu. Tato práce ani její podstatná část nebyla předložena k získání jiného nebo stejného akademického titulu.

Doubravka Požárová

V Praze, 5. 8. 2021 Doubravka Požárová

Acknowledgement

I would like to thank my supervisor, Filip Kolář, for his patience and enthusiasm which were both really necessary during my work and his willingness to discuss the thesis with me when I needed. Many thanks to Adam Knotek, from whom I learned lot about how to work on experiments and who spend hours explaining and working with me. Terezie Mandáková was extremely helpful when the plants were growing in Brno and her knowledge about how cultivate them and keep them happy was important. I would also like to thank Jan Smyčka for consulting statistics and modelling whenever I asked to. Many thanks also to Magdalena Bohutínská for cheering me up and advices on how to write and finish my work. I am also grateful for having such friends as Eliška Konečná and Timothée Lamotte who went through the master studies with me. To Tom I want to thank for helping me to stay optimistic and for showing that there are more options in life than it can look sometimes. His support and faith in my skills and capabilities was crucial. At least but not last to my parents and brothers, they are always there for me.



Abstract

Plants adjust to challenging environments by genetically fixed changes and phenotypically plastic response. Alpine environments pose multiple challenges to plant life including cold, high irradiance and short vegetative period. To survive such specific conditions, plants often significantly alter their morphology. In my thesis I studied to which extent specific traits of alpine ecotypes repeatedly appear among independently formed alpine populations and to which extent these changes represent fixed genotypic differentiation vs phenotypic plasticity. To address these questions I performed an experiment in which *Arabidopsis arenosa* plants from sixteen populations belonging to two ecotypes (alpine and foothill) were grown in conditions resembling alpine vs foothill conditions. Specifically, I modified levels of irradiance and temperature and complemented alpine-like and foothill-like treatment by additional two extreme treatments to reach full-factorial design. I used discriminant and classificatory analysis to examine the overall morphological differentiation characterised by set of twenty measured traits. Then I examined variation in each trait by statistical Bayesian model that I designed for this purpose. I found out that although ecotypes are predominantly differentiated by fixed morphological differences, there is a set of traits that appear strongly plastic, and the direction of plasticity differs between alpine and foothill plants. The results suggest that both non-plastic and plastic changes play role during recurrent alpine adaptation in *Arabidopsis arenosa*.

Keywords: plasticity, alpine environment, *Arabidopsis arenosa*, common garden experiment

Abstrakt

Rostliny reagují na obtížné podmínky jak změnami v genech samotných, tak změnami fenotypu bez změn v genotypu – fenotypickou plasticitou. Alpinské prostředí představuje pro rostliny výzvu v řadě faktorů zahrnujících chlad, vysokou úroveň záření a krátkou vegetační dobu. Aby rostliny v takových podmínkách přežily, často zásadně mění svůj vzhled. Ve své práci jsem zkoumala, nakolik se znaky specifické pro alpinské ekotypy opakovaně objevují u nezávisle vzniklých alpinských populací a do jaké úrovně jsou tyto změny dány zafixovanými rozdíly a do jaké míry jde o fenotypickou plasticitu. Experiment, zahrnující kultivaci řeřišničníku písečného (*Arabidopsis arenosa*) z šestnácti populací, alpinského i nížinného ekotypu, v podmínkách připomínajících jak nížinné, tak horské prostředí, byl proveden pro zodpovězení těchto otázek. Manipulovala jsem s úrovní osvitu a teplotou, tak aby byly napodobeny alpinské a nížinné podmínky a experimentální design doplnila o zbylé dvě možné kombinaci teploty a záření. Diskriminační a klasifikační analýza byly použity pro prozkoumání celkové morfologické diferenciace charakterizované souborem dvaceti znaků. Poté jsem hodnotila rozdíly v jednotlivých znacích Bayesovským modelem vytvořeným pro daný účel. Došla jsem k závěru, že přestože jsou ekotypy odlišeny hlavně v geneticky fixovaných znacích, existuje skupina znaků, které se jeví jako silně plastické a směr plasticity se liší pro rostliny alpinského a nížinného ekotypu. Celkově mé výsledky ukazují, že jak geneticky fixované změny, tak změny dané plasticitou, hrají roli při opakovaném adaptaci řeřišničníku písečného (*Arabidopsis arenosa*) k alpinským podmínkám.

Klíčová slova: plasticita, alpinské prostředí, *Arabidopsis arenosa*, květináčový pokus

Contents

1 Introduction

1.1 Role of adaptation and plasticity

Adaptation is a fundamental process enabling organism to cope with challenges (Basu, Ramegowda, Kumar, & Pereira, 2016; Leimu & Fischer, 2008). Organisms in general, and plants in particular, respond to environmental stimuli by a complex interaction between genotype and phenotype (Konečná, Yant, & Kolář, 2020). While natural selection operates on heritable variation (Nielsen, 2005), the environment may trigger changes which are not strictly heritable – when outcome phenotype depends on environment encountered which means phenotypic plasticity (Scheiner, Samuel M. Goodnight, 1983).

The extent to which plants respond to environmental challenges by phenotypic changes fixed in genotype and by plasticity, however, remains largely unknown. The extent of phenotypic plasticity itself is also heritable and thus adaptive under certain circumstances (Harder & Johnson, 2005; Palacio-López, Beckage, Scheiner, & Molofsky, 2015). Adaptive plasticity may evolve when a species is subjected to fine-scale environmental heterogeneity relevant within the life span of the organism and when conditions can be predicted based on environmental cues (Sultazn, Wilczek, Bell, & Hand, 1998; Valladares, Wright, Lasso, Kitajima, & Pearcy, 2000; Valladares et al., 2002; Herman, Spencer, Donohue, & Sultan, 2014). The genes behind phenotypic plasticity undergo the same long-term selection (Herman et al., 2014), whereas plasticity itself allows faster response at individual level, when affecting phenotype immediately or in short time after conditions are changed (Metlen, Aschehoug, & Callaway, 2009).

1.2 Relative importance and limits of adaptation and plasticity

Species which do not possess the ability to shift its phenotypic characteristic after drastic environmental changes are expected to be threatened by extinction (Matesanz, Gianoli, & Valladares, 2010; Chevin, Lande, & Mace, 2010). Thus, most of the species have ability to shift the distribution of their phenotypic traits when needed, especially when encountering unfordable or hostile conditions (Bhargava & Sawant, 2013).

Capacity to undergo changes and to adapt largely depends on genetic features, like the extent of genetic variability (Gandon & Michalakis, 2002), ploidy (Taylor et al., 2007; Berman, 2016), mating system (Hodgins & Yeaman, 2019; Lovell, Grogan, Sharbel, & McKay, 2014) and plasticity also has its limits and constraints and possible costs (Arnold, Nicotra, & Kruuk, 2019). Two of the most important limits are relaxed selection (when plasticity reactions are not selected for a substantial period, they diminish) and strong directional selection (selection on certain specific, non-plastic, trait value strong enough to limit the advantage of plasticity) (Murren et al., 2015). Additionally, the inability to produce the same trait by the means of plasticity, for example due to complex developmental timing, may also limit plasticity (Diggle, 2002)).

Often discussed is the idea of phenotypic plasticity cost – when organism with the same trait resulting from the plastic response has lower fitness compared to organism with the same trait fixed by non-plastic changes (Relyea, 2002; Lind & Johansson, 2009). Here the crucial thing is to be able to distinguish cost of phenotype itself and cost of plasticity. Maintenance of various pathways necessary to require information and theoretical higher developmental instability are among those (Dewitt, 1998). Yet the detection of cost is not common (Murren et al., 2015) probably because of many interplaying factors influencing organisms performance and because it is difficult to isolate such singular effect.

Opposed to adaptation changing trait in some fixed way, plasticity as a trait is favoured only in certain environments. Important factor is environmental reliability because it is impossible to change in meaningful way when no information related to the change is obtained from the environment (Molina-Montenegro, Atala, & Gianoli, 2010). On the opposite, periodical variability in time (repeated changes (Gulisija, Kim, & Plotkin, 2016)) and space (heterogenous environment (McIntyre & Strauss, 2014; Baythavong, 2011)) favour plasticity as it can have long-term fitness benefits in those habitats.

Both of these factors – the ability to adapt and the ability to change plastically – serve as important indicators to which extent will species be able to survive under environmental changes and how well it will cope with changes on different time scales (Figure 1). Thus, understanding relative extent of adaptation and plasticity is important and potentially helpful also in nature conservation (De Kort et al., 2020) and handling climatic changes (Matesanz et al., 2010; Walters & Berger, 2019).

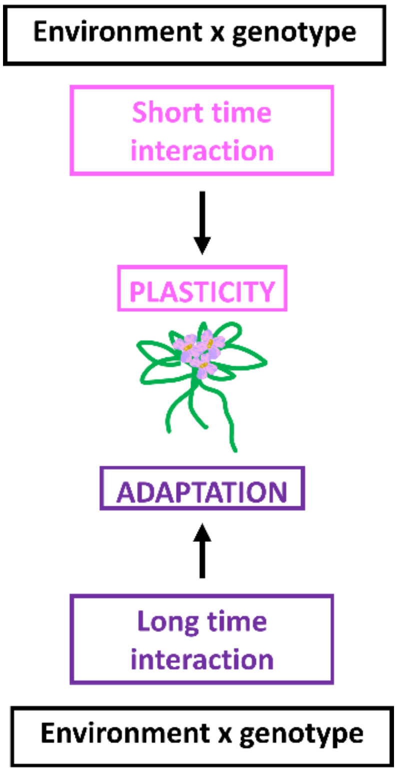


Figure 1 Plasticity and adaptation acting on different time scales.

Literature provides guide on estimation of relative importance of both (Stamp & Hadfield, 2020; Ghalambor, McKay, Carroll, & Reznick, 2007; Johansson, Pereyra, Rafajlović, & Johannesson, 2017; Santamaría et al., 2003), many studies demonstrate the role of genetic variability and thus a likely ability to adapt (Ralph & Coop, 2015; Flood & Hancock, 2017; Pyhäjärvi, Hufford, Mezmouk, & Ross-Ibarra, 2013; C. Rellstab et al., 2017; Kubota et al., 2015; Hämälä & Savolainen, 2019) as well as shifts driven by plasticity (Gao et al., 2018, Conti et al., 2018), and the adaptive heritable changes seem to be reported more commonly than the plastic.

To discuss to which extent plasticity and local adaptation contribute to phenotype distributions shifts under changing environments, one should be first able to distinguish between these two factors. To do so, one should ask if the phenotypic differences among populations become negligible once they are grown under constant conditions, or, even more properly, once they are grown under two contrasting sets of conditions, each representing an optimum for one of the contrasting populations (Anderson, Jameel, & Geber, 2021).

If the phenotypic differences between contrasting populations disappear under stable experimental conditions, they were likely caused by phenotypic plasticity, without the effect of genetic differentiation leading to local adaptation by adaptive allele frequency shifts. In contrast, if the differences are maintained under standard conditions, they were likely an effect of adaptive allele frequency differentiation. Finally, if the phenotypic difference between populations from contrasting environments is greater under corresponding in situ conditions than under standard conditions, they are likely mediated by a combination of adaptive genetic differentiation and plasticity (Honjo & Kudoh, 2019; Merilä & Hendry, 2014). Schematic representation of possible scenarios, including maladaptive reactions is on Figure 3.

In summary, the full-factorial design common garden experiments (Figure 2, Figure 3), mimicking in-situ trait variability is due to the adaptation, plasticity, or combination of both. Although the available literature suggests greater evolutionary impact of non-plastic adaptive changes, phenotypic plasticity may be subjected to specific selective pressures and be a relevant factor determining the potential of population to respond to changing or unstable environments.

Such design has further benefit in the ability to differentiate ecologically meaningful phenotypic traits (Cui, Töpper, Yang, Vandvik, & Wang, 2018) and to provide hints about which traits may be more subjected to plastic and which to adaptive responses.

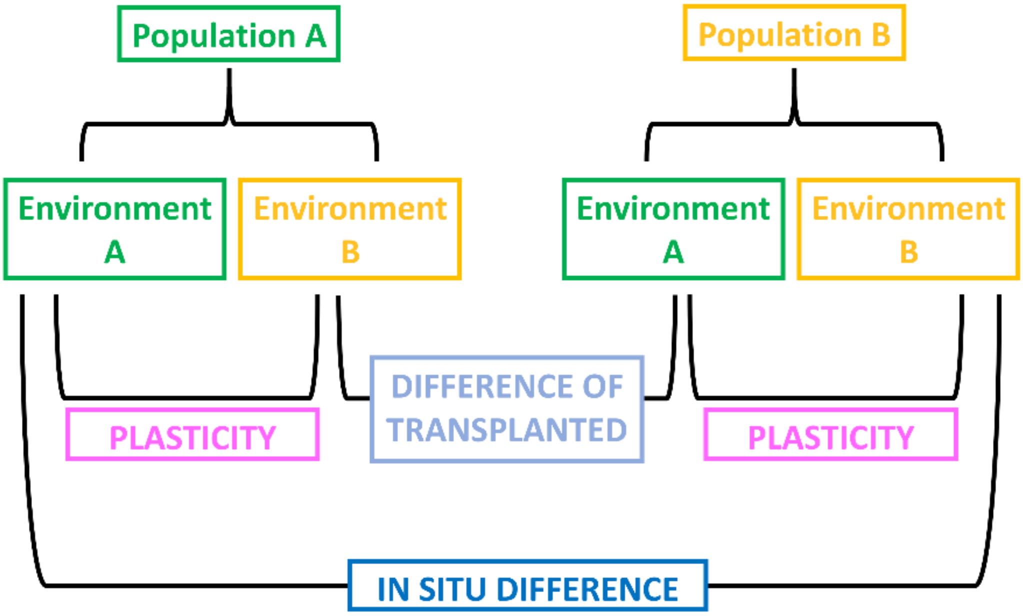
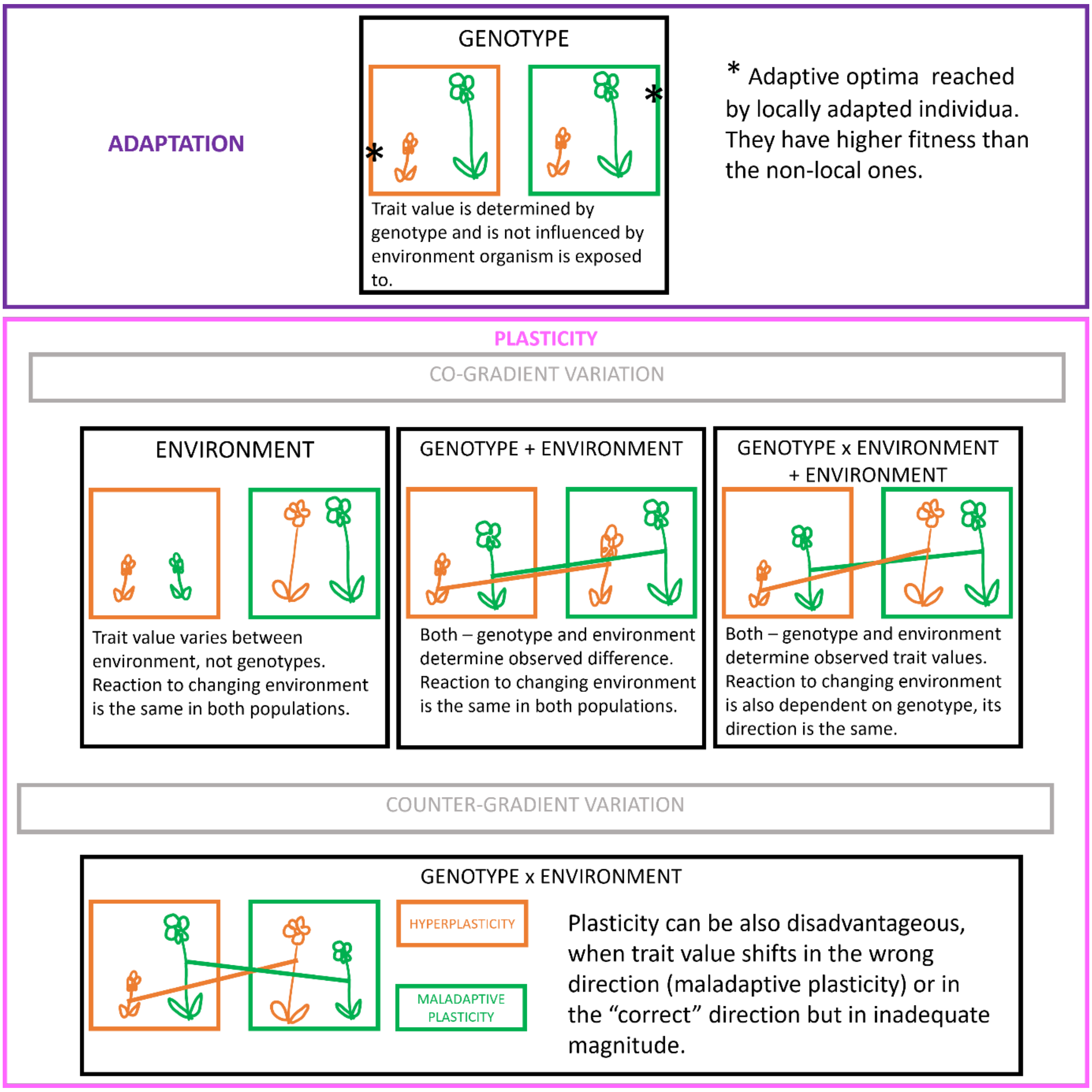


Figure 2 Scheme of reciprocal transplant experiment and ways it can be used to determine adaptation and plasticity contribution (Stamp & Hadfield, 2020).



Trait value is determined by genotype and is not influenced by environment organism is exposed to.

* Adaptive optima reached by locally adapted individua. They have higher fitness than the non-local ones.

Trait value varies between environment, not genotypes. Reaction to changing environment is the same in both populations.

Both – genotype and environment determine observed difference. Reaction to changing environment is the same in both populations.

Both – genotype and environment determine observed trait values. Reaction to changing environment is also dependent on genotype, its direction is the same.

Plasticity can be also disadvantageous, when trait value shifts in the wrong direction (maladaptive plasticity) or in the "correct" direction but in inadequate magnitude.

Figure 3 Sources of variance in phenotypic trait values between environments – possible scenarios when exposing populations of different origin to conditions mimicking both native environments.

1.3 Model system

Alpine environment provides a suitable model for study of adaptive response due to many reasons. It represents strong selective agents, its island-like distribution triggers repeated adaptation and it provides interesting approximation of environmental change relevant for future predictions. Set of environmental factors differentiating alpine localities and their counterparts in lower altitudes also provides hint for environmental factor values which is possible to use when searching for plastic responses.

Arabidopsis arenosa provides such a suitable model system encompassing repeatedly evolved alpine ecotypes (Bohutínská et al., 2021), Figure 4. This species occupies primarily a low- to mid-elevations across most of Europe, however, it independently colonized alpine environment in four mountain regions (Knotek et al., 2020). Alpine plants from all those regions are similar to each other by reduced stature, bigger flowers and proportionally larger investment into vegetative organs but distinct from their respective foothill counterparts, suggesting parallel evolution (Knotek et al., 2020; Měsiček, Goliašová, & Šípošová, 2002).

A common garden experiment demonstrated genetic basis of alpine phenotype overall (Figure 5, however, morphological stability varied from trait to trait suggesting varying degree of environmentally induced variation (phenotypic plasticity). Whether the alpine and foothill ecotypes differ in their total extent of plasticity and how much is such response consistent across independent instances of adaptation (i.e., the regions) remained unknown as plants of the same origin were not subjected to different environments.

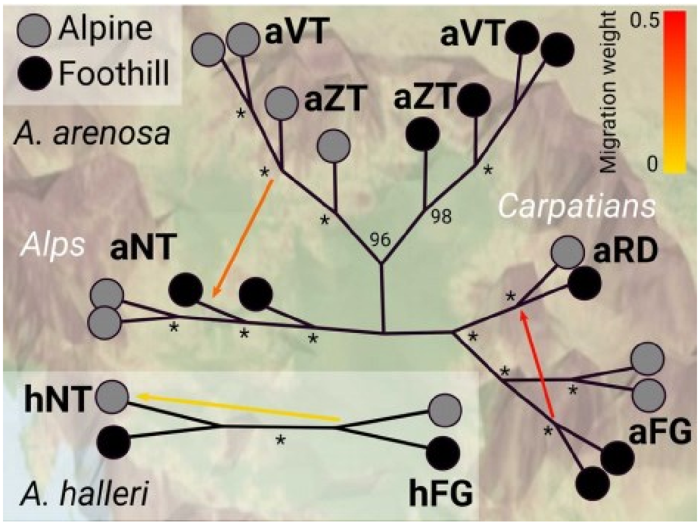


Figure 4 Reconstructed evolutionary history for alpine (grey) and foothill (black) populations of *Arabidopsis arenosa* (Bohutínská et al., 2021).

Figure 5 Common garden experiment with *Arabidopsis arenosa* plants – foothill ecotype plant in the middle, surrounded by plants of alpine ecotype. (Plants mostly from populations used later in the experiment, see Table 1, central plant: pop. AA208, clockwise from top: AA090, AA254, AA084, AA222, AA087, AA065) (photo: Doubravka Požárová).

1.4 Questions

The complex interplay between genotype, phenotype and environment makes it usually difficult to discern role of plasticity and heritable changes in adaptation. Repeated colonisation of challenging environments provides unique chance to test general questions about adaptation as it provides natural replicates of the adaptation process.

Here we established a chamber experiment to assess whether the two ecotypes differ in overall performance and plasticity to selected parameters of alpine environment. By leveraging four independent origins of alpine ecotypes, we tested which traits exhibit consistent environmentally induced response across the regions, suggesting adaptive value of such plasticity.

We manipulated two key factors differentiating the foothill and alpine environments (temperature and irradiance) in a full-factorial design and specifically asked:

1. Does the extent of ecotypic differentiation differ by treatment?
2. Do the ecotypes outperform each other in conditions resembling their native environment?
3. Do originally alpine and foothill populations differ in their phenotypic plasticity? If so, in which traits?

2 Material and methods

2.1 Sampling

Sampling was performed to reflect the evolutionary history of *Arabidopsis arenosa*. Alpine populations were established independently multiple times across European mountain ranges in this species (Knotek et al., 2020) (Bohutínská et al., 2021). Such population structure provides a set of natural replicates of lowland to alpine colonization events and enables comparison between occupied mountain ranges.

There are five mountain ranges where colonization of the alpine environment occurred (Knotek et al., 2020) (Bohutínská et al., 2021), sampling was performed in four of them due to inaccessibility of the last one in the time of seed collection: Eastern Alps – Niedere Tauern (NT), Făgăraș Mts. in Southern Carpathians (FG), Vysoke Tatry Mts. (VT) and Zapadne Tatry Mts. (ZT) (Figure 6).

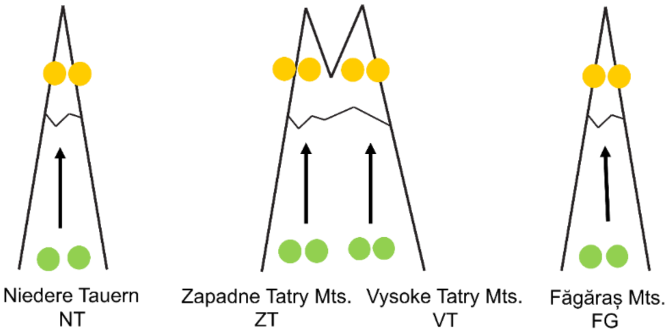


Figure 6 Scheme of sampling design and relationship between populations. Alpine populations (yellow) and lowland populations (green). These colours are used consistently throughout all the schemes.

Based on the species demography modelling, two sampling units are distinguished in Tatry Mts. where alpine populations likely emerged twice – once in diploid lineage (VT) and once in tetraploid lineage (ZT) (Knotek et al., 2020) (Figure 7). Even though interploidy gene flow was detected between those two Tatry Mts. populations (Bohutínská et al., 2021), those are still taken as separate colonization events in this study to reflect also the difference in ploidy between both lineages. Only tetraploid populations were found in other mountain ranges.

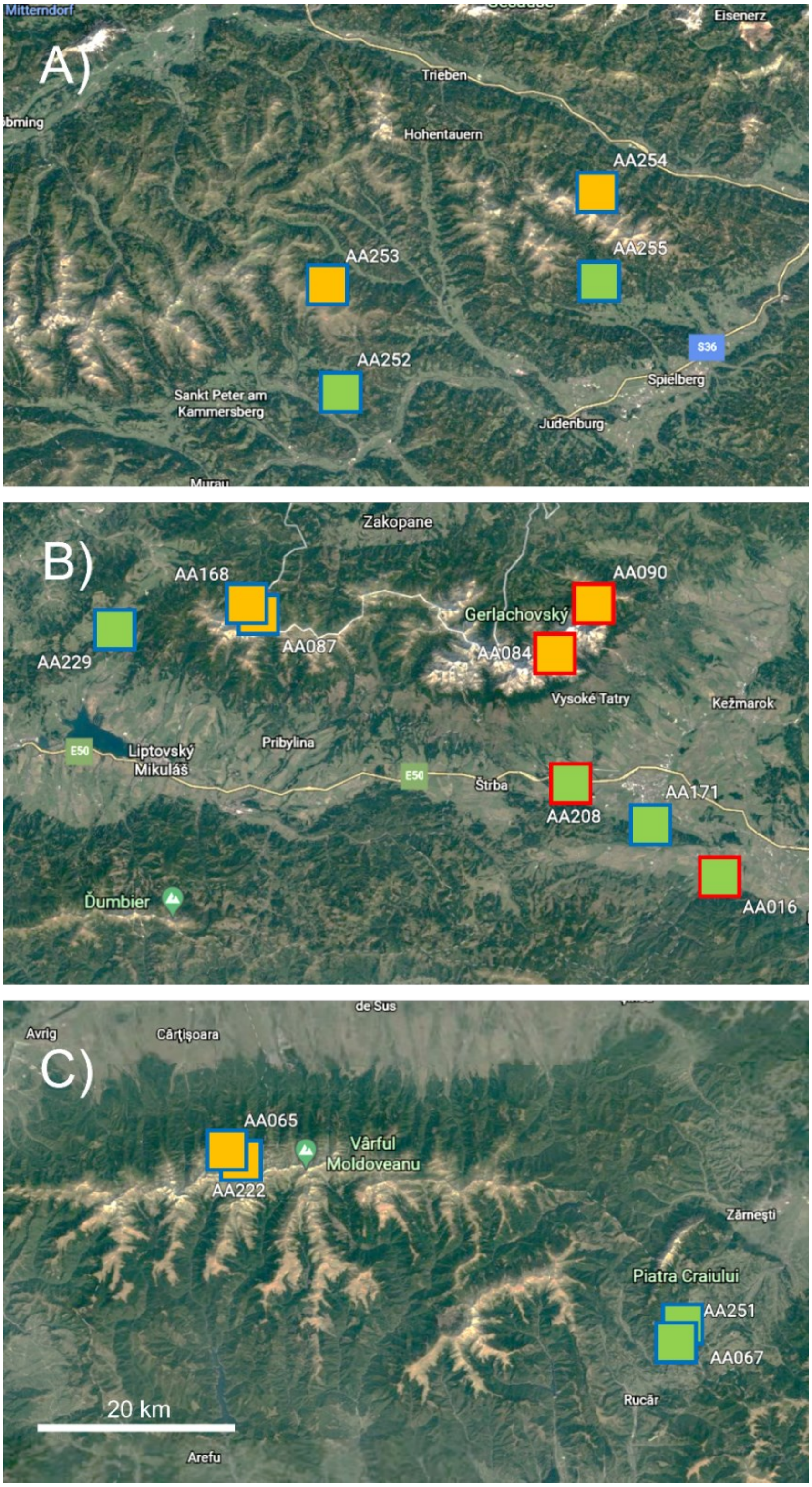


Figure 7 Maps of three mountain ranges with sampling sites of foothill (green) and alpine (orange) populations. A) Eastern Alps – Niedere Tauern (NT), B) Western Carpathians – Vysoke Tatry Mts. (VT) and Zapadne Tatry Mts. (ZT). C) Făgăraș Mts. in Southern Carpathians (FG). Alpine populations (orange), foothill populations (green), diploids (red), tetraploids (blue) (Google Earth, version 9.140.0.5, 2021)

Table 1 Overall information on sampled populations used in the experiment, coordinates are listed in Supplement 1.

population	locality	region	region	ecotype	ploidy	m. a. s. l.
AA065	Lacul Balea	Făgăraș Mts.	FG	A	4x	2269
AA222	Lacul Capra	Făgăraș Mts.	FG	A	4x	2092
AA253	Schießeck	Niedere Tauern	NT	A	4x	2225
AA254	Hochreichart	Niedere Tauern	NT	A	4x	2360
AA084	Velická dolina	Vysoke Tatry Mts.	VT	A	2x	1823
AA090	Zelené pleso	Vysoke Tatry Mts.	VT	A	2x	1625
AA087	Plačlivý Roháč	Zapadne Tatry Mts.	ZT	A	4x	2031
AA168	Tri Kopy	Zapadne Tatry Mts.	ZT	A	4x	1783
AA067	Dambovicioara	Făgăraș Mts.	FG	F	4x	858
AA251	Dambovicioarei	Făgăraș Mts.	FG	F	4x	915
AA252	Schönberg	Niedere Tauern	NT	F	4x	820
AA255	Ingeringgraben	Niedere Tauern	NT	F	4x	970
AA016	Suchá Belá	Vysoke Tatry Mts.	VT	F	2x	600
AA208	Baba	Vysoke Tatry Mts.	VT	F	2x	844
AA171	Hranovnica	Zapadne Tatry Mts.	ZT	F	4x	720
AA229	Kvačianska dolina	Zapadne Tatry Mts.	ZT	F	4x	673

As explained, there are four regions with pairs of alpine and foothill populations included in this study (Table 1). Material was collected from two foothill and two alpine populations per replicate, 16 populations in total. Alpine populations were collected at 1625 to 2360 m. a. s. l. – always above the timberline on scree and rocks; foothill populations at 600 to 970 m. a. s. l. in semi-shaded habitats, often on rocky outcrops and steeper slopes (Figure 8, left)).

Seeds were collected by my colleagues before the start of my project. Approximately 10 plants per population were sampled (example of sampling process Figure 8, right)), sampled plants always grew at least 1 meter from each other to lower the risk of collecting half siblings (*A. arenosa* is an obligate outcrosser). Seeds were dried in paper bags and stored in the refrigerator in Eppendorf tubes until sowing.

Figure 8 *Arabidopsis arenosa* growing on shaded walls of Dambovicioarei gorge (left, photo Doubravka Požárová). Sampling in Dambovicioarei gorge, population AA251 (right, photo Filip Kolář).

2.1.1 Cultivation of the first generation

Seeds collected from natural populations were cultivated in growth chambers under standard conditions used for cultivating *Arabidopsis arenosa* (Wos, Bohutínská, Nosková, Mandáková, & Kolář, 2021): light periods (approximately 300 µmol $m^{-2} s^{-1}$) were set to 16 hours, night to 8 hours, temperatures were 21 °C during the day and 18 °C at night. Plants were cultivated in pots filled with a mixture of sand and peat in a ratio of 3:2.

For each population, 14 flowering plants were used for crossing. As *Arabidopsis arenosa* is outcrossing, available flowers were pollinated manually by a mixture of pollen from different plants from the same population. Produced seeds are thus of siblings and half siblings. Advantage of this procedure is minimalization of maternal effect – seeds of plants cultivated under identical conditions should not be influenced by conditions maternal plant grew in.

2.1.2 Cultivation of the second generation

To test for the effect of alpine adaptation and plasticity in *A. arenosa*, it was necessary to expose plans of different origin (described in sampling section) to a set of conditions mimicking foothill and alpine environment. Two factors – temperature and irradiance, which play important role in natural environments and vary along altitudinal gradient were chosen for cultivation of the second generation of plants.

Specifically, the foothill and alpine temperature settings (Figure 9 A)) were calculated based on meteorological data from Seckau, Austria, approximately 900 m. a. s. l., average temperatures in April and Patscherkofel, Austria, approximately 2200 m. a. s. l., average temperatures in June. Chosen values vary during the day in more natural manner than just day and night differentiation yet still it is necessary to remember that this setting completely neglects role of extremes as it does not include any. Consistent difference of 8 °C between high and low temperature setting is kept during whole day.

Irradiance values (Figure 9 B)) are derived from irradiance data measured by other research group for *Helliospermum pusillum* plant (Erschbamer, 2018) in habitats similar to those of *Arabidopsis arenosa*. Original high irradiance setting turned out to be too harsh for seedlings of *A. arenosa*, plants exposed to those intensities of light did not perform well, did not grow, changed colour to reddish-brown and were under risk of death. As death of half of experimental subject was not desired, irradiance setting was changed after five weeks to 30 % lower.

Two levels of temperature conditions and two levels of irradiance conditions were combined in full-factorial design, resulting in four different treatments (Table 2). Treatment with High temperature and Low irradiance (HL) is the one resembling foothill site conditions by this parameter combination, Low temperature and High irradiance (LH) treatment seeks to be similar to alpine sites.

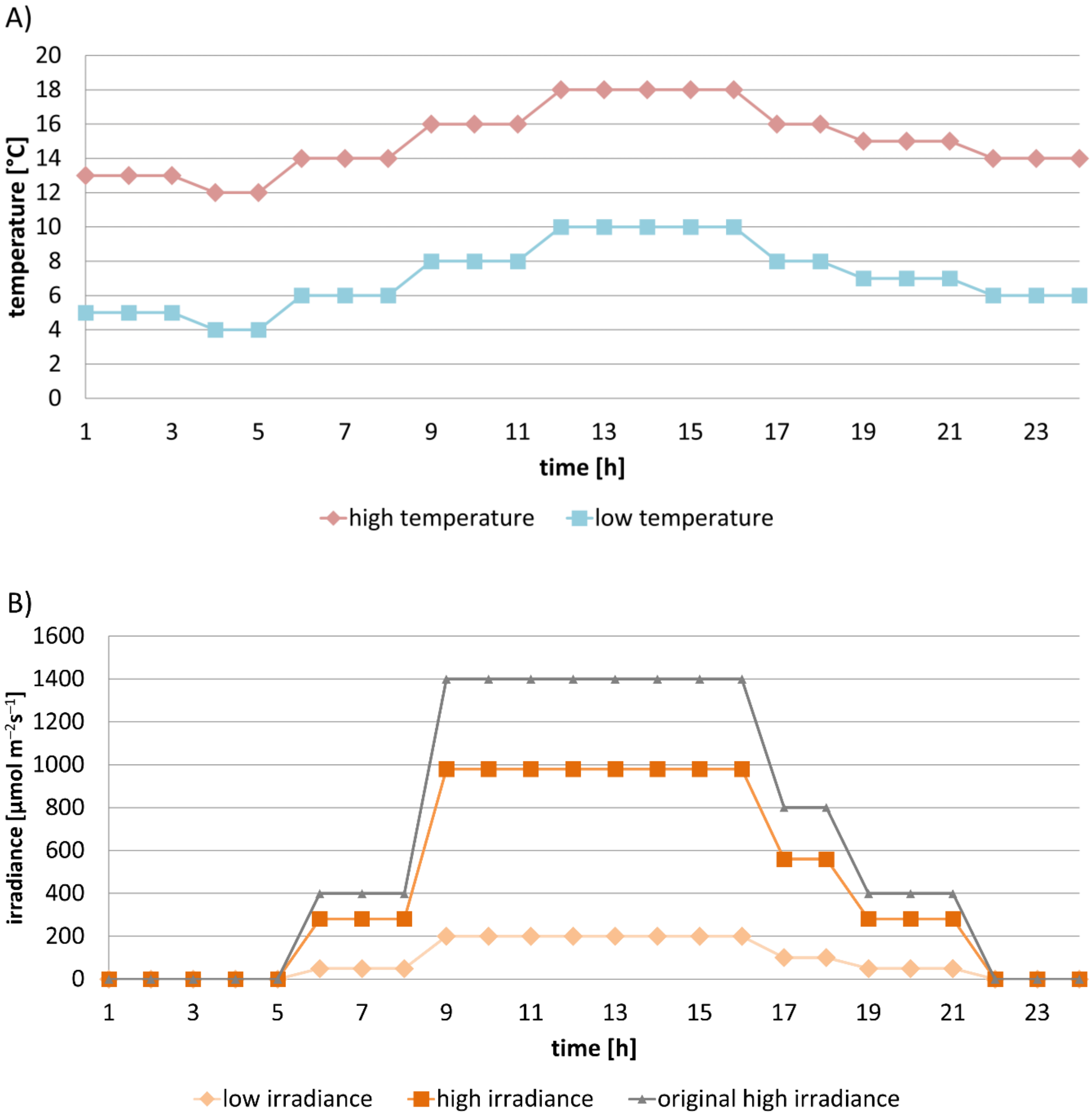


Figure 9 A) Temperature settings. Consistent difference of 8° between high and low temperature setting is kept during the entire day. Values are based on average temperatures Austrian Alps. B) Irradiance setting. Values are based on irradiance data from corresponding habitats. Original high irradiance values were lowered to high irradiance values (-30 %) as plants did not grow well in the original conditions.

Table 2 Experimental design

	High temperature	Low temperature
High irradiance	HH	LH – alpine like
Low irradiance	HL – foothill like	HL

Seeds from 5 maternal lineages were used for each of 16 populations, 5 – 10 seeds were sown in one pot, 320 pots were used in total. Used substrate contained 1:1 non-peat cultivation substrate (floraself, Hornbach) and white sand (kaznějovský, 16 – 22 mm). To avoid parasites (especially Sciaridae) infestation, soil was treated with dilution of parasitoid nematodes eggs. Trays with seeds were covered by humidity domes to avoid over-drying. Illustration of seedlings and cultivation material is on Figure 10.

Half of the seeds was placed to growth chamber with high temperature setting half to the low temperature setting, only low irradiance setting was used (HL and LL treatments). Plants designed to be in high irradiance treatment were moved there after one week (HH, HL treatments). Scheme of experimental design is shown in Figure 11. Overall germination success rate was high enough to start the experiment in growth chambers.

When the plants reached stage with two leaves developed (fifth to seventh week) they were repoted to individual pots (6.9 cm x 6.9 cm x 6.9 cm). In populations when just enough plants germinated all were repoted, if there were more than necessary random seedlings were chosen. To avoid undesired effect of experimental design on results, plants were randomised every two weeks during the entire cultivation period. This minimizes the unwanted effect of specific tray, position within a growth chamber and of a growth chamber on plant development and appearance.

Constant and ample plant moisture was kept in all treatments, which required different amount of water in each treatment as a result of different temperature – irradiance regimes.

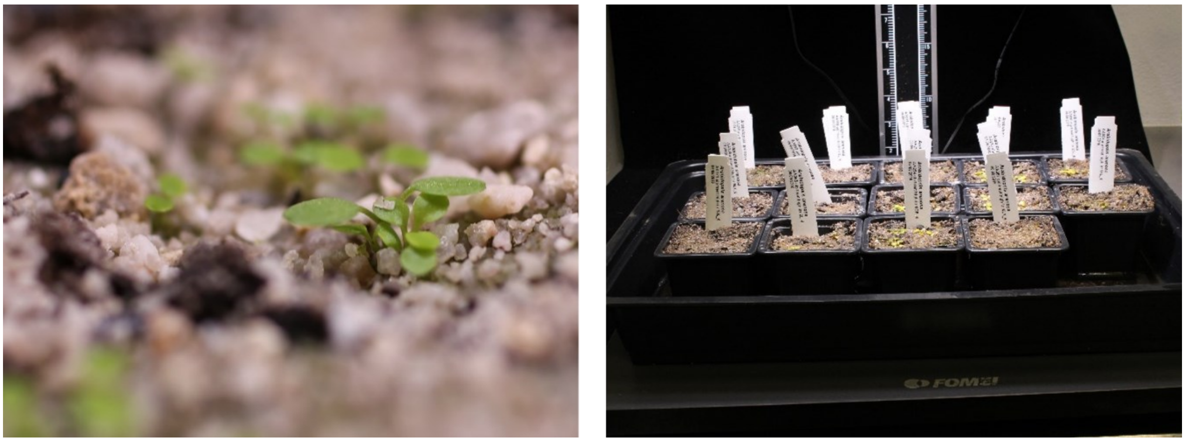


Figure 10 Seedlings of second-generation plants (left, photo: Adam Knotek). Pots and trays used for cultivation (right, photo: Adam Knotek).

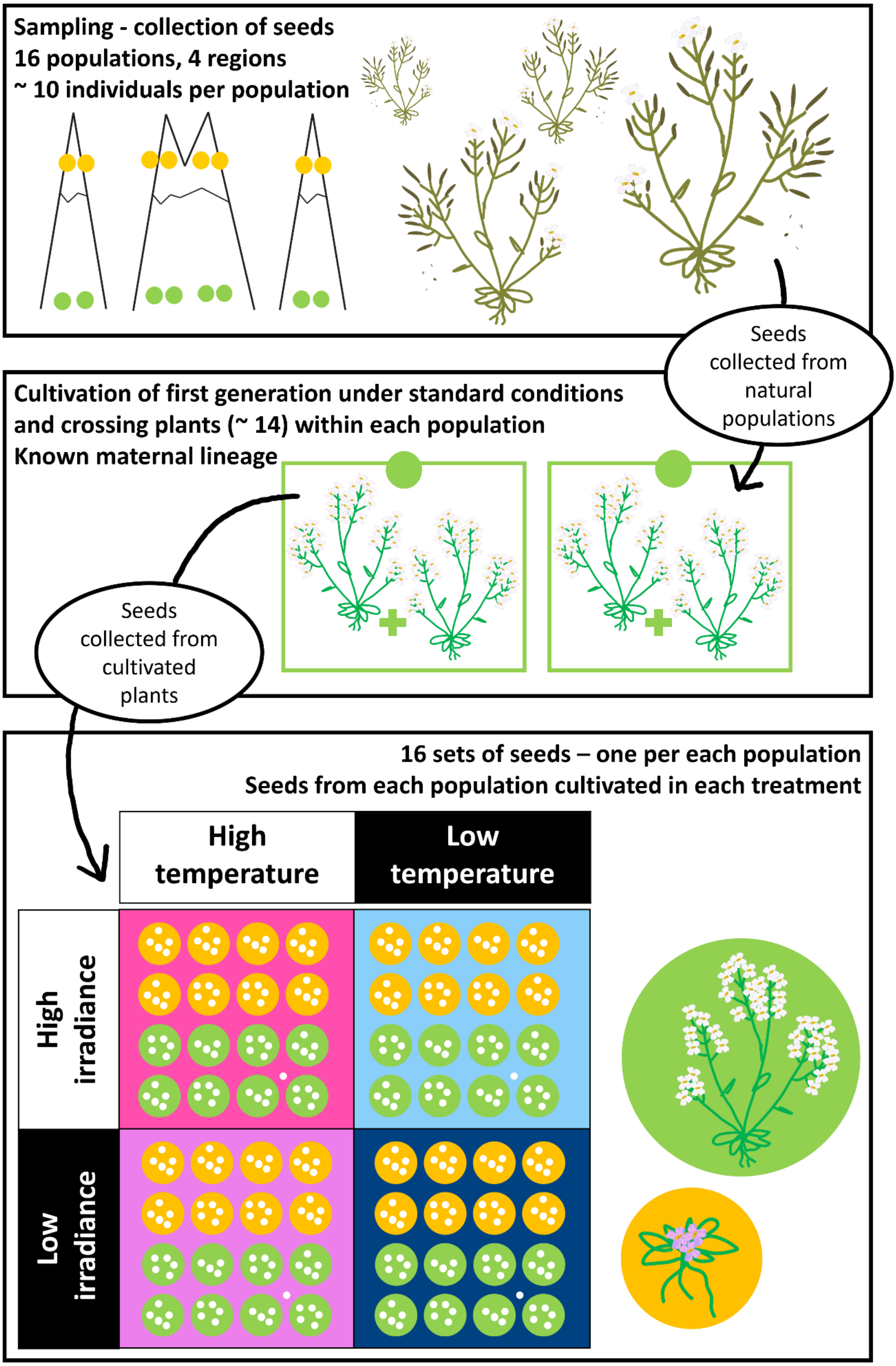


Figure 11 Scheme of the experiment.

2.2 Measurements

Photos (Figure 12) were taken every two weeks during six months period. Unique identity was assigned to plants as they were repotted to individual pots. As soon as plants started to flower, the uppermost flower in the inflorescence was selected and individual flower parts (sepals, petals, anthers, style) were stick to black paper and such vouchers was scanned for future measurements and morphometry analysis.

Photos and scans were processed in Fiji ImageJ2 program (Schindelin et al., 2012) to measure flower trait distances and sizes. Distances were scaled based on scale present in pictures. All data was handled using excel and R software (R Studio).

Other traits were measured at the end of the experiment or in the final developmental stage of plants, using living plants. Considering difference in phenology and risk of losing information because of deteriorating plants in time, I did this final measurement at different time points for different plants always trying to sample fully developed plant (following the procedure successfully applied in (Knotek et al., 2020)). At the end of six months period all remaining plants were collected.

After the last measurement, entire plants were removed from pots, roots were thoroughly washed. Plants were then dried in drying room pressed in newspapers. Completely dry plants were divided to three (sometimes just two, depending on flowering status) parts and weighted using laboratory scales. All measured traits are illustrated on Figure 13 and listed in Table 3.

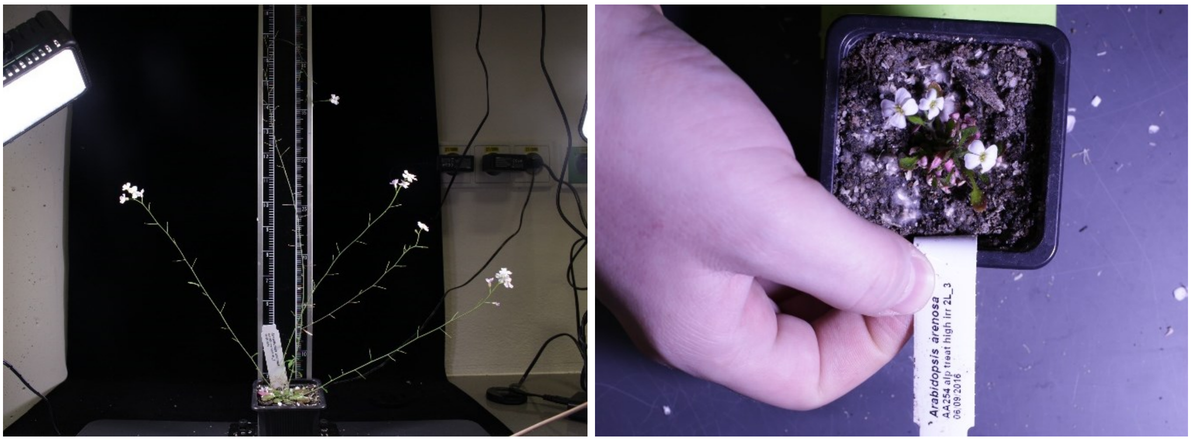


Figure 12 Side view photo (left, photo Doubravka Požárová) upper view photo (right, photo Adam Knotek). Such photos were used for the subsequent analysis.

Sixteen traits (Figure 13, Table 3) were selected to be included in downstream analysis, to analyse traits of functional significance under varying light and temperature levels, resembling variation on natural sites of origin of alpine and foothill populations (Hämälä & Savolainen, 2018; Pigliucci & Schlichting, 1995; Schranz & Osborn, 2004). Thus, some traits of mostly taxonomical importance obtained during experiment were excluded from the final selection even though they were already measured.

Not all plants reached the flowering stage ad as part of the traits is only possible measure for flowering plants, traits in Table 3 are divided to two groups: measured for all plants (measured = all) and measured only for flowering plants (measured = flowering, in pink). This division was decided based on flowering status of plant, which is also important variable showing life history of plant.

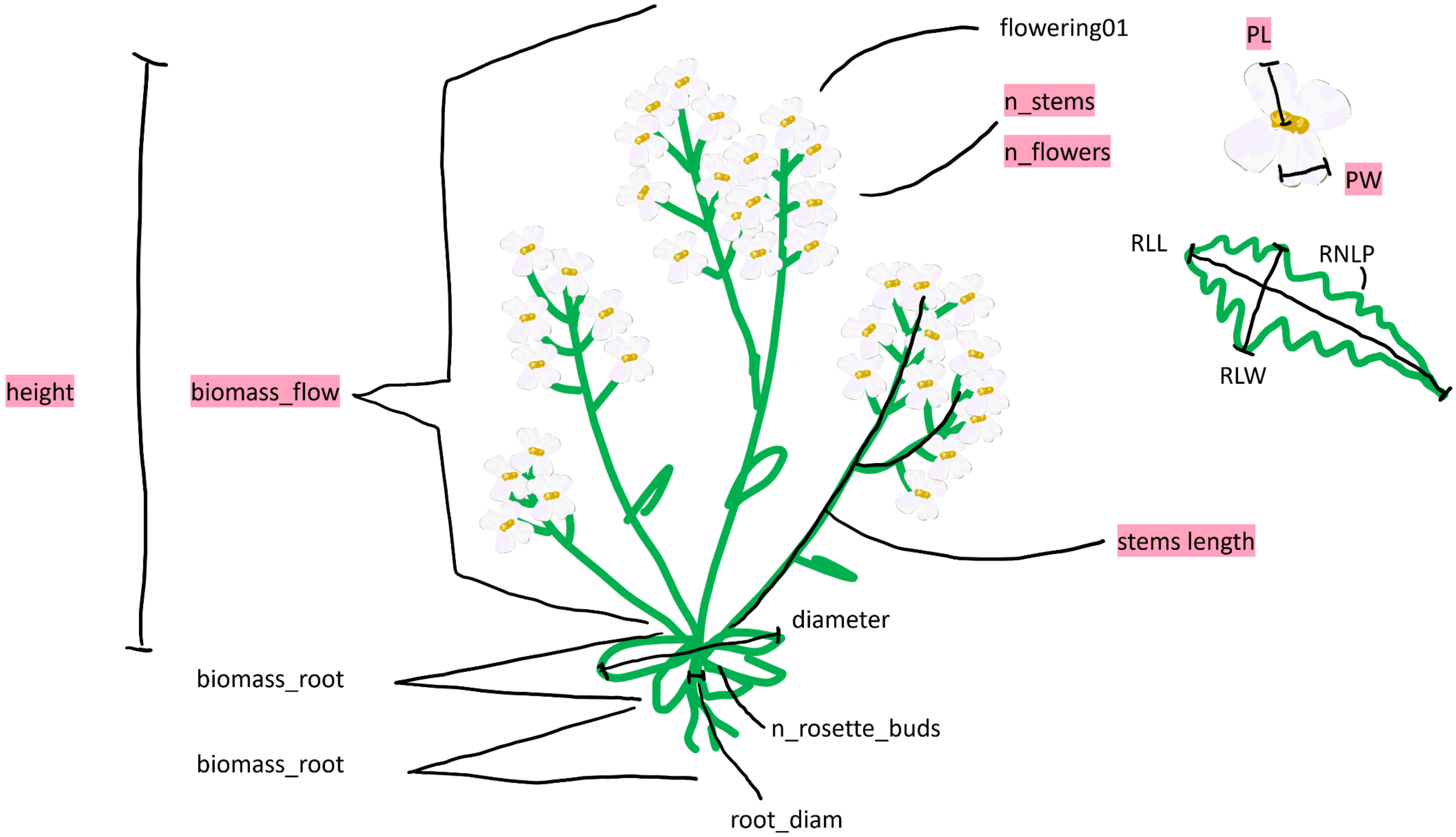


Figure 13 A scheme of 16 measured traits used in the analysis.

Table 3 Traits measured and calculated for cultivated plants.

trait	description	source	units	measured	transformation
biomass_rosette	dried biomass of leaf rosette	dried plant	mg	all	log
biomass_root	dried biomass of roots	dried plant	mg	all	log
flowering01	flowering or not	living plant	0/1	all	none
diameter	diameter of rosette	photo	mm	all	log
RLL	longest rosette leaf length	voucher	mm	all	log
RLW	longest rosette leaf width	voucher	mm	all	log
RNLP	rosette leaf number of lobes	voucher	count	all	sqrt
n_rosette_buds	number of buds found in rosette	living plant	count	all	sqrt
root_diam	diameter of root right under the leaf rosette	living plant	mm	all	log
biomassR_root_shoot	ratio of dried root biomass to above ground biomass (dried leaf rosette and dried biomass of stem if available), root to shoot biomass ratio	*calculated*	ratio	all	sqrt
SLA	ratio of calculated leaf area ((pi * diameter2)/4) to dried biomass of leaf rosette	*calculated*	ratio	all	sqrt
biomass_tot	dried biomass of all available parts of plant, total biomass	calculated	mg	all	log
biomass_flow	dried biomass of stem (including flowers)	dried plant	mg	flowering	log
n_stems	number of separate stems	living plant	count	flowering	sqrt
n_flowers	number of flowers present on the plant over time (including flowers and remnants of flowers)	living plant	count	flowering	sqrt
height	height of plant - longest stem	photo	mm	flowering	log
stems_length	overall length of all stems and branches	photo	mm	flowering	log
PL	petal length	voucher	mm	flowering	log
PW	petal width	voucher	mm	flowering	log
biomassR_gen_veg	ratio of dried root and leaf rosette biomass to dried biomass of stem, generative tovegetative biomass ratio	*calculated*	ratio	flowering	sqrt

2.3 Analyses

Analyses were performed using R (R Core Team, 2021) with the RStudio (RStudio Team, 2021) environment. Tidyverse package (Wickham, 2021) functions were used intensively to manage and prepare the data. For graphical visualisation mostly ggplot (Wickham, 2016) package and its extensions were used.

2.3.1 Principal component analysis, linear discriminant analysis and classification analysis

Principal component analysis (PCA) was used to illustrate the main trends in the variability of the data. Plotting was done with ggfortify (Horikoshi & Tang, 2018). Linear discriminant analysis was used to characterize measured traits which contribute to separation of ecotypes and treatments. Classification analysis was deployed to quantify success rate of observed classifications to predefined groups (treatments, ecotypes) based on available measured data. Both linear discriminant analysis and classification analysis were performed using Morphotools (Koutecký, 2015).

2.3.2 Bayesian linear regression

Bayesian linear regression was used to describe and test differences between reactions of ecotypes to different treatments. I chose to use Stan software (Stan Development Team, 2021) with Rstan interface (Stan Development Team, 2020) as this combination provides friendly user experience, many plotting options and manuals and examples are widely available and actualized.

In general, Bayesian inference quantifies probability of certain parametric values (θ) given the existing data (D) (Equation 1).

$$P(\theta|\mathrm{D})\frac{P(\theta)\times P(D|\theta)}{\Sigma\, P(\theta)\times P(D|\theta)}$$

Equation 1 Bayesian theorem.

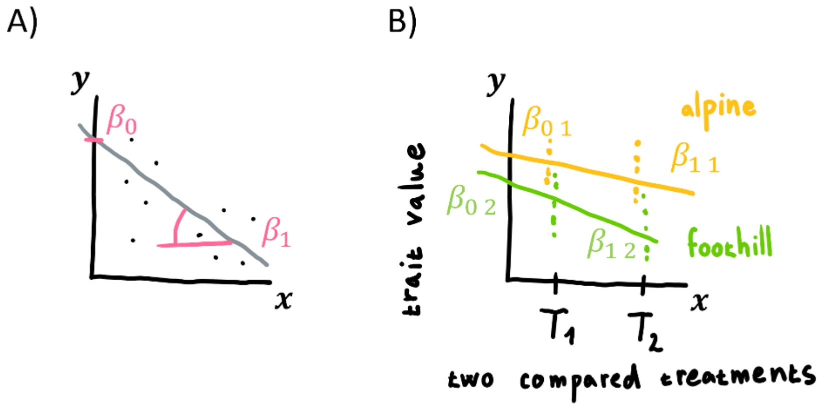


Figure 14 Parameters estimated by used model.

I want to characterize parameters describing regression line β_0 (intercept of regression line with y axes) and β_1 (slope of regression line) (Figure 14 A)). In this case, β_0 necessary for estimation trait values for groups and β_1 is representing reaction of given group of plants to different treatments as illustrated on Figure 14 B).

Assuming y values are from normal distribution two parameters are necessary to describe it μ – mean of distribution and σ – standard deviance of the distribution, where σ is standard deviance for each observation and μ is calculated based on β0, β1 and x values. x values are given in data and β0 and β1 parameters are modelled to describe observed values as well as possible. There are no prior expectations according to parameter values. This is described by Equation 2 and schematically illustrated on Figure 15.

$$\boldsymbol{y} \sim N(\mu, \sigma)$$
$$\mu = \beta_0 + \beta_1 \times \boldsymbol{x}$$
$$\beta_0, \beta_1, \sigma \sim uniform\ distribution$$

Equation 2 Equation for linear regression.

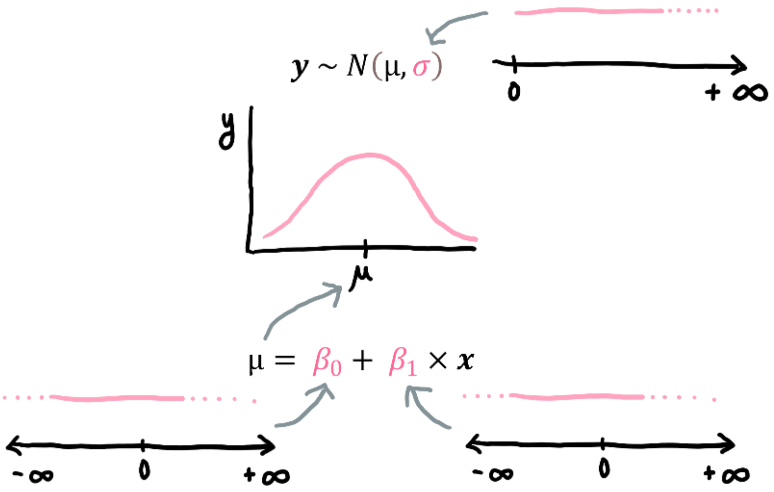


Figure 15 Scheme of parameters and distributions.

2.3.3 Statistical model for testing plasticity effects

To answer questions concerning ecotype performances in various treatments and differences in performance between treatments I wrote statistical model inferring posterior probabilities of variable values, based on my data.

As there can be found more groups in my data (interacting ecotype and region information) I have decided to model with sub-group parameters as described in Equation 3. I have tried to also include an additional level of population, hierarchically nested within regions but there is not enough data for all groups and the model was not converging properly for those reasons. I chose gamma distribution as my measured values can be only positive and are mostly positively skewed (Supplement 4).

My transcription of this model to stan language is in Supplement 5. For each dataset model is ran in 60000 iterations, including 10000 warmup iterations, which are not included in posterior fitted values. Data was processed to state when usable for the model as described in script in Supplement 6.

$$y \sim gamma(\boldsymbol{\alpha}, \boldsymbol{\beta})$$

$$\boldsymbol{\alpha} = \frac{{\mu_{ke}}^2}{\sigma_y}$$

$$\boldsymbol{\beta} = \frac{\mu_{ke}}{\sigma_y}$$

$$\mu_{ke} = \beta_{0ke} + \beta_{1ke} \times x_{ke}$$

$$\beta_{0ke} = \beta_{0e} + e_{0ke}$$

$$\beta_{1ke} = \beta_{1e} + e_{1ke}$$

$$e_{0ke}, e_{1ke} \sim N(0, \sigma_d)$$

$$\beta_{0e},\ \beta_{1e},\ \sigma_y,\ \sigma_d \sim uniform\ distribution$$

Equation 3 Parameters estimated for more groups of observed individuals.

Prepared data are passed to stan model in **`data`** part model (Supplement 5). Main parameters are estimated in **`parameters`** part of script. **`Transformed parameters`** section includes parameters which were calculated using parameters estimated in previous part of model.

Part including probability distributions expectations is in **`model`** part of Supplement 5. All parameters with undefined prior distribution are assigned an implicit uniform prior with limits based on declaration of variable. β_{0e} and β_{1e} values are drawn from uniform distribution (-∞, +∞), sigma parameters are limited to positive values (0, +∞).

With parameters estimated in previous parts in last part of model I compute other **`generated quantities`** useful for result presentation, like difference in line slopes and values for treatments. All parameters are generated in a form of their value distributions. Overall scheme of model is illustrated by scheme on Figure 16.

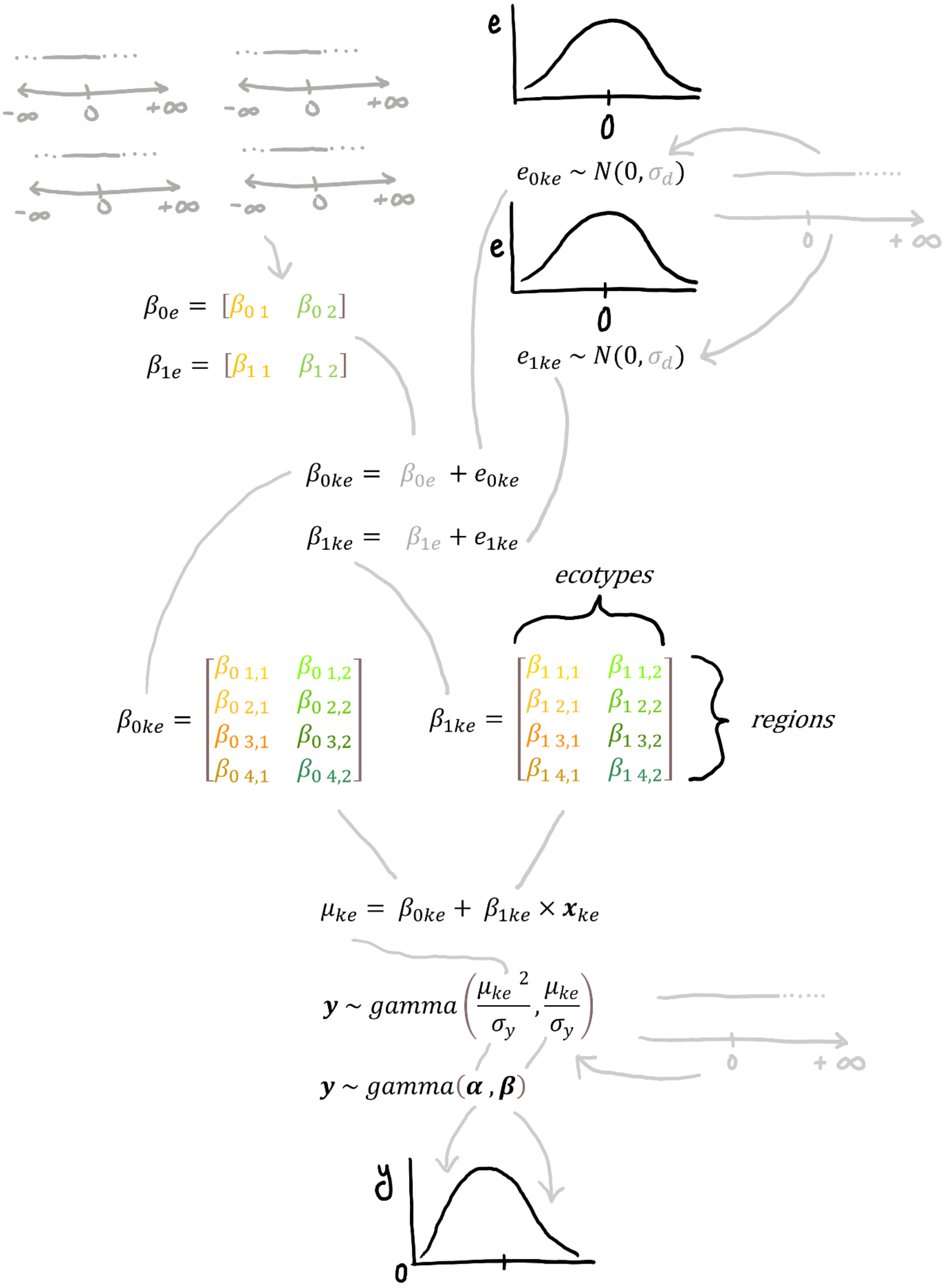


Figure 16 Diagram of the stan model I prepared.

3 Results

3.1 Dataset description

In total I grew 524 plants across the four treatments (distributed in the experimental conditions as shown in the Figure 17, dataset in Supplement 2) until collection, in some populations low number of plants germinated but overall, only a few plants died. The uneven number of plants cultivated in treatments is given by lower number of growth chambers with high irradiation settings accessible and the fact that the germination of alpine plants was the lowest in the LL treatment, suggesting that these conditions represent generally unfavourable set of conditions (Figure 17).

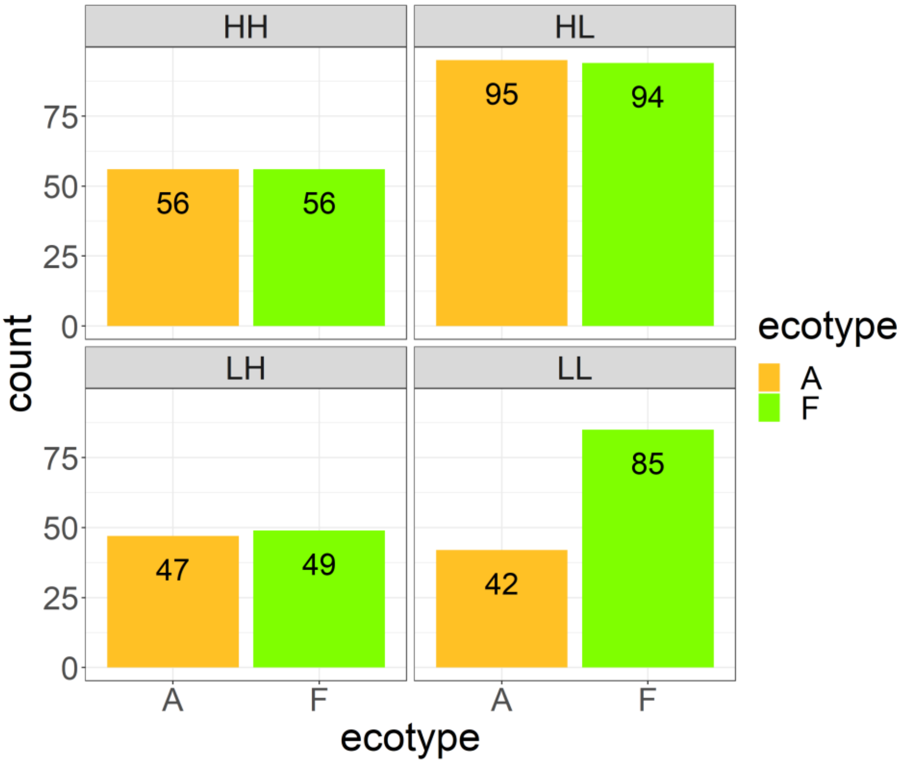


Figure 17 Number of plants that survived until the end of the experiment. First column shows the two high irradiance treatments (HH, LH), where around 100 plants per treatment were cultivated, the second one low irradiance treatment with more chambers accessible. Is evident that the Low irradiance Low temperature treatment (LL) was problematic for plants of alpine origin resulting in a lower number of plants in that treatment.

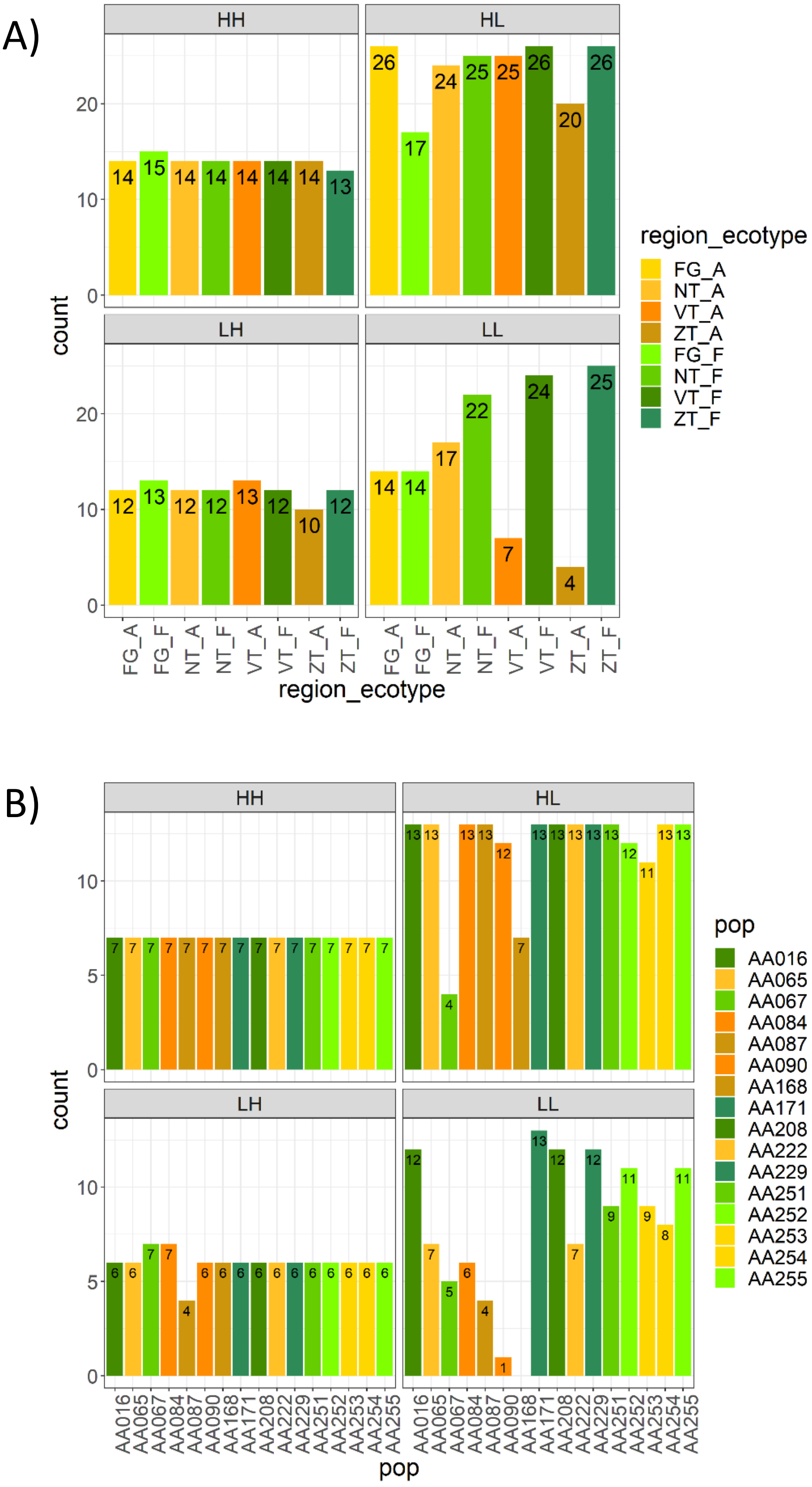


Figure 18 A) Number of individuals from each region divided by ecotype. B) Numbers of individuals from each population. For region and population codes see Table 1.

As demonstrated in the Figure 18, I experienced remarkable variability in the number of plants per ecotype and region and the finally obtained number often differs from intended design of minimum 12 individuals per region and ecotype combination (respectively 6-7 plants per population in high irradiance conditions and 12 – 13 plants per treatment for low irradiance conditions). The inequality of dataset was later magnified in (non)flowering plants because substantial number of measured traits (Table 3) is related to flowering and not possible to measure on non-flowering plants (see Figure 19 and Figure 20).

This high inequality in the initial dataset, caused by the unpredictability of plant germination, growth, and development, provided challenging for the subsequent analysis. Thus, as a part of my diploma thesis results, I prepared a Bayesian model, designed to deal with datasets (Chapter 2.3.3).

Since not all plants were flowering and comparing flowering and nonflowering plants is complicated, the dataset was divided to two parts (**Dataset I**) a 'full dataset' of all 524 individuals and 12 traits scored on vegetative organs (Table 3, white) and (**Dataset II**) only 390 individuals reaching flowering-stage but with all traits measured (Table 3, all traits). Table 3Boxplots summarizing the distribution of the values for all measured traits, separately for each ecotype and treatment, are available in Supplement 3.

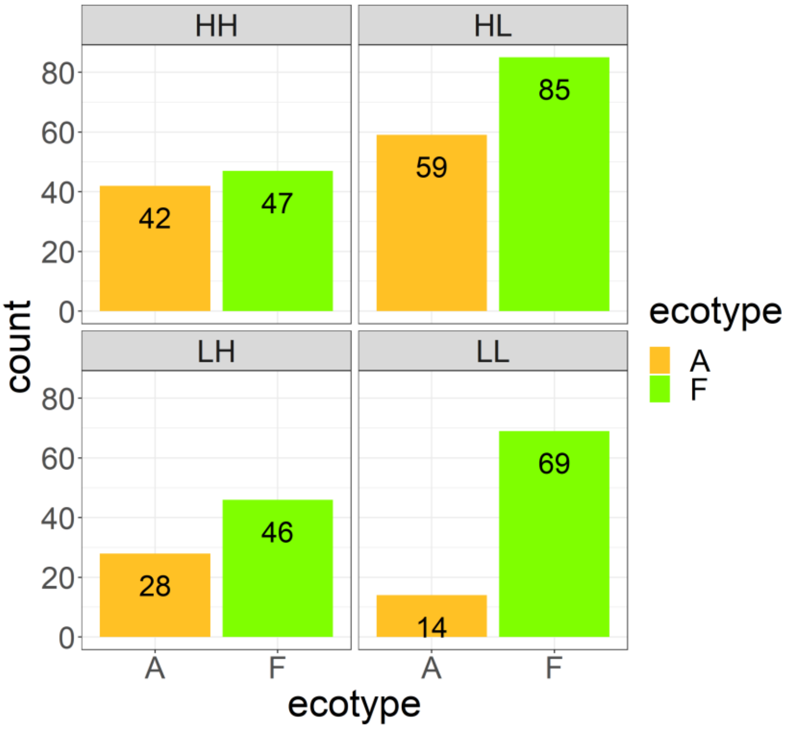
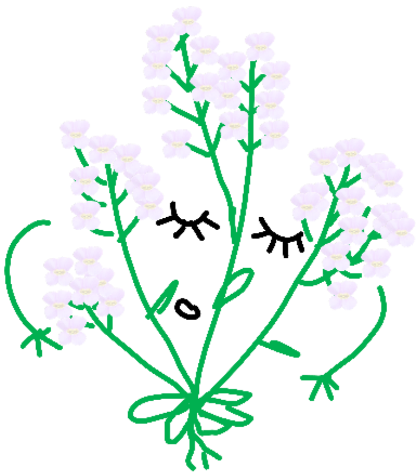


Figure 19 Numbers of flowering individuals from each ecotype grown in each treatment.



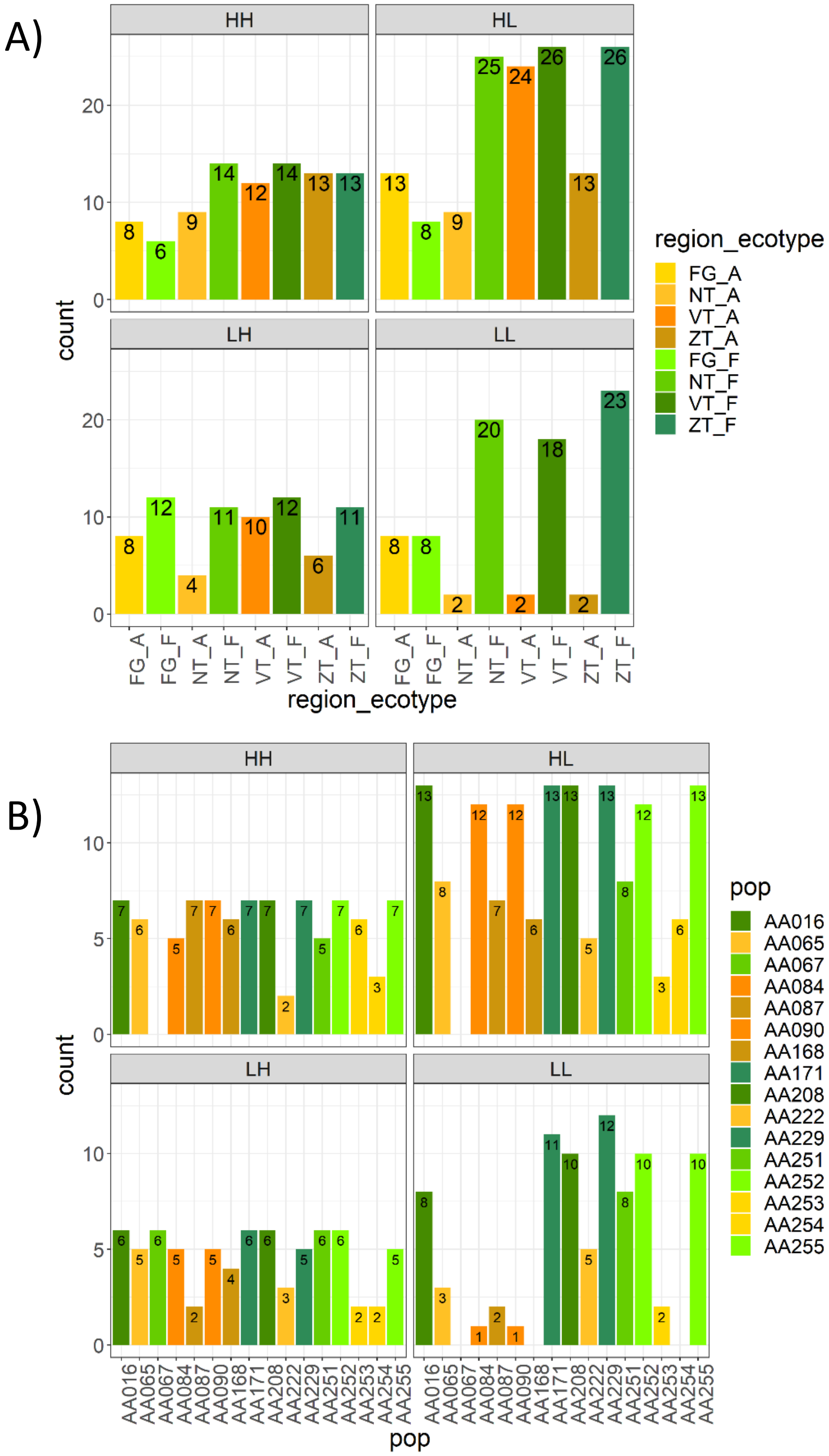
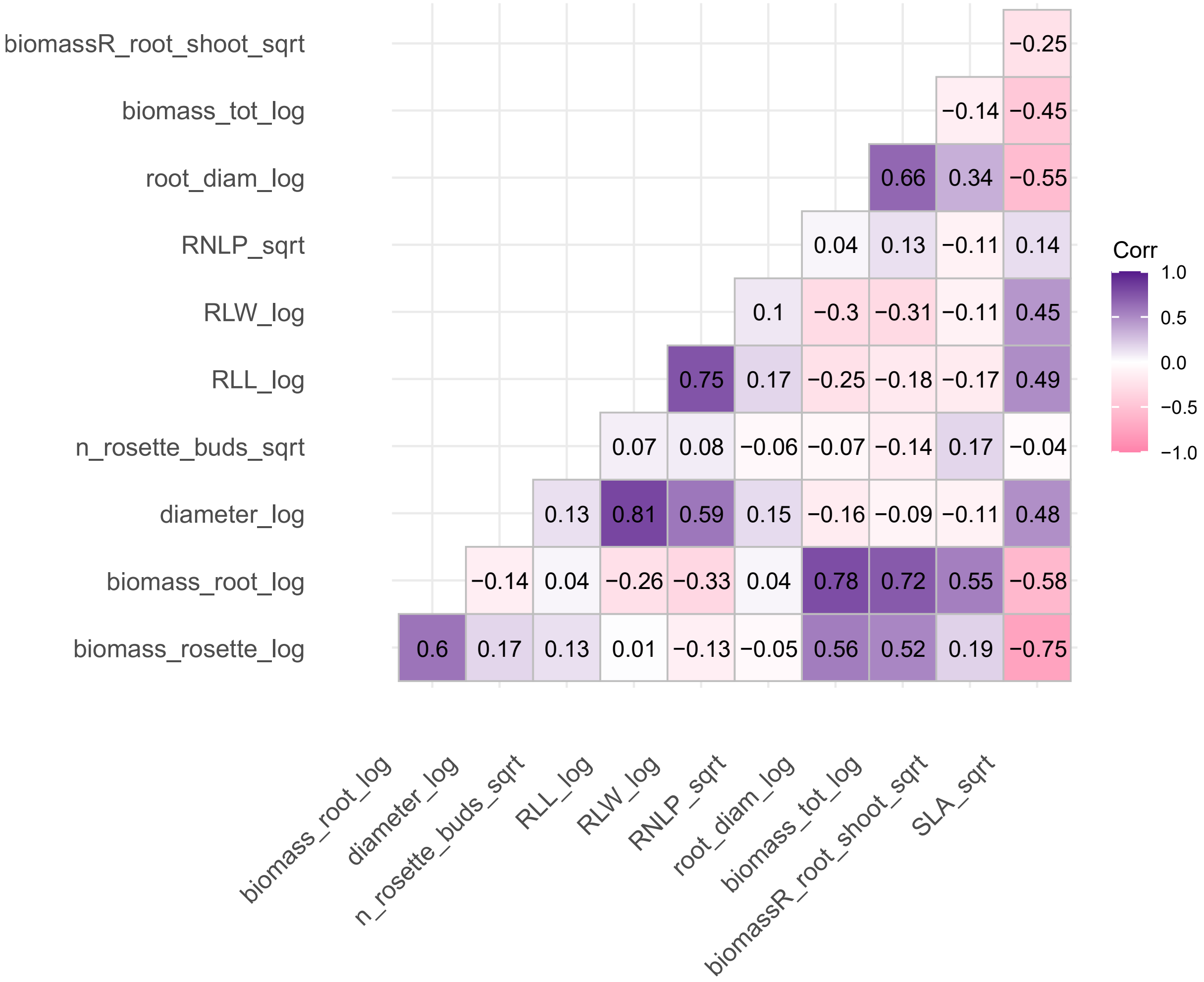


Figure 20 A) Numbers of flowering plants from each region separated according to an ecotype at the end of the experiment B) Numbers of flowering individuals from each population. For region and population codes see Table 1.

3.2 Extent of ecotypic differentiation

To avoid using too strongly correlated traits in subsequent principal component analysis, linear discriminant analysis and classification analysis, I firstly calculated correlation among measured phenotypic traits using Pearson's correlation (Figure 21, Figure 22). To approach normal distribution, I transformed the data – with log transformation in case of measurements of weight and length and square root transformation in case of ratios and counts (Table 3); only quantitative variables were used. Histograms of transformed values are in Supplement 4.

Missing values were replaced by population means for each treatment separately in dataset I – non-flowering and dataset II – flowering plants. Only a single variable, stems_lenght available in dataset II, correlated with biomass of flowering parts with higher correlation coefficient than +- 0.9. Thus, this trait was excluded from further analysis. No correlation among traits > +- 0.9 has been found in dataset I. Correlations are shown in Figure 21 for dataset I and Figure 22 in for dataset II.



	biomass_root_log	diameter_log	n_rosette_buds_sqrt	RLL_log	RLW_log	RNLP_sqrt	root_diam_log	biomass_tot_log	biomassR_root_shoot_sqrt	SLA_sqrt
biomassR_root_shoot_sqrt										−0.25
biomass_tot_log									−0.14	−0.45
root_diam_log								0.66	0.34	−0.55
RNLP_sqrt							0.04	0.13	−0.11	0.14
RLW_log						0.1	−0.3	−0.31	−0.11	0.45
RLL_log					0.75	0.17	−0.25	−0.18	−0.17	0.49
n_rosette_buds_sqrt				0.07	0.08	−0.06	−0.07	−0.14	0.17	−0.04
diameter_log			0.13	0.81	0.59	0.15	−0.16	−0.09	−0.11	0.48
biomass_root_log		−0.14	0.04	−0.26	−0.33	0.04	0.78	0.72	0.55	−0.58
biomass_rosette_log	0.6	0.17	0.13	0.01	−0.13	−0.05	0.56	0.52	0.19	−0.75

Figure 21 Correlation among the 10 vegetative traits in the full dataset (N of individuals = 524). The values reflect Person's correlation coefficient, shading depicts intensity of the correlation. None of the person's correlation coefficient values exceeds 0.9 which was set as threshold value.

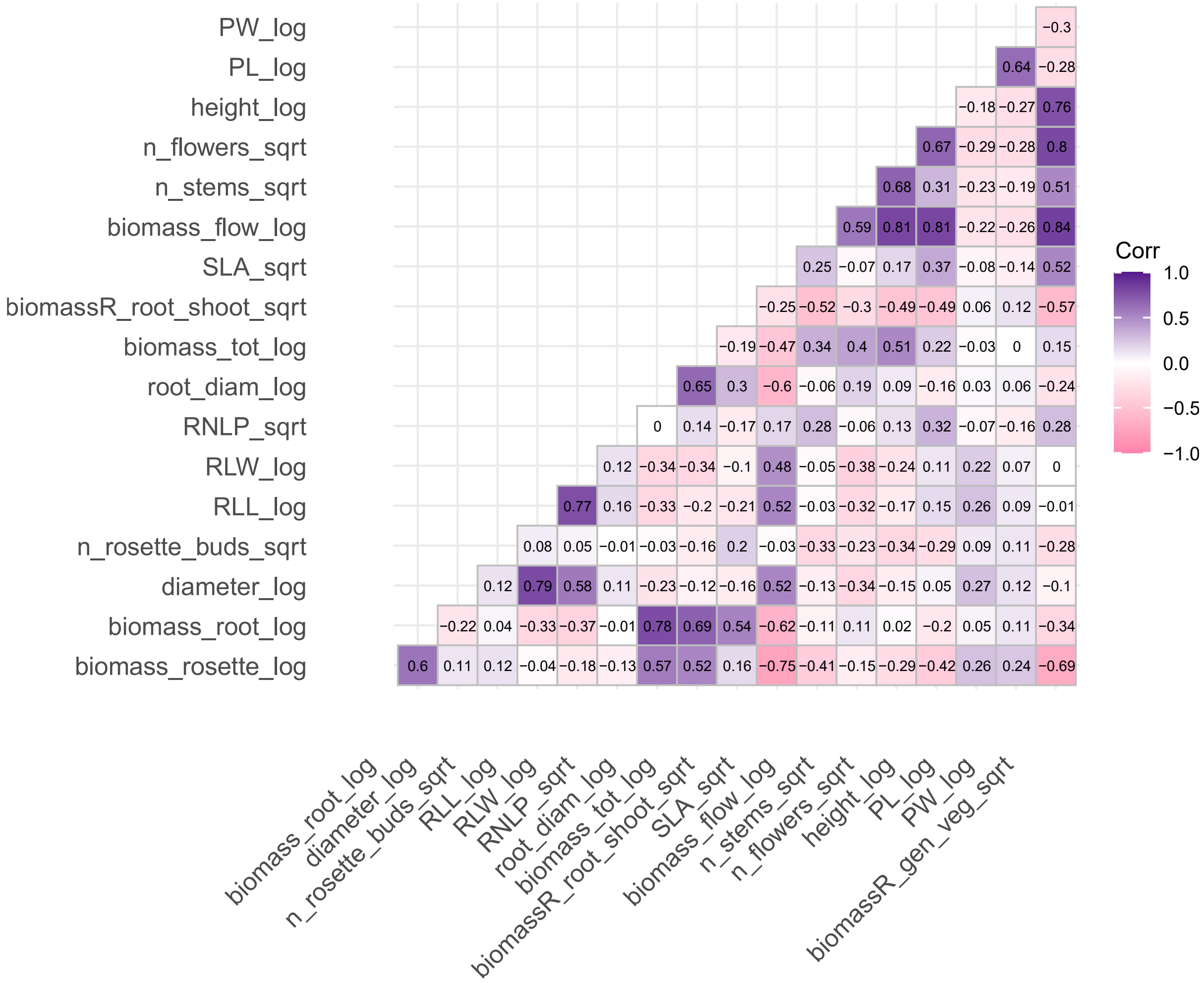


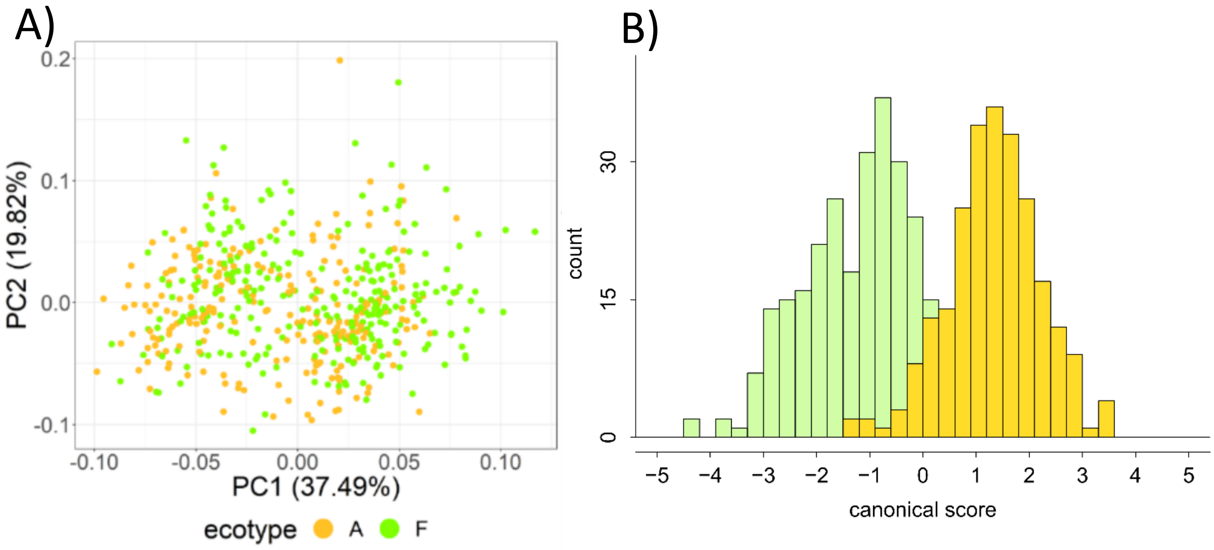
Figure 22 Correlation among the 17 vegetative and flowering traits used in the analyses of in the full dataset (N of individuals = 390). The values reflect person’s correlation coefficient, shading depicts the strength of the correlation. I removed the stems length (stems_length) variable as it was highly correlated (> +-0.9) with biomass of flowering parts (biomass_flow).

3.2.1 The extent of differentiation in vegetative traits (dataset I)

Using the two pre-processed datasets, I started with inquiry of the main trends in variability of the data. Firstly, I used ordination analyses to display the relationships among all individuals characterized by all quantitative functional traits scored. Principal component analysis (PCA) of all individuals from all treatments, with vegetative traits only, showed less clearly defined groups defined by ecotypes Figure 23 A) than groups from the same treatment - Figure 24 A) providing a first hint about potentially strong morphological plasticity. Figure 23 B) and Figure 24 B) showed results of linear discrimination analysis illustrating how well the set of phenotypic traits discriminate between predefined groups (in first case ecotypes, in second case treatments). The corresponding classification based on linear discriminant analysis result is displayed in tables on Figure 23 D) and Figure 24 D). When the full dataset I was analysed, ecotype classification success (89.7%) exceeded the treatment classification success (82.8%) suggesting higher effect of heritable basis of these traits.

This pattern of morphological discrimination changes when treatments are divided not to four, but to two groups based only on one factor of two used (temperature or irradiance) see Figure 25. Discrimination is more successful for contrast between High irradiance (HH, LH) and Low irradiance (HL, LL) – 96.8 % Figure 25 A), B) than for contrast between the groups based on temperature level High temperature (HH, HL) and low temperature (LH, LL) , with 81.5 % correctly classified individuals Figure 25 C), D).

The traits most strongly contributing to the discrimination between predefined groups are listed in tables on Figure 23 C) and Figure 24 C). Differences between treatments, that can be considered plastic, are mostly based on differences in complete biomass, biomass of root and diameter of root and the rosette diameter and length of the longest rosette leaf. Traits mostly contributing to the differences between ecotypes are biomass of rosette, number of rosette leaf lobes, SLA and root:shoot ratio.



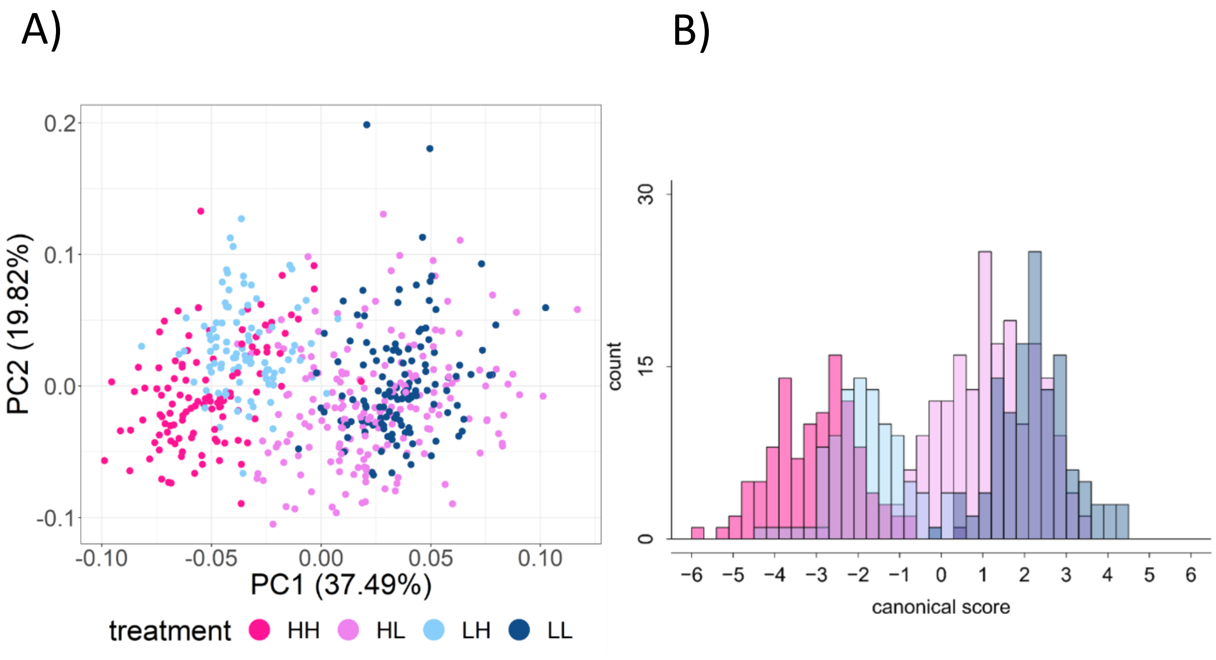
C)

Character	CCA1
biomass_rosette	0.44
RNLP	-0.39
SLA	-0.29
biomassR_root_shoot	0.24
n_rosette_buds	0.21

D)

Ecotype	N	Correct %
A	240	91.3
F	284	88.4
Total	524	89.7

Figure 23 A) Ordination analysis for vegetative traits (dataset I, N traits = 10, N individuals = 524) with individuals separated according to the ecotype (alpine, A, foothill, F). The first component explains 37% of the variation, and the second component 20% (rounded). No clear separation of ecotypes is seen across all treatments. B) Scores of individuals belonging to the two ecotypes on the first (discriminant) axis of the linear discriminant analysis (LDA). LDA results show imperfect separation of the two groups (ecotypes). C) Characters mostly contributing to ecotype discrimination; correlation coefficients associated with the first discrimination axis (CCA1) are shown. D) Success of classification (CA) based on ecotype.



C)

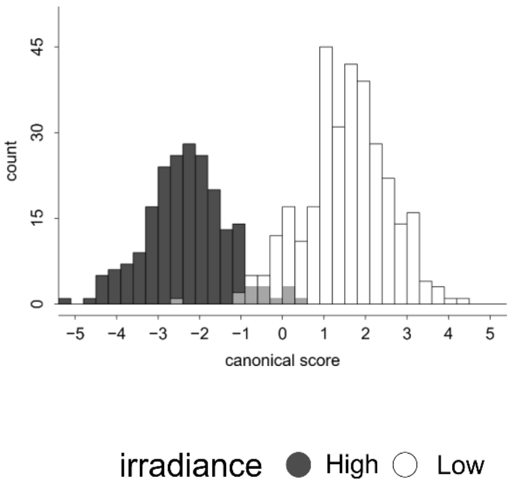
Character	CCA1	Character	CCA2
biomass_tot	-0.47	diameter	-0.61
biomass_root	-0.46	biomass_tot	-0.45
root_diam	-0.44	RLL	-0.41
SLA	0.42	SLA	-0.35
RLW	0.41	n_rosette_buds	0.31

D)

Treatment	N	Correct %
HH	112	81.3
HL	189	79.4
LH	96	85.4
LL	127	87.4
Total	524	82.8

Figure 24 A) PCA ordination based on vegetative traits (dataset I, N traits = 10, N individuals = 524). The first component explains 37% of the variation, and the second component 20% (rounded). Individuals are mostly separated into two groups based on the type of irradiance treatment. B) Results of linear discriminant analysis shows the groups are mostly divided by irradiance level along the first axis (CCA1) while the second axis discriminates approximately between the temperature (not shown). C) Characters mostly contributing to treatment discrimination along the first two discriminant axes (CCA1, CCA2); correlation coefficients on the axes are shown. D) Success of classification (CA) based on the four treatment groups.

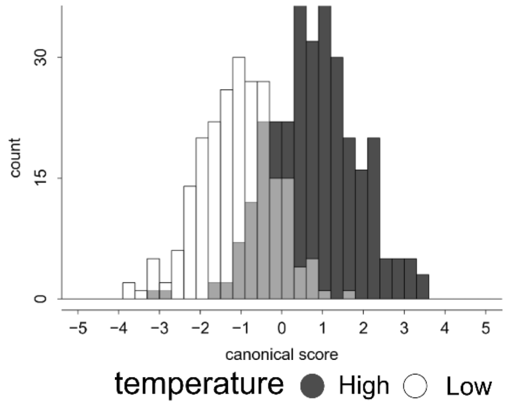
A)



B)

Irradiance	N	Correct %
H	208	97.1
L	316	96.5
Total	524	96.8

C)



D)

Temperature	N	Correct %
H	301	79.4
L	223	84.3
Total	524	81.5

Figure 25 Results of linear discriminant analysis shows that plants are better divided by irradiance level A) than temperature level B). Success of classification (CA) is higher in irradiance groups B) – 96.8 % than temperature groups D) – 81.5 %.

3.2.2 Extent of differentiation in flowering (generative) traits (dataset II)

Next, I analysed the subset of flowering plants and thus involving flowering traits (dataset II). Firstly, I tested for the possible difference between foothill and alpine ecotype in their ability to flower in my experiment. I used chi square test and the input was the number of flowering vs. non-flowering plants (flowering01). Total number of plants of given ecotypes and their flowering status (0 = did not flower, 1 = flowered) is shown in Table 4, There is significant difference between alpine and foothill ecotype in flowering incidence, with higher probability of flowering in foothill ecotype (X-squared = 49.837, df = 1, p = 1.671e^{-12}). This suggests a difference in life strategies between the ecotypes, with short lived foothill plants investing more to flowering every year compared to alpine plants which tend to be perennial and may also have stricter requirement of vernalization.

Table 4 Number of plants of given treatment which were not flowering.

	Alpine	Foothill
Not flowering (0)	97	37
Flowering (1)	143	247

Testing differences separately in all four treatments gives significant results in three of four treatments. For LH – Low temperature High irradiance, HL – High temperature Low irradiance and LL – Low temperature Low irradiance the p-value is < 0.05; for HH – High temperature High irradiance the result is non-significant, and the two ecotypes are indistinguishable in flowering incidence. Numbers of individuals in each category are shown in Table 5. As light is known factor stimulating flowering, it is possible that the difference between ecotypes is masked in this treatment with highest energy income encompassing both high temperature and high irradiance.

Table 5 Contingency tables for flowering divided by treatment. The table with numbers of flowering and non-flowering plants resulting in non-significant chi square test results is marked in grey (HH: X-squared = 0.87543, df = 1, p = 0.3495; HL: X-squared = 19.358, df = 1, p = $1.084e^{-5}$; LH: X-squared = 14.097, df = 1, p = 0.0001736; LL: X-squared = 26.343, df = 1, p = $2.858e^{-07}$).

HH		
	Alpine	Foothill
Not flowering (0)	14	9
Flowering (1)	42	47

LH		
	Alpine	Foothill
Not flowering (0)	19	3
Flowering (1)	28	46

HL		
	Alpine	Foothill
Not flowering (0)	36	9
Flowering (1)	59	85

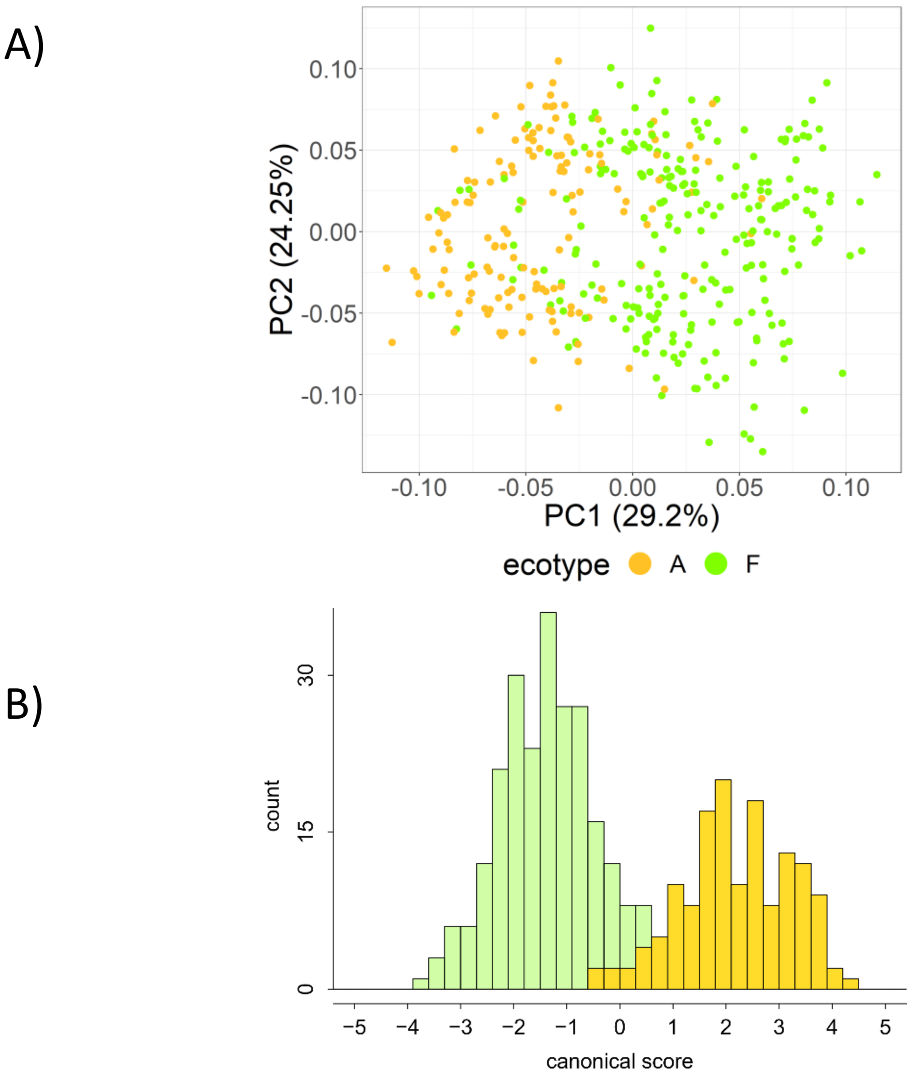
LL		
	Alpine	Foothill
Not flowering (0)	28	16
Flowering (1)	14	69

Principal component analysis of flowering individuals from all treatments, with both, flowering and vegetative traits Figure 26 A) shows more clearly defined ecotypes than the previous analysis encompassing only vegetative traits (Figure 23 A)), as flowering traits help the differentiation. Ecotypes are approximately differentiated along the first axis, while the second axis divides the treatments, again primarily divided into groups according to irradiance level - Figure 27 A).

Results of linear discrimination analysis illustrating how well the traits discriminate between predefined groups (in first case ecotypes, in second case treatments) are shown on Figure 26 B) and Figure 27 B); results of the corresponding classification analyses are shown in tables on Figure 26 D) and Figure 27 D). In this case, plants are equally well classified to the ecotype (93.1 % success rate) and to the treatment (92.1 %), suggesting high effect of both plasticity and heritable basis of these traits.

Using the full set of phenotypic traits, individuals were again better discriminated into High irradiance (HH, LH) vs. Low irradiance (HL, LL) treatments (with 97.2 % success rate) than to High temperature (HH, HL) vs. low temperature (LH, LL) treatments – 92.8 % successfully classified samples (Figure 28).

Differences between the treatments were mostly based on differences in complete biomass, biomass of root and SLA and diameter of rosette; the only strictly flowering-related variable among those traits was the total number of flowers Figure 27 C). Traits mostly contributing to defining differences between ecotypes are ratio of biomass of generative (root, rosette) and vegetative (stem) parts, stem height, biomass of flowering parts and biomass of rosette – three of those four traits are directly connected with flowering stage. This suggests that flowering related traits are less plastic and are kept the same between treatments, pointing towards differences between ecotypes which are not influenced by environment. This contrasts with higher plasticity of vegetative traits, which may possibly more efficiently respond to changing environments.



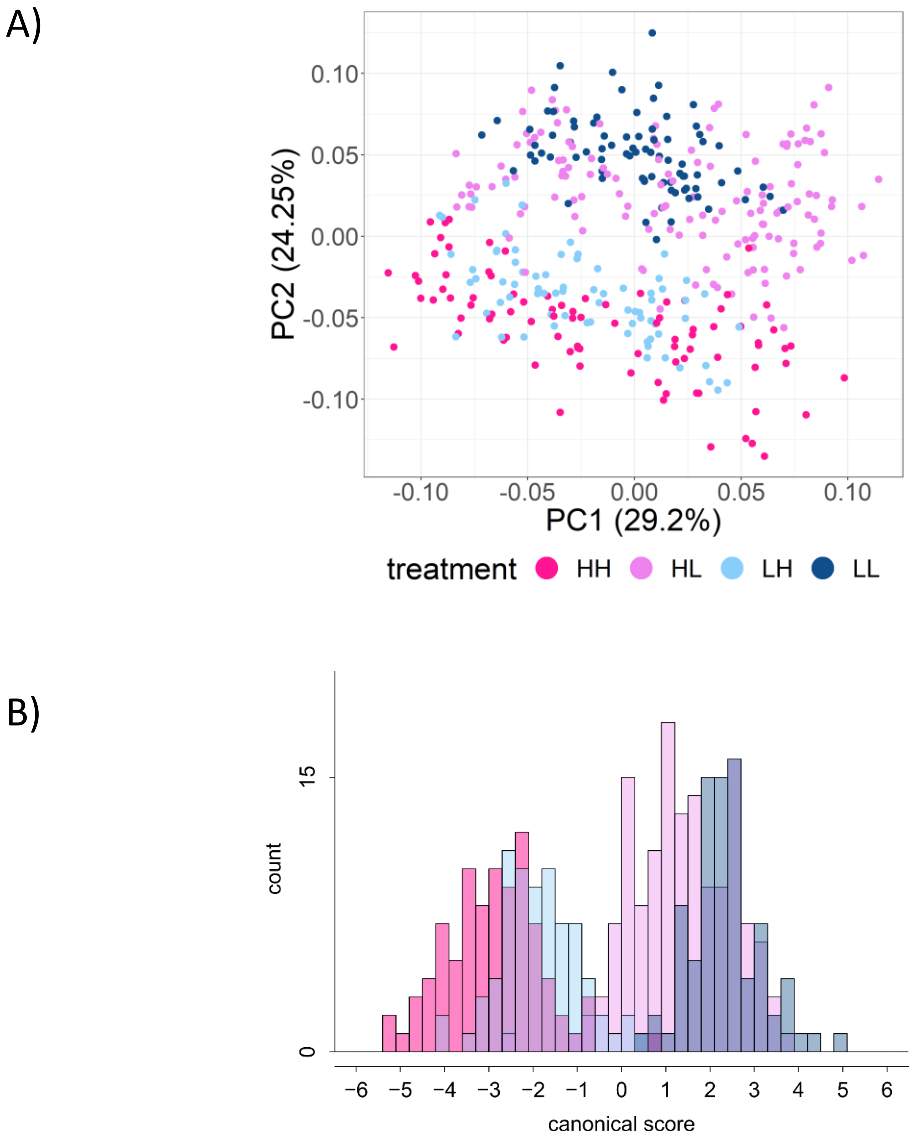
C)

Character	CCA1
biomassR_gen_veg	-0.52
height	-0.50
biomass_flow	-0.46
biomass_rosette	0.36
RNLP	-0.34

D)

Ecotype	N	Correct %
A	143	93.0
F	247	93.1
Total	390	93.1

Figure 26 A) PCA ordination based on all traits (dataset II, N traits = 17, N individuals = 390). The first component explains 29% of the variation, and the second component 24% (rounded). B) Scores of individuals belonging to the two ecotypes on the first axis of the linear discriminant analysis C) characters mostly contributing to trait discrimination are mostly flowering-related; correlation coefficients on the first discrimination axis (CCA1) are shown. D) Success of classification (CA) based on ecotype.



C)

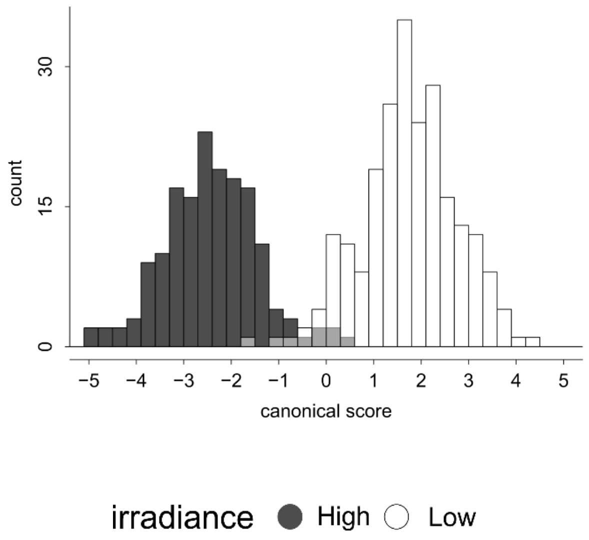
Character	CCA1	Character	CCA2
biomass_root	-0.49	diameter	0.37
SLA	0.46	biomass_tot	0.35
biomass_tot	-0.46	n_flowers	0.31
root_diam	-0.45	RLL	0.23
RLW	0.39	height	0.22

D)

Treatment	N	Correct %
H	89	91.0
HL	144	89.6
LH	74	90.5
LL	83	98.8
Total	390	92.1

Figure 27 A) Ordination analysis for full set including flowering traits (dataset II, N traits = 17, N individuals = 390). Treatments are separated along the second axis corresponding to the irradiance level. B) Results of linear discriminant analysis. C) characters mostly contributing to treatment discrimination, character contributing to differentiation are mostly vegetative-related. D) Success of classification (CA) based on the four treatment groups.

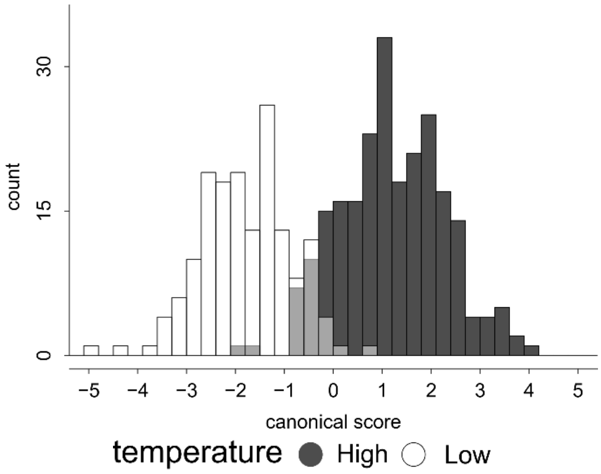
A)



B)

Irradiance	N	Correct %
H	163	96.3
L	227	97.8
Total	390	97.2

C)



D)

Temperature	N	Correct %
H	233	91.0
L	157	95.5
Total	390	92.8

Figure 28 Results of linear discriminant analysis shows that plants are better discriminated by morphological variation associated with varying irradiance A) than temperature B). Success of classification (CA) is higher in irradiance groups B) – 97.2 % than temperature groups D) – 92.8 %.

3.2.3 The extent of differentiation in different treatments

To understand morphological differentiation between the ecotypes more clearly, I divided the datasets by treatment, getting four sub-datasets corresponding to four common gardens. Once again, the analyses were run separately for both vegetative-only traits (dataset I) and all traits (dataset II). The ecotypes were phenotypically differentiated within each treatment, as evidenced by high success rate of classificatory analysis (rate between 82.14 – 97.59 %) (Figure 29, Figure 30, Figure 31, Figure 32). Again, better differentiation was provided when flowering characters were also included, but some treatments (especially Low temperature, Low irradiance treatment (LL) were characterized by low number of plants and thus reduced power for the subsequent statistical analysis (see below).

For vegetative dataset (I) the ecotypes were separated along second axis in treatment representing alpine conditions (LH - Low temperature and High irradiance) and successfully differentiated in foothill resembling (HL – High temperature and Low irradiance) environmental conditions (Figure 29 B, C). For full dataset (II), the ecotypes were more or less differentiated along the first PCA axis (Figure 31 B, C).

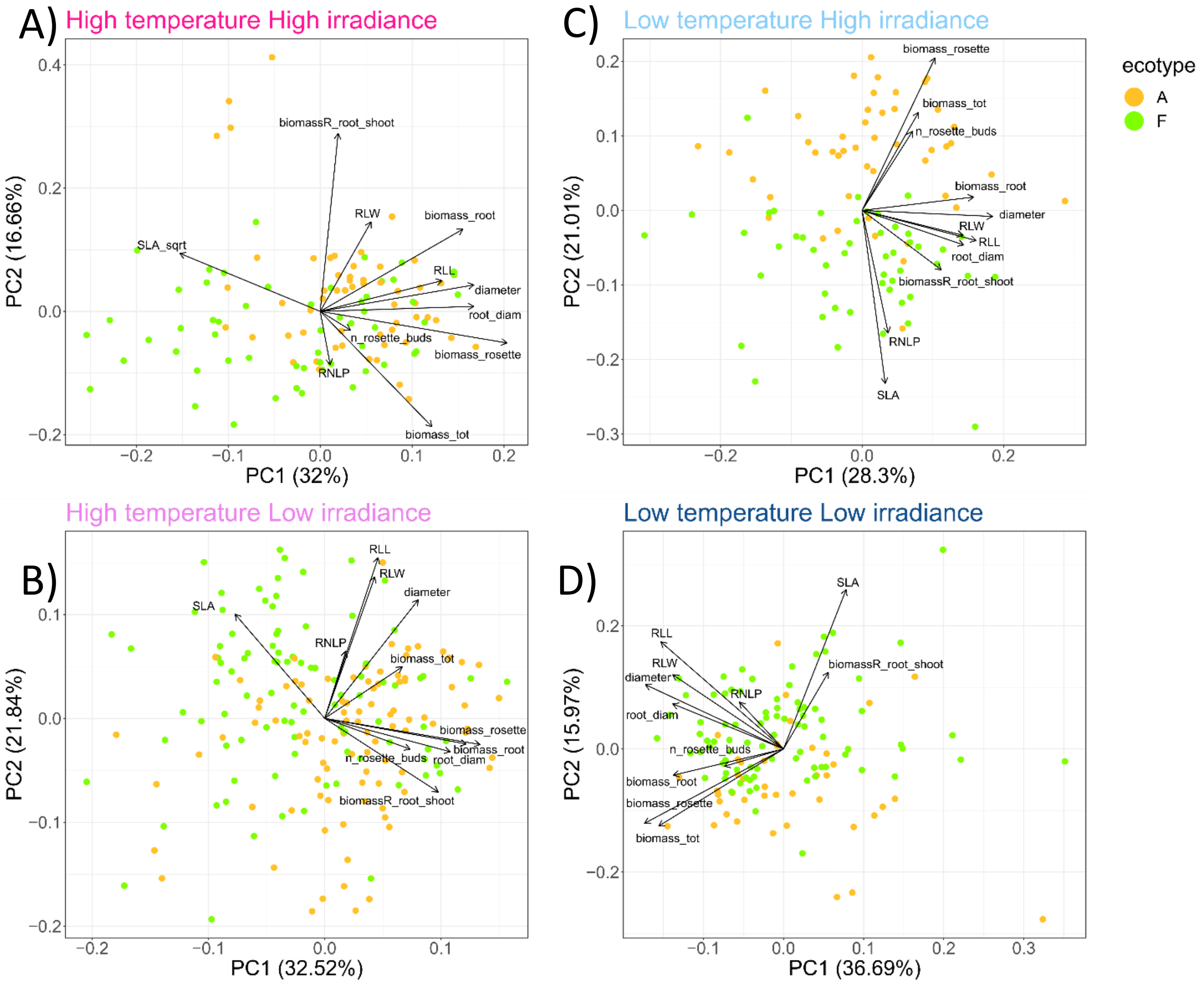
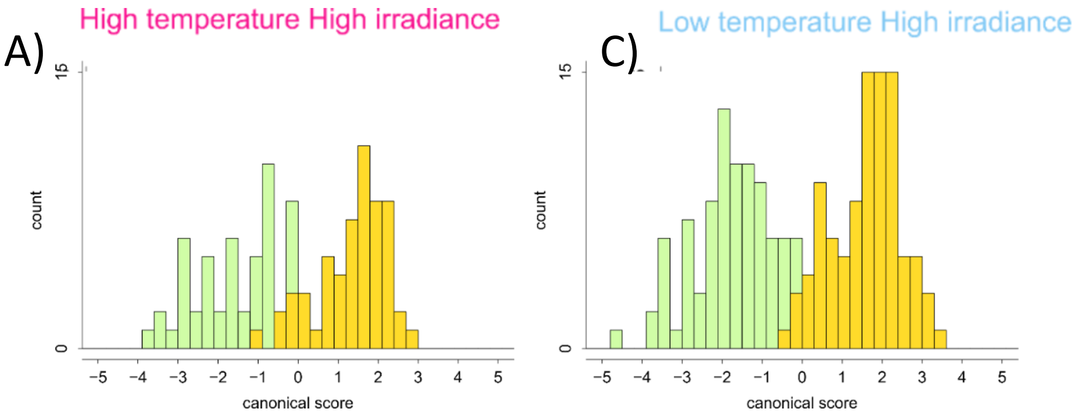
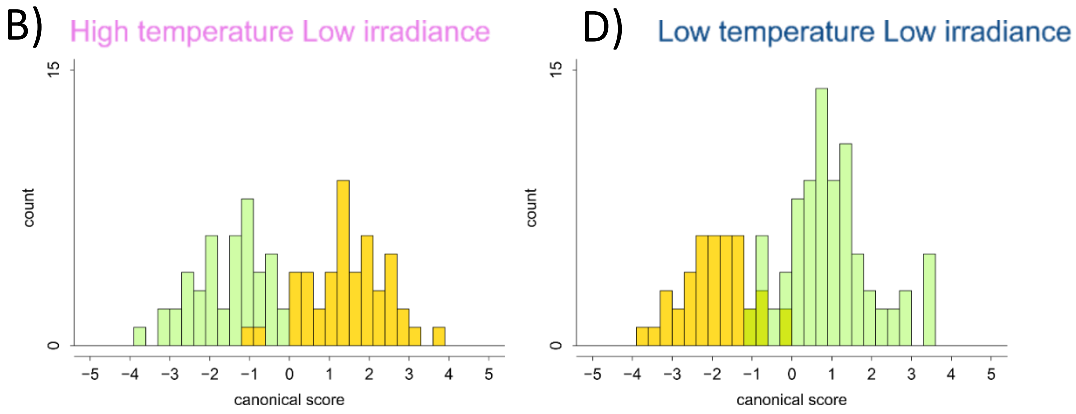


Figure 29 PCA done separately for all four treatments. Dataset I, non-flowering traits (N traits = 10, N individuals: HH = 112, HL = 189, LH = 96, LL = 127).



Ecotype	N	Correct %
A	56	83.93
F	56	80.36
Total	112	82.14

Ecotype	N	Correct %
A	47	89.36
F	49	91.84
Total	96	90.63



Ecotype	N	Correct %
A	95	92.63
F	94	92.55
Total	189	92.59

Ecotype	N	Correct %
A	42	95.24
F	85	88.24
Total	127	90.55

Figure 30 Linear discriminant analysis done separately in each of the four treatments to discriminate between ecotypes. Tables are showing success rate of classificatory analysis. Dataset I, non-flowering traits (N traits = 10, N individuals: HH = 112, HL = 189, LH = 96, LL = 127).

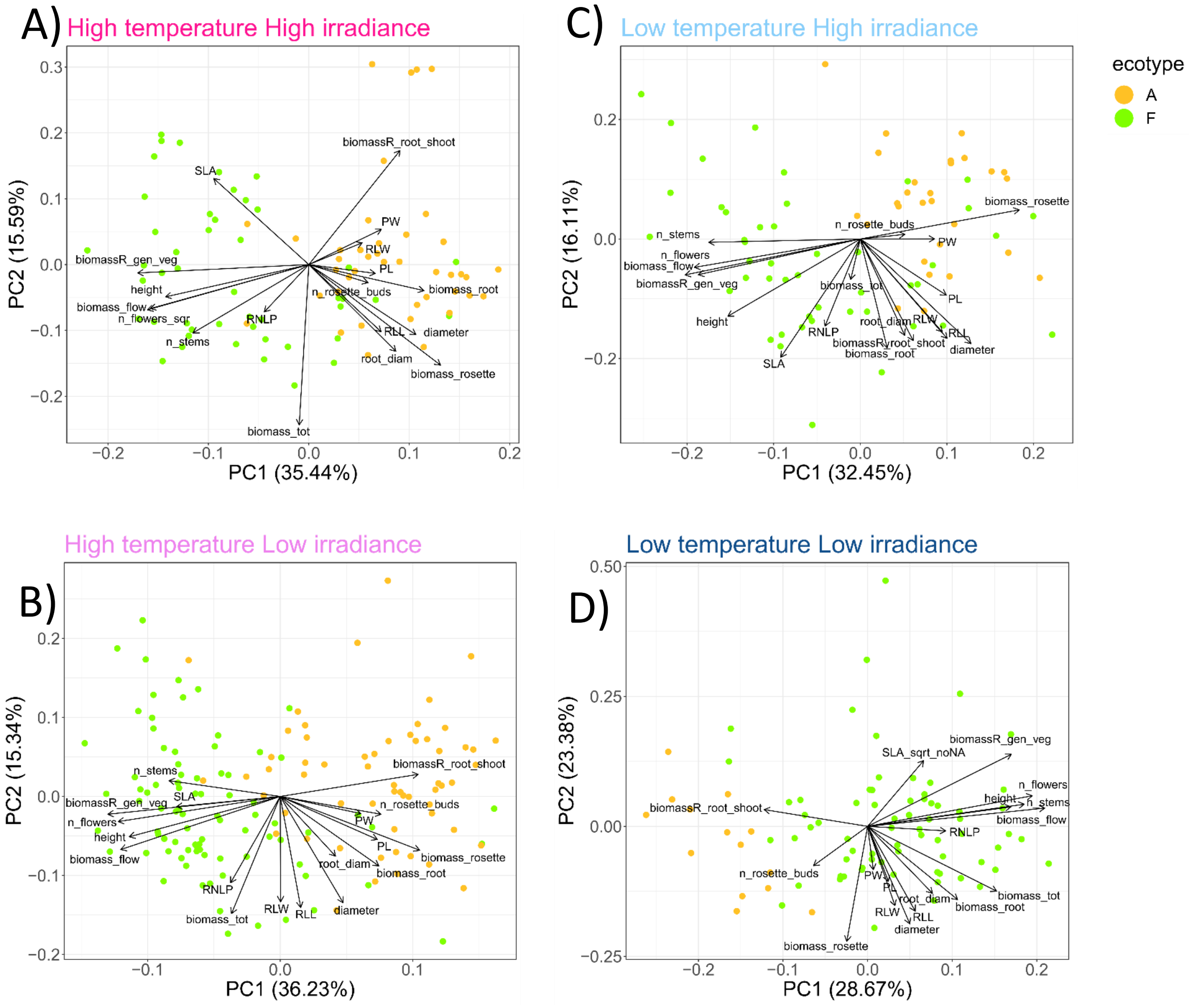
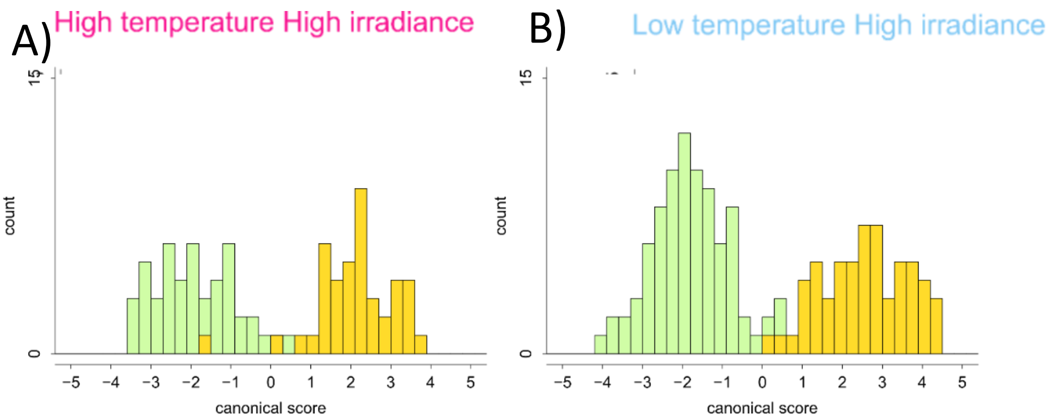
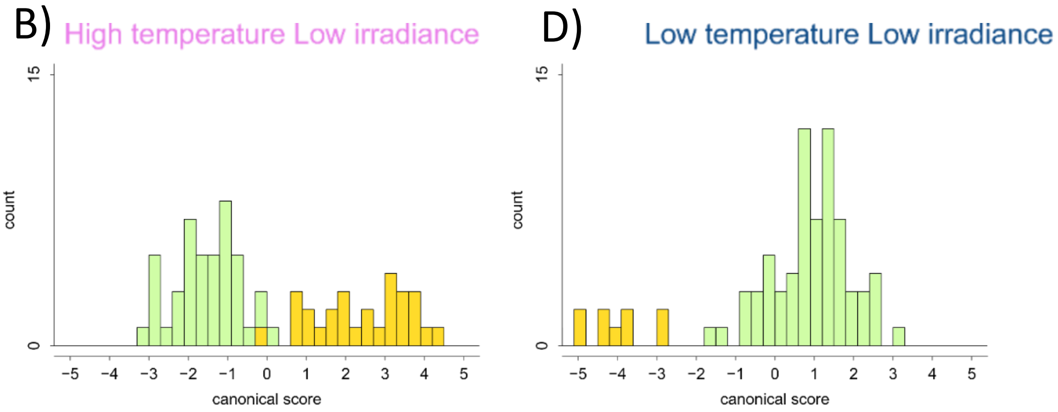


Figure 31 PCA done separately for all four treatments. Dataset II, all traits (N traits = 17, N individuals: HH = 89, HL = 144, LH = 74, LL = 83).



Ecotype	N	Correct %
A	42	95.24
F	47	93.62
Total	89	94.38

Ecotype	N	Correct %
A	28	85.71
F	46	95.65
Total	74	91.89



Ecotype	N	Correct %
A	59	94.92
F	85	95.29
Total	144	95.14

Ecotype	N	Correct %
A	14	100.00
F	69	97.10
Total	83	97.59

Figure 32 Linear discriminant analysis done separately to discriminate between ecotypes in all four treatments. Tables are showing success rate of classificatory analysis. Dataset II, flowering traits (N traits = 17, N individuals = 390).

Traits mostly contributing to the discrimination between ecotypes in given treatments are listed in Table 6 for dataset with vegetative characters only and for dataset II in Table 7. Among vegetative traits the most crucial for differentiating among ecotypes (consistent across all treatments) were biomass of rosette (biomass_rosette), number of lobes on rosette leaves (RNLP) and ratio of rosette biomass to its surface (SLA - specific leaf area), those emerging as important in at least two treatments are root:shoot ratio and number of rosette buds.

Table 6 Characters mostly contributing to ecotype discrimination in each treatment, based on vegetative traits only. Correlation coefficients associated with the first = discriminant axis (CCA1) in each analysis is shown. Five traits with highest values are in bold.

	CCA1			
Character	**HH**	**HL**	**LH**	**LL**
biomass_rosette	**0.36**	**0.42**	**0.67**	**-0.25**
biomass_root	0.28	0.09	0.04	-0.02
diameter	0.19	0.18	0.13	0.02
n_rosette_buds	**0.35**	0.21	**0.25**	-0.05
RLL	0.07	0.04	0.05	0.11
RLW	-0.07	-0.09	-0.03	**0.20**
RNLP	**-0.37**	**-0.26**	**-0.41**	**0.39**
root_diam	0.10	-0.02	-0.13	**0.22**
biomass_tot	-0.14	**-0.24**	0.13	0.04
biomassR_root_shoot	**0.33**	**0.28**	-0.05	-0.11
SLA	**-0.30**	**-0.28**	**-0.51**	**0.40**

Table 7 Characters mostly contributing to ecotype discrimination in each treatment. For Dataset II, all traits. Correlation coefficients associated with the first = discriminant axis (CCA1) in each analysis is shown. Five traits with highest values are in bold.

	CCA1			
Character	**HH**	**HL**	**LH**	**LL**
biomass_rosette	**0.30**	0.31	**0.45**	-0.14
biomass_root	0.22	0.08	0.03	0.07
diameter	0.20	0.13	0.08	0.03
n_rosette_buds	0.22	0.11	0.09	-0.05
RLL	0.10	0.02	0.02	0.08
RLW	0.02	-0.07	-0.02	0.08
RNLP	-0.25	-0.26	**-0.40**	0.24
root_diam	0.09	-0.02	-0.05	0.14
biomass_tot	-0.10	-0.21	0.09	0.13
biomassR_root_shoot	0.24	0.24	-0.03	-0.10
SLA	-0.21	-0.20	**-0.34**	0.20
biomass_flow	**-0.51**	**-0.47**	-0.22	**0.56**
n_stems	-0.17	-0.12	-0.14	**0.25**
n_flowers	**-0.42**	**-0.45**	-0.25	**0.32**
height	**-0.53**	**-0.48**	**-0.47**	**0.58**
PL	0.15	0.24	0.18	0.04
PW	0.29	**0.33**	0.33	-0.04
biomassR_gen_veg	**-0.59**	**-0.55**	**-0.40**	**0.35**

Comparing traits mostly contributing to differentiation among ecotypes in both vegetative and flowering traits for set of flowering plants (dataset II), the one consistently discriminating across all treatments is the height of plant (height) and ratio of biomass of vegetative and generative parts (biomassR_gen_veg). Those characters with major contribution to differentiation in at least two treatments are biomass of rosette, biomass of flowering parts and number of flowers. The most important traits from both datasets are summed in Table 8.

Table 8 Traits mostly contributing to discrimination between ecotypes across all treatments.

trait
biomass_rosette
RNLP
SLA
height
biomassR_gen_veg
biomass_flow
n_flowers
n_rosette_buds
biomassR_root_shoot

To illustrate the complex interplay of non-plastic and plastic effects on the phenotype, Figure 33 shows plants from the same population across all four treatments, while variability among plants form one population in one treatment (HL) is shown on Figure 34.

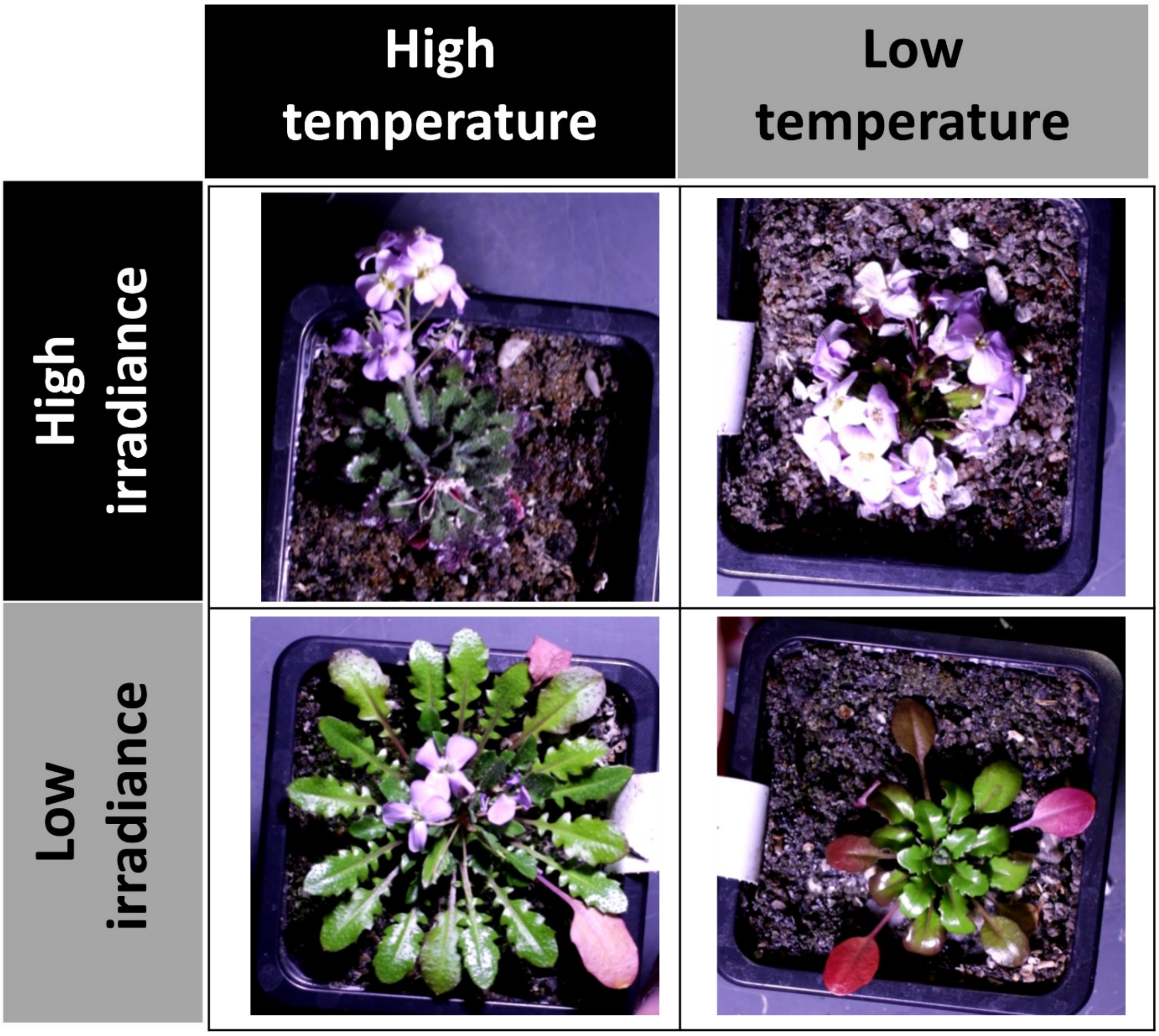


Figure 33 Plants originating from one population (alpine) in four different treatments.

Figure 34 Variability of plants originating from one population (alpine) in one treatment.

3.3 Ecotypes performance in conditions resembling their native environment

Next, I tested for differences in attained total biomass with respect to the ecotype and treatment resembling the conditions of origin of each ecotype, pointing towards higher fitness of plants in their native conditions and thus local adaptation. As an input, I compared total biomass (biomass_tot) of plants of alpine and foothill origin in treatments resembling foothill (HL) and alpine (LH) environments (using a model described in Supplement 5, data pre-processed as described in Supplement 6 and setting for modelling described in Supplement 7). Plot showing how the model converges is shown in Supplement 8.

These results show trend of higher total biomass in "native" conditions of each ecotype, supporting local adaptation scenario (Figure 36). Yet, this trend is not significant, as evidenced by overlap of intervals for predicted slope (beta_1, Table 9). Schematic illustration of all used parameters is on Figure 35.

The highest density intervals are plotted on Figure 38. Apparently, the trait variability among the two ecotypes is too high to get any significant result under my limited number of observations (available N: HL = 189, LH = 96). Similarly, the difference of slopes values from zero is also not significant, thus unable to provide statistical support for the observation that there is a reaction. Modelled trait values under foothill and alpine-like treatments also overlap, showing non-significant difference of ecotypes in total biomass attained between treatments (Figure 39, Table 11). This was true for comparison between treatments for one ecotype as well as between ecotypes.

When comparing alpine and foothill ecotypes from the same region, the differences in reaction of ecotypes were more prominent. For FG and NT region the difference in slopes (difference between slope of regression line for foothill and alpine ecotype – see parameter delta_1k in Table 10) was significantly different from 0, and it can be also seen on Figure 37. Biomass increased between HL (foothill like) to LH (alpine like) treatment for alpine ecotype (suggesting its local adaptation to alpine environment) in three out of four regions (FG, NT, VT), see parameter beta_1k in Table 10.

Parameter distributions informs of probability of parameter being given value. Thus, for example, when the distributions 5% quantile value is above 0 and the rest of the values also, the probability of such parameter being 0 is less than 95% (for visual representation of probability distributions see Figure 39).

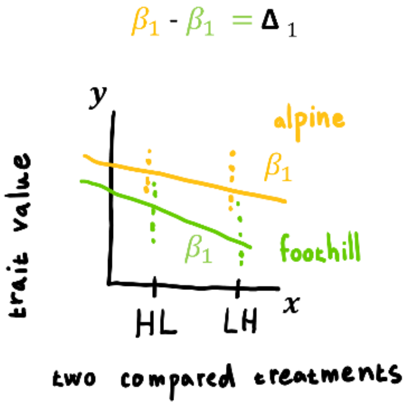


Figure 35 Illustration for parameters in Table 9.

Table 9 Modelled distributions of parameters for all regions (with 5%, 10%, 90% and 95% quantiles).

	mean	se_mean	sd	5%	10%	90%	95%
beta_1e A	98.91	0.42	119.95	-63.62	-11.74	209.44	262.73
beta_1e F	-22.38	0.41	118.24	-184.74	-133.01	88.61	140.78
delta_1e	121.29	0.60	170.60	-109.24	-35.71	277.77	353.11

Table 10 Modelled distributions of parameters for each region (VT, ZT, FG, NT) separately (with 5%, 10%, 90% and 95% quantiles).

	mean	se_mean	sd	5%	10%	90%	95%
beta_1k FG_A	**137.83**	**0.12**	**34.56**	**80.13**	**92.91**	**181.80**	**193.81**
beta_1k NT_A	**58.75**	**0.12**	**34.36**	**1.96**	**14.65**	**102.83**	**115.39**
beta_1k VT_A	**69.90**	**0.06**	**30.60**	**19.16**	**30.67**	**108.81**	**119.81**
beta_1k ZT_A	38.22	0.07	34.10	-18.48	-5.54	81.66	93.93
beta_1k FG_F	-18.11	0.06	30.17	-67.51	-56.57	20.37	31.63
beta_1k NT_F	-27.45	0.06	29.51	-76.61	-65.40	9.96	20.45
beta_1k VT_F	29.52	0.06	30.71	-21.37	-9.85	68.70	79.62
beta_1k ZT_F	-10.70	0.06	32.37	-64.19	-52.14	30.65	42.06
delta_1k FG	**155.94**	**0.12**	**44.97**	**82.31**	**98.49**	**213.72**	**230.34**
delta_1k NT	**86.20**	**0.13**	**44.51**	**12.53**	**28.97**	**143.22**	**159.01**
delta_1k VT	40.38	0.09	43.23	-30.68	-14.83	95.57	111.66
delta_1k ZT	48.92	0.09	47.04	-28.75	-11.47	109.04	126.22

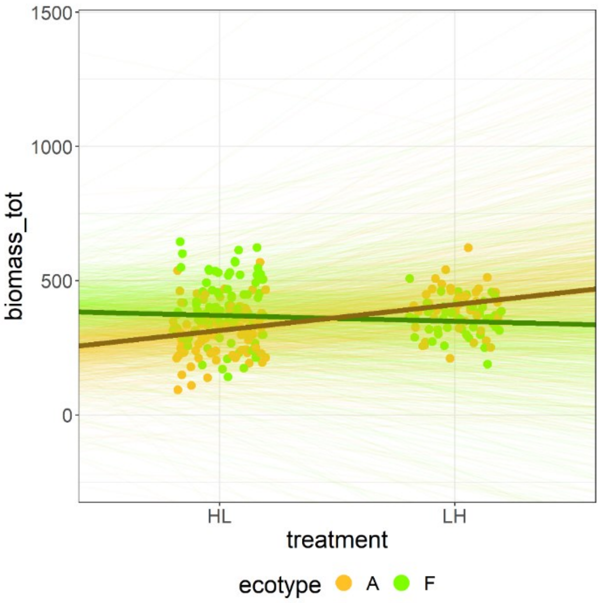


Figure 36 Modelled regression lines (1000 random samples – thin lines and mean value – thick line) describing change in biomass between ecotypes grown under HL and LH treatments. Despite apparent native-condition advantage, these data were not different from modelled neutral data and thus I did not identify any statistical support for this trend. Generated with function described in Supplement 11.

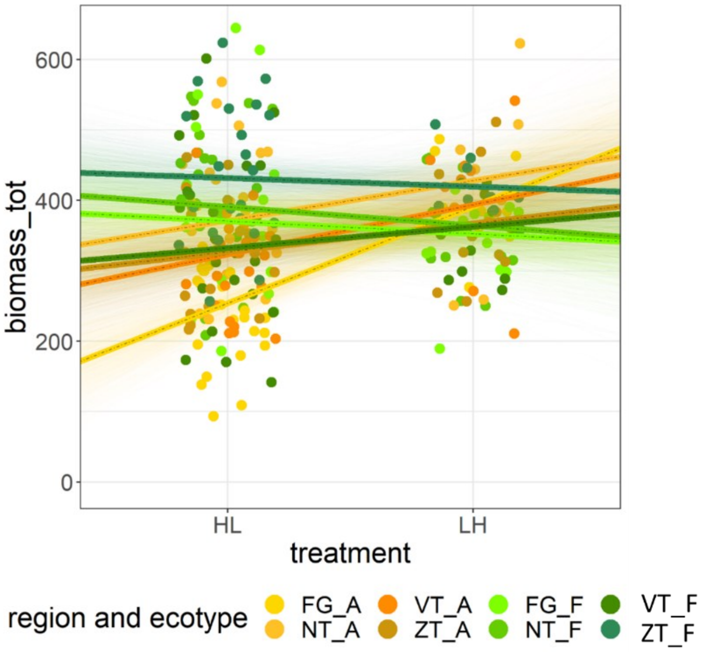


Figure 37 Modelled regression lines (1000 random samples – thin lines and mean value – thick line) describing change between biomass in HL and LH treatment for ecotypes in regions. Generated with function described in Supplement 13.

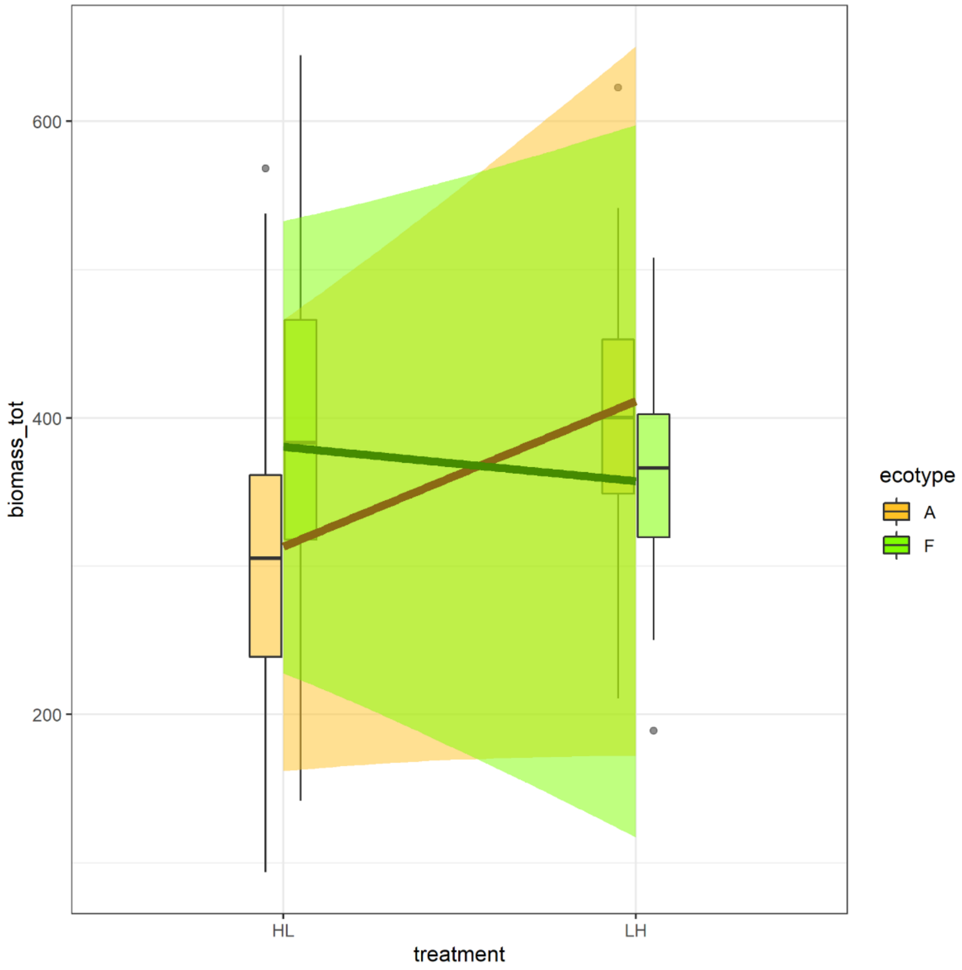


Figure 38 Highest density probability intervals (for interval 0.1 – 0.9) for beta_1 parameters, describing the interaction between ecotype and treatment, separately for ecotypes. Generated with function described in Supplement 12.

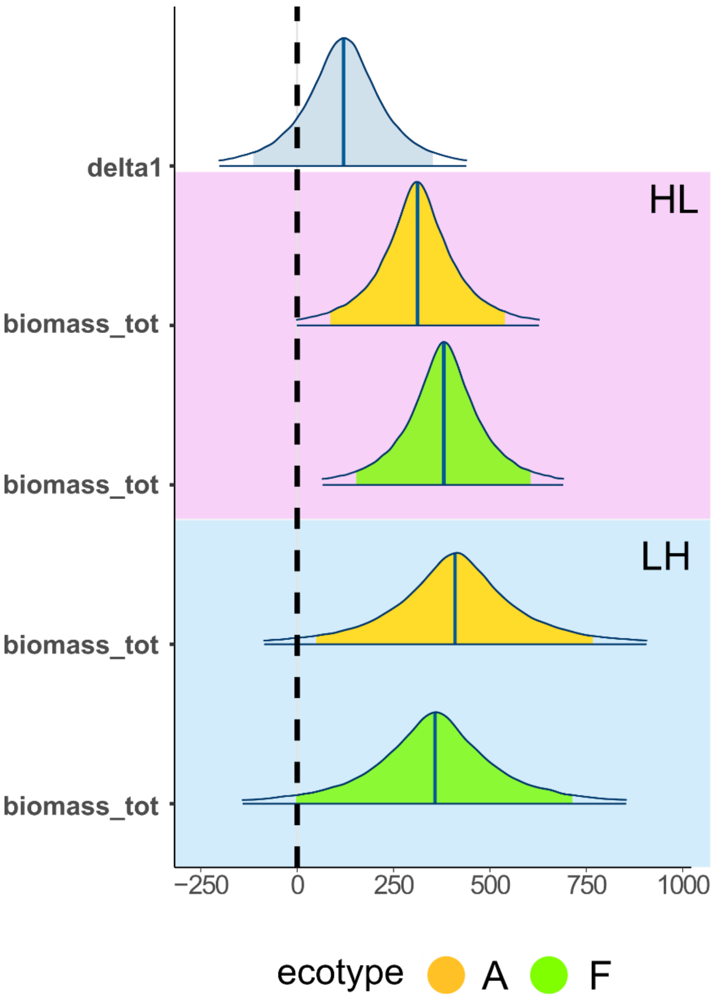


Figure 39 Probability distributions for selected parameters (90 % probability - coloured, 95 % - outer lines) in given treatments. High degree of overlap is evident. Delta1 shows distribution of difference between beta_1 parameters for alpine and for foothill plants, which could be interpreted as difference in reaction to HL and LH environments between the two ecotypes.

Table 11 Modelled total biomass values for HL and LH treatment.

	mean	se_mean	sd	2.50%	5%	50%	95%	97.50%
trait_value_F LH	357.47	0.88	264.18	-140.52	-2.32	357.97	715.64	857.02
trait_value_A LH	411.37	0.85	260.70	-86.70	56.12	410.26	770.39	910.28
trait_value_F HL	380.57	0.56	166.45	64.11	152.50	381.29	608.08	697.03
trait_value_A HL	313.21	0.54	166.26	-1.33	87.79	312.18	541.35	631.59

Function plotting the differences in values of traits is in Supplement 9 with examples of plots in Supplement 10. I also plotted the reaction norms among pairwise contrasts of all four treatments. This analysis suggests that low temperature induces higher response in biomass than other environmental shifts (see Figure 40 and Figure 41).

If taking total biomass as a proxy for plant fitness, alpine populations seemed to be better adapted (in three of four cases - regions) for growing in alpine-like conditions. Plants of the foothill ecotype seemed not to react, and they kept the same performance under both treatment with slighter higher biomass yield in HL (foothill) treatment Figure 37, Figure 39). This suggest alpine plants are adapted to survive in colder and higher-irradiance conditions and the opposite may be true for originally foothill plants, yet larger data sample would be necessary to confirm this trend with statistical confidence.

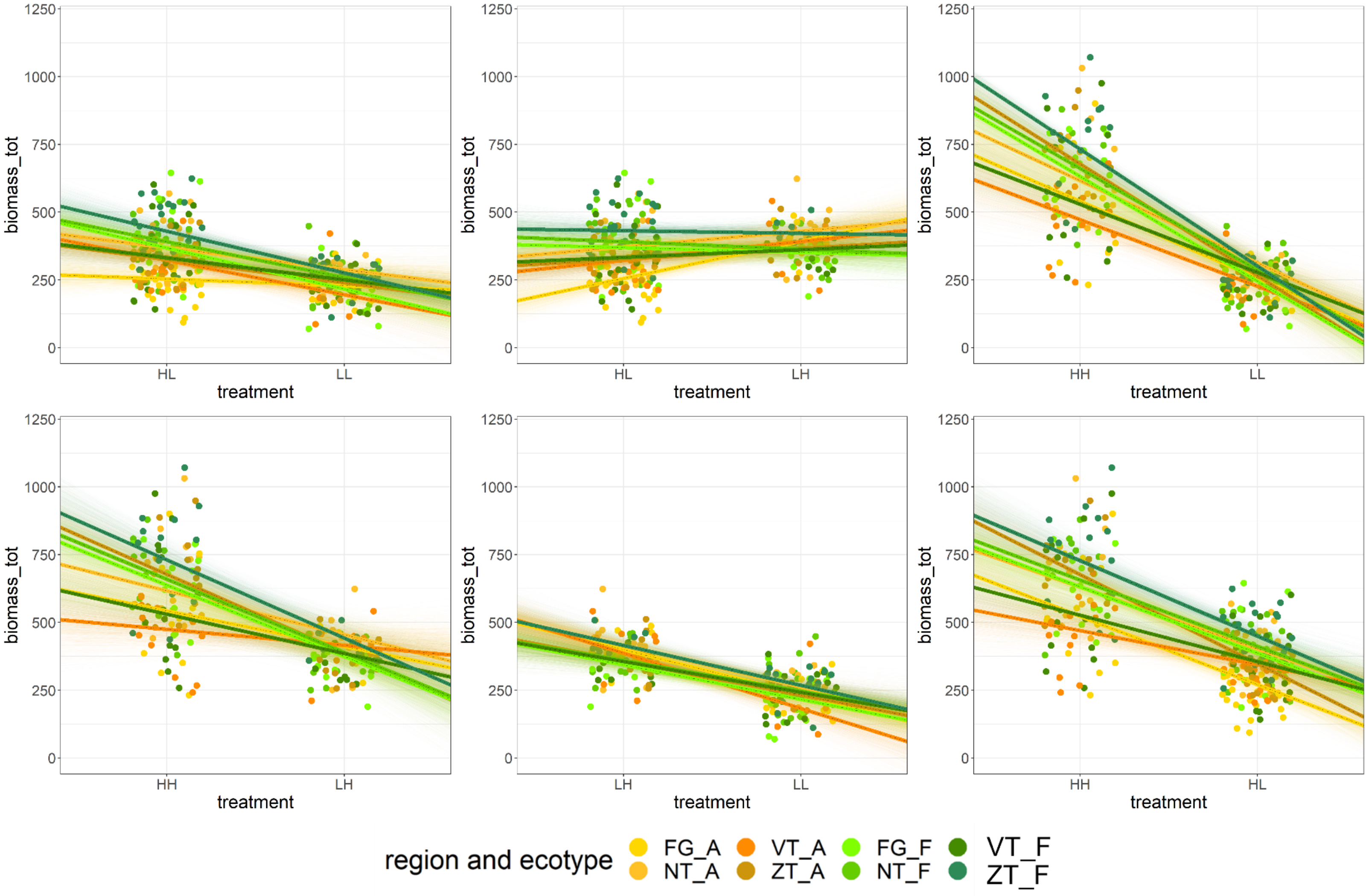


Figure 40 Modelled regression lines (1000 random samples – thin lines and mean value – thick line) describing change between biomass of plants of different origin and ecotype in all combinations of treatments.

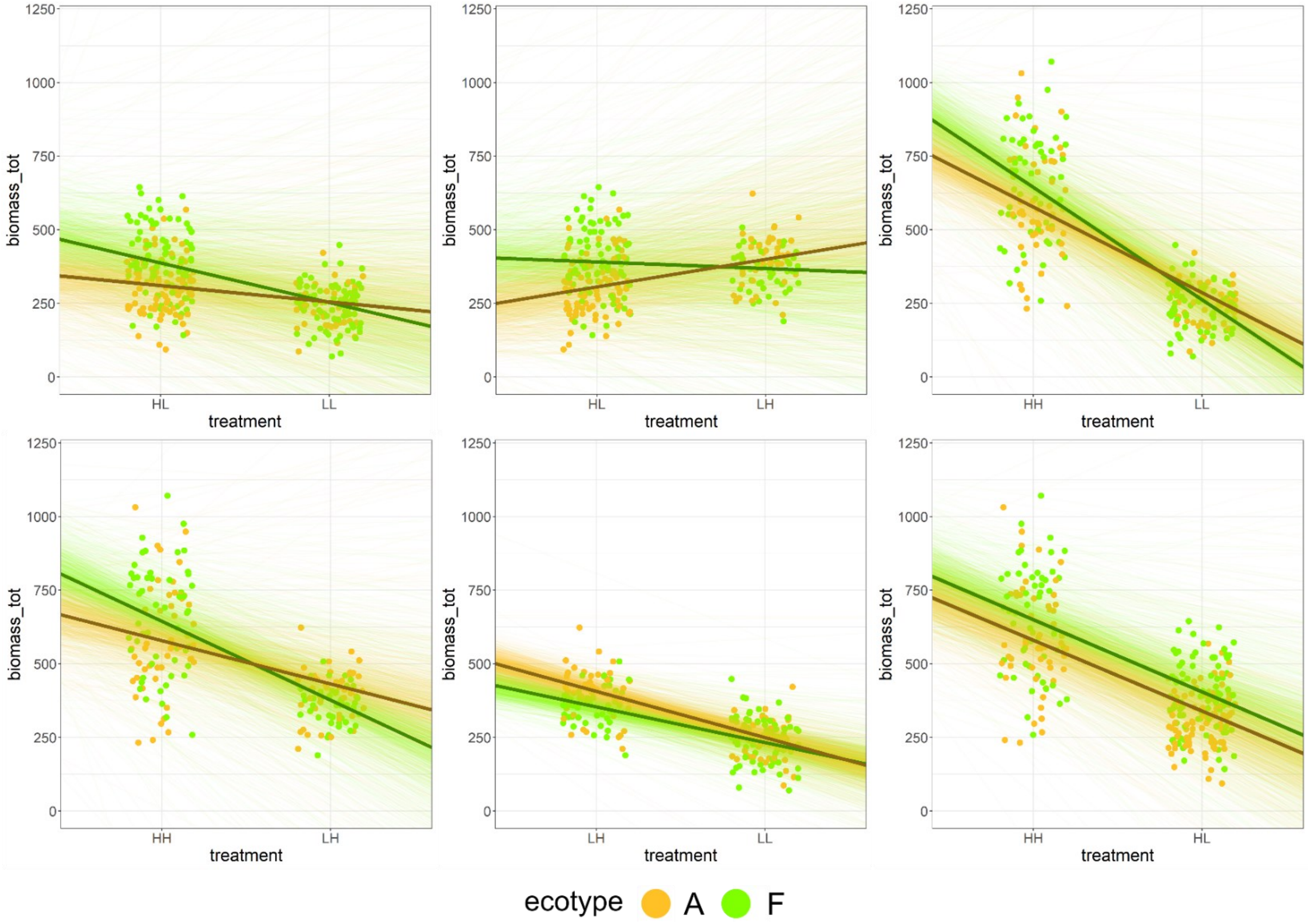


Figure 41 Modelled regression lines (1000 random samples – thin lines and mean value – thick line) describing change in biomass between ecotypes in all combinations of treatments.

3.4 Difference of alpine and foothill populations in phenotypic plasticity and traits subjected to phenotypic plasticity

Finally, I applied the above-described statistical model (Chapter 2.3.3, Supplement 5) to calculate posterior probabilities of selected parameters describing how the plants of different ecotype respond to conditions resembling foothill and alpine conditions and to infer their level of plastic response to manipulated environmental conditions. Differences in reactions are always shown in the direction from the foothill-like environment (High temperature Low irradiance, HL) towards the alpine-like environment (Low temperature High irradiance, LH). Results are summed up in Table 12 for ecotypes across all regions and Table 13 for alpine and foothill ecotype in each region separately. Graphic representations for all traits (for ecotypes and for ecotypes – region combinations) are on Figure 43 to Figure 47. Tables with results are in Supplement 14, illustrative example of calculated values on Figure 42.

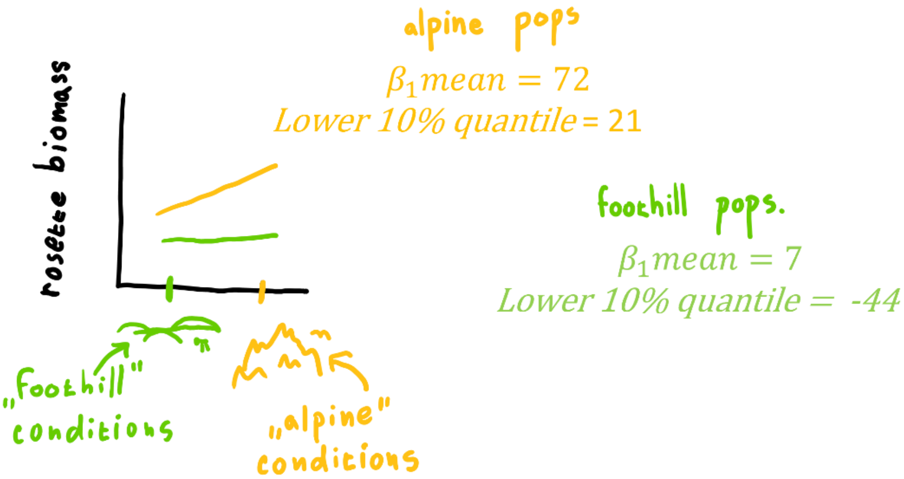


Figure 42 Example of existing posterior probabilities for parameters values together with the scheme of experiment.

Table 12 Results of linear regression Bayesian model comparing how plants of different ecotypes react to alpine-like conditions. The model itself does not include the effect of region separately from the effect of ecotype as those are crossed, so the non-significant results for all regions together may be cofounded by that fact. Down arrow (↓) symbolises significantly negative slope of line representing reaction, up arrow (↑) significantly positive. As in no case reaction goes in different directions, comparison (A x F) always shows in which ecotype the reaction was stronger.

trait	A	F	A x F
biomass_tot as fitness proxy			
biomass_rosette	↑		
biomass_root			
diameter	↓	↓	
RLL	↓	↓	
RLW	↓	↓	
RNLP			
n_rosette_buds			
root_diam			
biomassR_root_shoot			
SLA	↓	↓	
biomass_flow			
n_stems			
n_flowers			
height			
PL			
PW			
biomassR_gen_veg			

When comparing across all regions, several traits showed significantly lower trait value towards alpine-like conditions. However, as the model does not account for the effect of region, due to poor convergence, there can be ecotypic effect underestimated due to differences among regions, corresponding to distinct genetic lineages and thus also independent alpine colonisation events. Thus, I also modelled the same effects in each region separately (Table 13).

Table 13 Results of linear regression Bayesian model comparing how plants of different ecotypes react to alpine-like conditions. Analyses were run separately per each region of origin, corresponding to distinct genetic lineage. Down arrow (**↓**) symbolises significantly negative slope of line representing reaction, up arrow (**↑**) significantly positive (i.e. trait values higher and lower in alpine-like conditions, respectively). As in no case reaction goes in different directions, comparison (A x F) always shows in which ecotype the plastic reaction was stronger. Thin arrows mark more than 90% probability of obtaining value of β_1 - slope of regression line, which is different from 0, thick ones 95% probability.

trait	FG			NT			VT			ZT		
	A	F	A x F	A	F	A x F	A	F	A x F	A	F	A x F
biomass_tot as fitness proxy	**↑**		**A > F**	**↑**		**A > F**	**↑**					
biomass_rosette	**↑**		**A > F**	**↑**		**A > F**	**↑**	**↑**		↑		
biomass_root	**↑**		**A > F**	**↑**	**↑**	F > A	**↑**	**↑**			**↑**	**F > A**
diameter	**↓**	**↓**		**↓**	**↓**		**↓**	**↓**		**↓**	**↓**	**A > F**
RLL	**↓**	**↓**		**↓**	**↓**		**↓**	**↓**		**↓**	**↓**	
RLW	**↓**	**↓**		**↓**	**↓**	**F > A**	**↓**	**↓**		**↓**	**↓**	
RNLP										**↓**	**↓**	
n_rosette_buds				**↑**		**A > F**						
root_diam	↑			**↑**	**↑**	**F > A**	**↑**	**↑**		**↑**	**↑**	
biomassR_root_shoot					**↑**	**F > A**	**↑**	**↑**			**↑**	**F > A**
SLA	**↓**	**↓**		**↓**	**↓**		**↓**	**↓**	**F > A**	**↓**	**↓**	
biomass_flow	**↑**		F > A		↓	F > A		**↓**	**F > A**		**↓**	**F > A**
n_stems					**↑**	**F > A**	↑				**↑**	**F > A**
n_flowers		**↓**	F > A		**↓**	F > A		**↓**	**F > A**		**↓**	**F > A**
height						**F > A**	↓	**↓**	**F > A**		**↓**	**F > A**
PL							**↓**	**↓**				
PW				↑				↓				
biomassR_gen_veg								**↓**	**F > A**		**↓**	**F > A**

Finally, for comparison between alpine and foothill ecotypes in each region separately, multiple traits showed significant difference between plants growing in alpine and in foothill conditions.

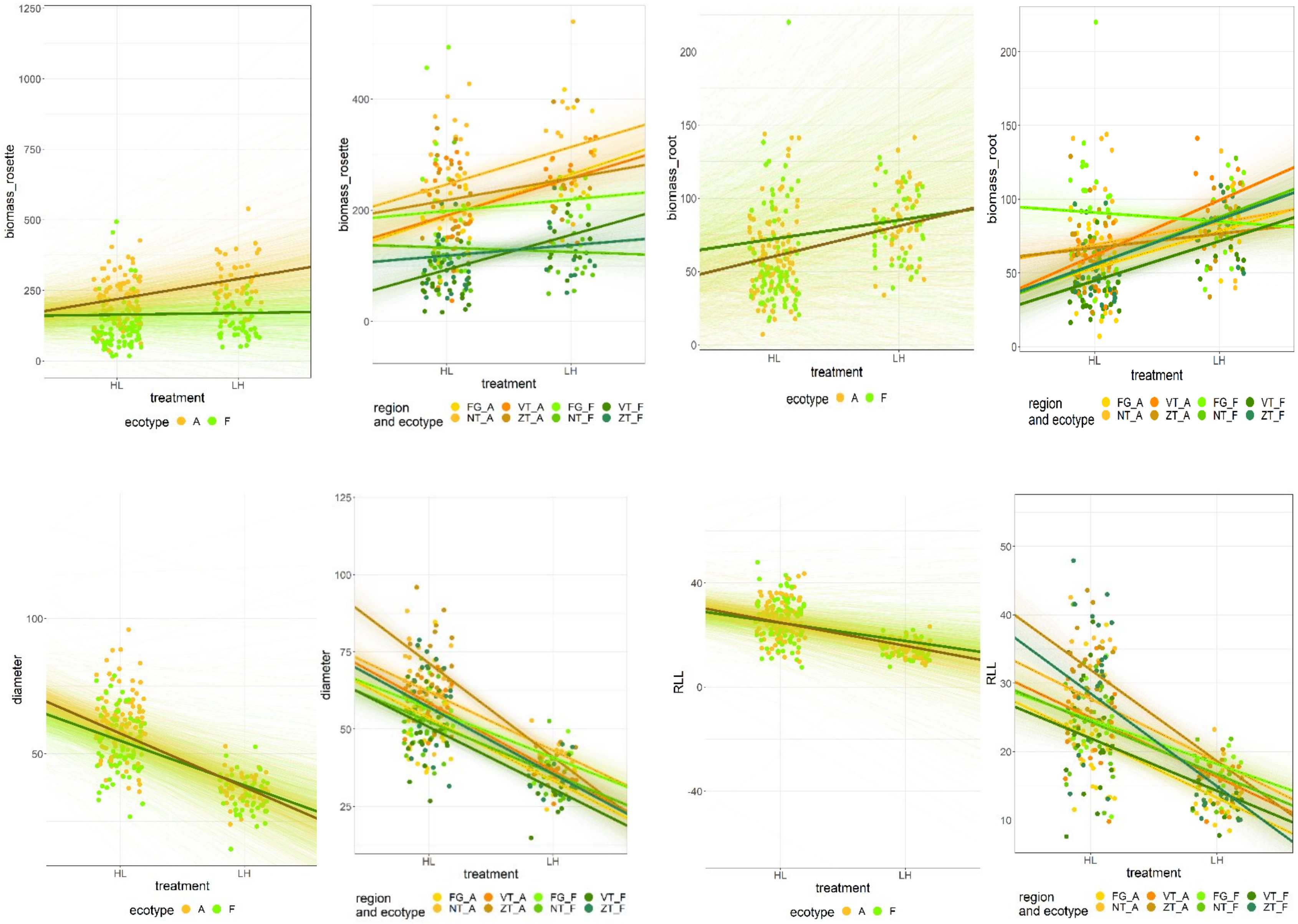


Figure 43 Reaction norms I.

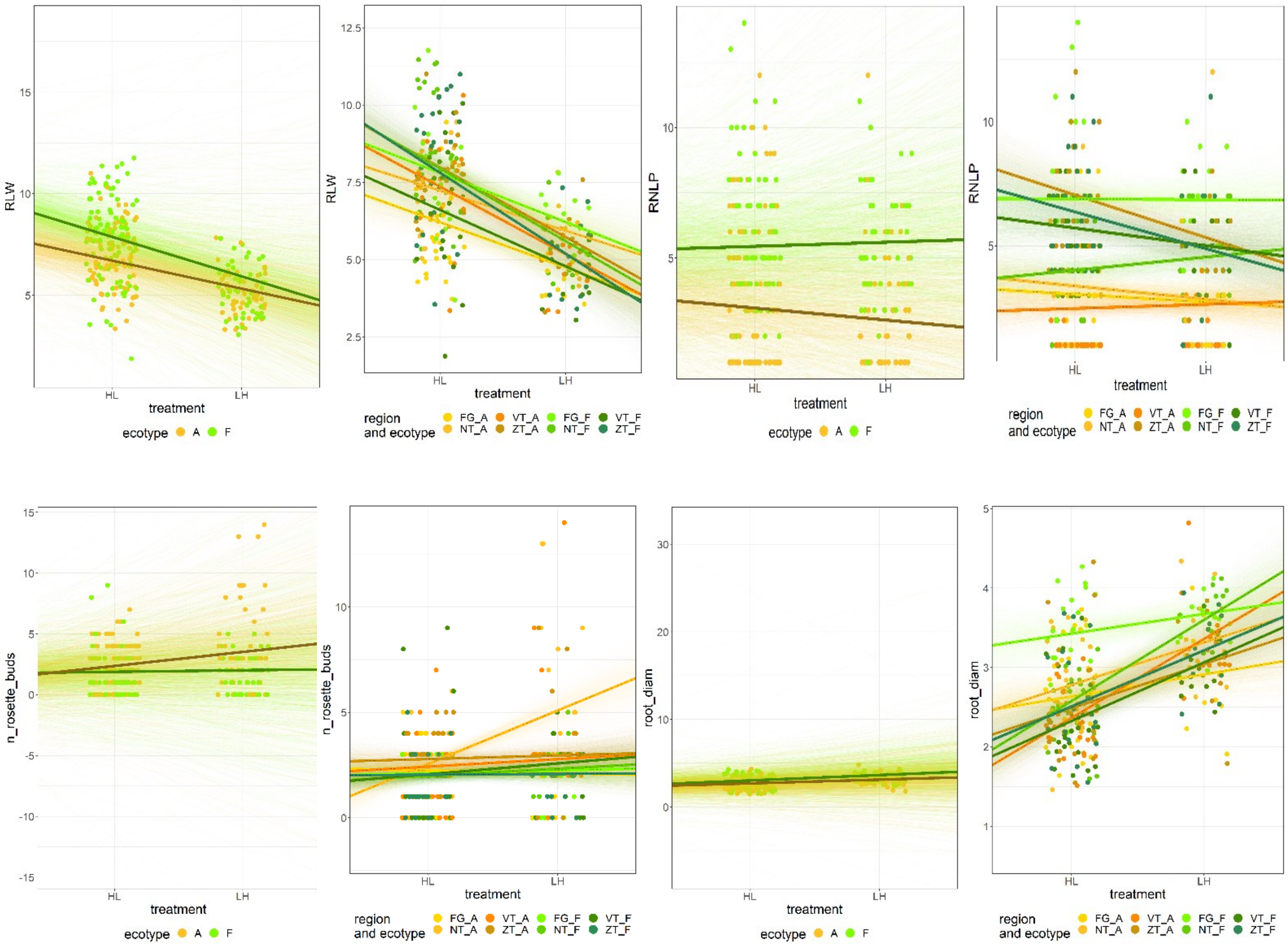


Figure 44 Reaction norms II.

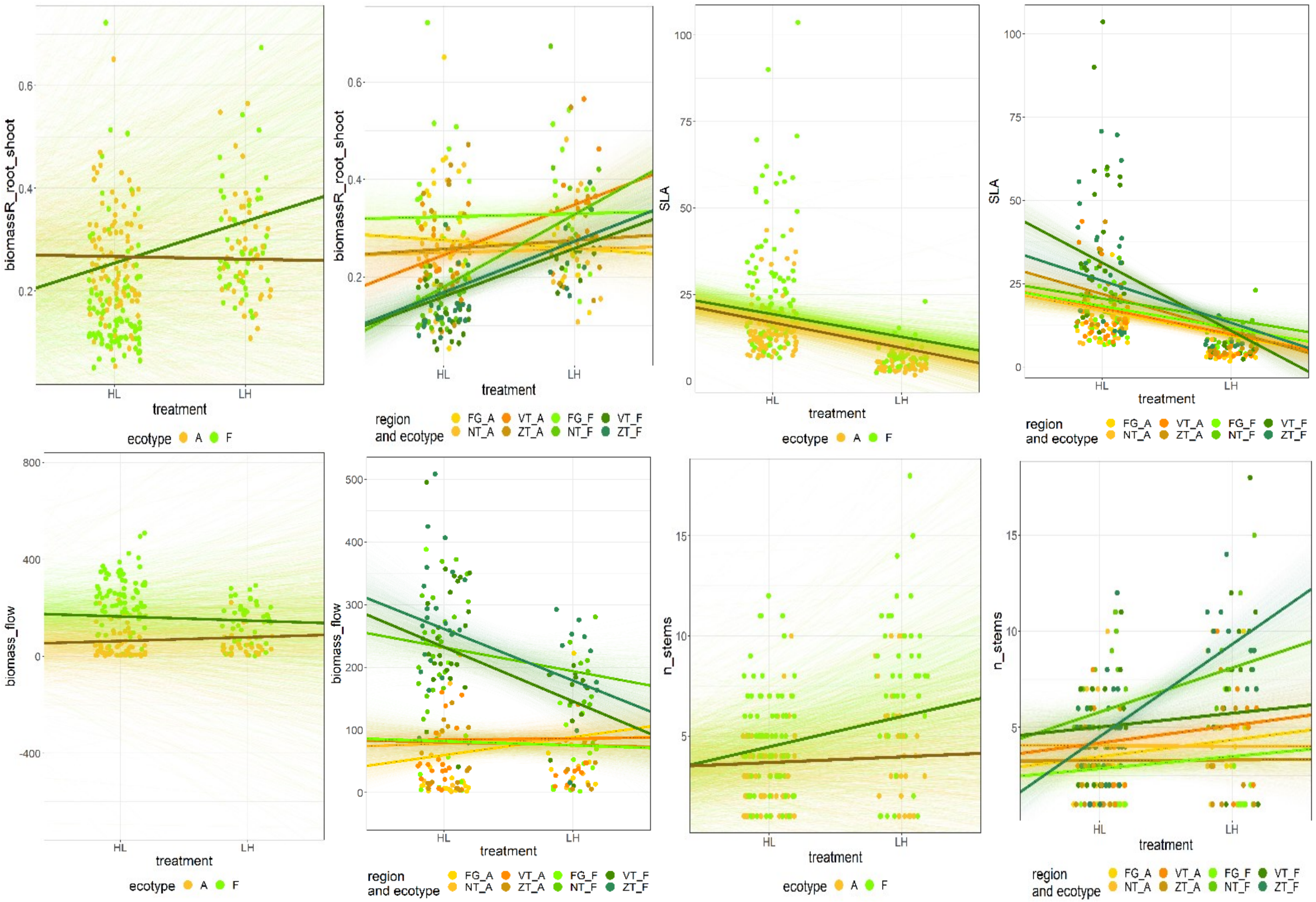


Figure 45 Reaction norms III.

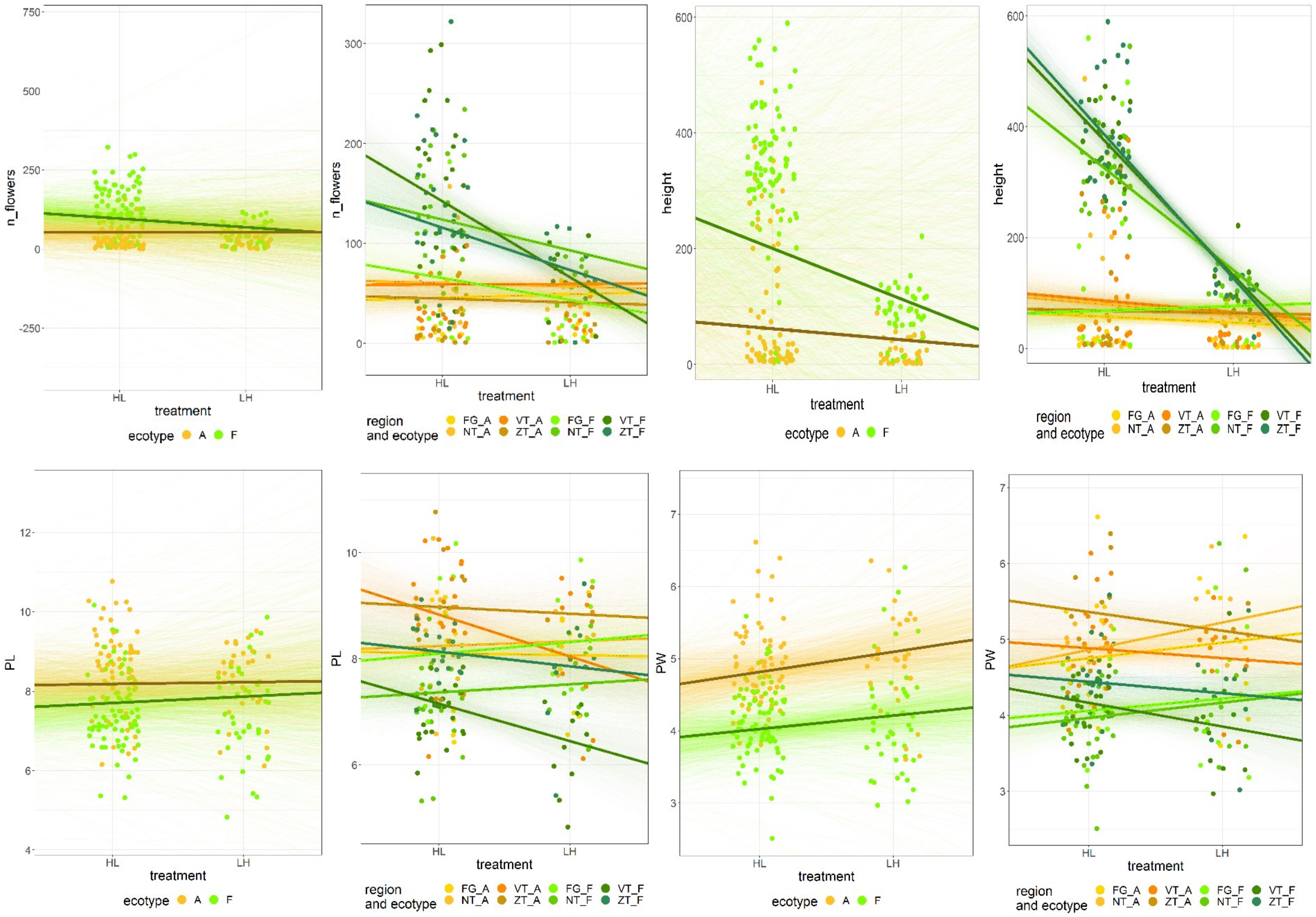


Figure 46 Reaction norms IV.

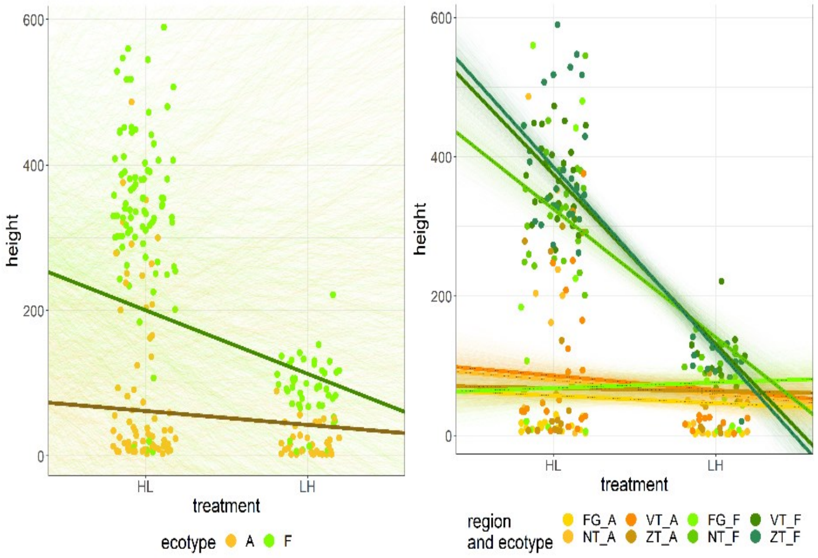
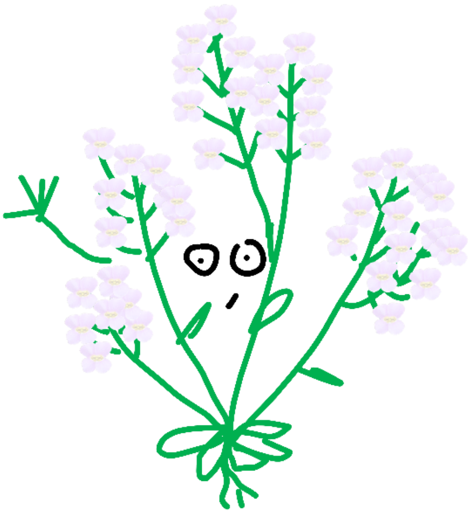


Figure 47 Reaction norms V.



4 Discussion

4.1 Does the extent of ecotypic differentiation differ by treatment?

Plants of alpine and foothill origin (ecotypes) were distinguishable on basis of the measured trait values in all four treatments. The success rate of determination was between 84 and 95 % when using set of vegetative traits and 92 – 98 % when also traits from flowering parts were included. This implies that the difference between alpine and foothill populations is genetically based and are not merely response to particular conditions (as explored previously by (Knotek et al., 2020; Wos et al., 2021)). Innovatively, I found out that this ecotypic distinction applies not only for one set of conditions ("standard", foothill-like conditions have been investigated so far) but remains significant over a range of varying light and temperature levels, i.e., also in conditions resembling foothill and alpine habitats. Importantly, several traits turned out to be the most prominent distinguishing characters in discriminant analyses of all treatments, indicating a consistent set of traits differentiates ecotypes, regardless of particular cultivation conditions. I observed the persisting difference between ecotypes across treatments when comparing across measured set of traits. However, neither linear discriminant analysis nor classificatory analysis within a single treatment has provided information whether the traits distinguishing ecotypes are fixed, or a mere subject of different directions of plasticity.

The main character contributing to ecotypic differentiation was biomass of rosette (biomass_rosette) and also SLA (which is related to biomass of rosette). This is in agreement with other studies of phenotypic changes linked to alpine adaptation in Brassicaceae. For example, alpine *Arabidopsis helleri* in Swiss Alps was shown to have smaller rosette than its foothill ancestors (Fischer et al., 2013). Similarly, alpine *A. halleri* in Japan evolved also smaller rosette sizes, independently of its European sister subspecies (Kubota et al., 2015). Likewise, *Arabidopsis lyrata* in two mountain ranges of Norway was shown to have smaller and thicker leaves (Hämälä & Savolainen, 2018), which could be interpreted similarly to altered rosette size to biomass ratio. However, in this study one can hardly distinguish the effect of increased elevation (comparable to selection force in my dataset) to increased latitude (unlike my dataset).

Smaller plant and rosette size was also shown in other more distant Brassicaceae species, namely *Arabis alpina* (Poncet et al., 2010) and *Cardamine resedifolia* (Ometto et al., 2015), both growing in the Alps.

Similar phenotypic changes were also identified outside Brassicaceae. For example, *Potentilla saundersiana* (Rosaceae) (Ma, Sun, et al., 2015) and *Lamiophlomis rotata* (Campanulaceae) (Ma, Yang, et al., 2015) growing in high elevation (>4000 m) in Himalayas both exhibited changes in specific leaf area.

Second group of traits which were important for discrimination between alpine and foothill plants across treatments includes traits related to generative parts of the plants as stem height, ratio of vegetative to generative biomass, total biomass of flowering parts and number of flowers. Root:shoot ratio is another trait reflecting different investment into flowering. In sum, all these above-described traits are probably intensely influenced by the distinction whether the ecotype invests into flowering or vegetative survival.

Transition to flowering by itself is thus one of the most important traits, with lower flowering rate detected in alpine plants in three of four treatments. The only treatment where no difference was detected was the one with the highest energy input: high temperature and irradiance. Probably, the non-natural combination of both high temperature and irradiance in this treatment disrupt the gene regulatory machinery responsible for the timing of flowering in both ecotypes. In extension, this may suggest that both ecotypes are to some extent plastic in their onset of flowering, yet only under the most extreme conditions.

The combination of irradiance (in terms of various photosynthetically active photon flux density levels) and temperature sensitivity likely explains the way alpine plants have to deal with delayed spring and periods of unstable weather during the spring (Keller & Körner, 2003). Selection on flowering time is generally common in alpine plants (Izawa, 2007; Romero Navarro et al., 2017; Hall & Willis, 2006) and is often also linked to photoperiodism, which was not included in this study because of population grows all in similar latitude.

The last important traits differentiation ecotypes were number of rosette leaf lobes and number of non-developed stems (buds) in rosette. Leaf morphology is recorded to play role in dealing with cold and freezing (Wittenberg, Anderson, & Berti, 2019; Gray, Chauvin, Sarhan, & Huner, 1997) and number of buds in rosette can be used as estimation of plants strategy and potential to future growth.

4.2 Do the ecotypes outperform each other in conditions resembling their native environment?

Because measuring seed set was not possible in my experiment, due to necessity of artificial pollination in this outcrossing species, non-synchronized flowering and generally non-natural conditions in the chambers, we used overall biomass as a measure of overall growth success. Keeping in mind potential limitations of using total biomass as proxy for fitness (Franklin & Morrissey, 2017; Younginger, Sirová, Cruzan, & Ballhorn, 2017), we detected consistent, yet only weak and non-significant trend of higher biomass attained in native environment of each ecotype, in line with the hypothesis of local adaptation. Although final confirmation of alpine adaptation requires designated in situ transplant experiments (G. Wos et al, in prep.), molecular signatures of adaptation have been recently revealed in the same *A. arenosa* lineages using population genomics (Bohutínská et al., 2021).

Additional reason for weak differences can be short time of the entire experiment. From our field observations I suspect that the ecotypes also diverge in total life span. Our field observations of old well-branched rosettes in alpine plants together with obvious trend of larger allocation of alpine ecotype into vegetative part in my experiment together suggest higher tendency for pereniality in alpine ecotype and for short-life span (biennial) in foothill ecotype. Plants expecting to persevere over years are not necessarily investing to flowering first year as their fitness is spread over multiple years.

4.3 Do originally alpine and foothill populations differ in their phenotypic plasticity? If so, in which traits?

When analysing all regions together, significant differences between the values of at least one ecotype in foothill vs. alpine conditions is observed only for five traits – biomass of rosette, diameter of rosette, the longest rosette leaf length (RLL), longest rosette leaf width (RLW) and SLA – specific leaf area. For diameter of rosette (diameter), the longest rosette leaf length (RLL), longest rosette leaf width (RLW) and SLA the reaction is congruent, both ecotypes decreasing in those traits when grown in alpine-like conditions, which means there is generally a plasticity in these traits in response to varying outer environment, but no difference in plasticity between alpine and foothill plants. Importantly, all those traits are functionally connected – diameter of rosette is interlinked with leaf size and specific leaf area is ratio of rosette surface to its biomass. What is interesting to note, that biomass of leaf rosette itself does not decrease in foothill and even increases in alpine plants. It seems that changed morphology of leaf rosette is universal reaction under lower temperature and higher irradiance and that alpine plants enlarge their rosette biomass when grown in conditions resembling their native environment.

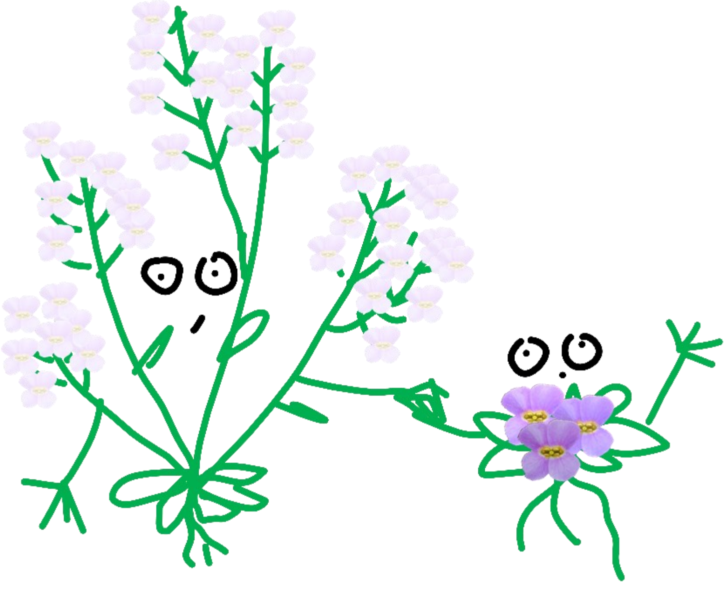
Number of flowers was in all cases higher in foothill ecotype in foothill conditions than in alpine, pointing towards inability of foothill plants to perform well in more extreme conditions. Flowers themselves are described by variables PL (petal length) and PW (petal width). Here no consistent response is seen, only some regional-specific differences: NT alpine plants had slightly wider petal leaves in alpine conditions, VT plants from both ecotypes short her petal leaves (in VT foothill plants, both width and length of petals was smaller, resulting in smaller flower size.

Height of plants decreased in alpine conditions for foothill plants, this variable is again interconnected with their varying investment to flowering. On the contrary, number of stems increased in foothill populations from two of four regions. Number of rosette buds, measured for assessing how much are plants prepared to create new stems was higher only in alpine plants in one region. Last not yet evaluated character is number of lobes on leaves, which was decreased in ZT region in both ecotypes.

As a starting hypothesis I assumed that alpine plants would show decreased plasticity either as a consequence of loss of variability during adaptation and ongoing selection pressures (Murren et al., 2015; Dewitt, 1998) in one direction or due to extensive costs of plasticity in extreme environments. However, my results do not support this hypothesis – I identified similar number of traits showing plasticity in in both alpine and foothill ecotypes. This may have multiple explanations. First, recent study based on whole genome data of the same lineages showed that there is not a significant difference in genetic variability between foothill and alpine populations (Bohutínská et al., 2021). Thus, there is no reason to compensate reduced levels of genetic variation by increased plasticity. Second, I propose that similar level of phenotypic plasticity of foothill and alpine population might reflect the need of alpine plants to adapt to distinct microhabitats, that may be slightly different in each mountain range studied (Keller & Körner, 2003; Christian Rellstab et al., 2020). This would be supported by the observation of many traits that appeared as plastic in some but not in all four mountain ranges. Third, the level of plasticity may not correlate to the level of genetic variability (Oostra, Saastamoinen, Zwaan, & Wheat, 2018). Finally high levels of plasticity in foothill habitats may also reflect trends unrelated of alpine adaptation, for example higher number of occupied habitats of foothill plants (Kolář et al., 2016; Monnahan et al., 2019)

5 Summary

In my thesis I asked to which extent plants alter their phenotypes by plastic and non-plastic trait shifts during adaptation to extreme alpine environments. To do so, I studied alpine differentiation in the species *Arabidopsis arenosa*, a predominantly foothill species that colonised alpine stands independently in several mountain regions. I, together with my supervisor, designed an experiment in which I subjected both alpine and foothill ecotypes of this species to treatments resembling foothill and alpine conditions, as well as to two control treatments in a full-factorial experiment design. As a first outcome of my diploma project, I developed a statistical Bayesian model designed to analyse such multi-dimensional dataset. I expect that it may prove useful to other students or scientists analysing similar datasets. Next, using a discriminant analysis, I found that the variability of the set of traits which I measured is divided both by ecotype and by treatment, suggesting that these plants exhibit a combination of plastic and non-plastic (heritable) morphological responses to the treatments. I supported these first results by further analysis using the dedicated model framework applied to each pre-defined functional trait separately. I found a non-random difference in the trait reaction of both ecotypes to different treatment. However, this was true only for a subset of traits, again in line with a combination of plastic and non-plastic responses. In summary, I showed that foothill and alpine ecotypes of *A. arenosa* exhibit trait shifts under different treatments, and the intensity of these shifts was both ecotype- and trait-specific. Altogether this suggests that *A. arenosa* has a capacity to mitigate extinction under environmental change by altering its phenotype both in ecological (plastic change) and evolutionary (ecotype-specific non-plastic heritable trait shifts) scales.



6 References

Anderson, J. T., Jameel, M. I., & Geber, M. A. (2021). Selection favors adaptive plasticity in a long-term reciprocal transplant experiment. *Evolution*, 1711–1726. https://doi.org/10.1111/evo.14280

Arnold, P. A., Nicotra, A. B., & Kruuk, L. E. B. (2019). Sparse evidence for selection on phenotypic plasticity in response to temperature. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *374*(1768). https://doi.org/10.1098/rstb.2018.0185

Basu, S., Ramegowda, V., Kumar, A., & Pereira, A. (2016). Plant adaptation to drought stress [version 1; referees: 3 approved]. *F1000Research*, *5*(0), 1–10. https://doi.org/10.12688/F1000RESEARCH.7678.1

Baythavong, B. S. (2011). Linking the spatial scale of environmental variation and the evolution of phenotypic plasticity: Selection favors adaptive plasticity in fine-grained environments. *American Naturalist*, *178*(1), 75–87. https://doi.org/10.1086/660281

Berman, J. (2016). Ploidy plasticity: A rapid and reversible strategy for adaptation to stress. *FEMS Yeast Research*, *16*(3), 1–5. https://doi.org/10.1093/femsyr/fow020

Bhargava, S., & Sawant, K. (2013). Drought stress adaptation: Metabolic adjustment and regulation of gene expression. *Plant Breeding*, *132*(1), 21–32. https://doi.org/10.1111/pbr.12004

Bohutínská, M., Vlček, J., Yair, S., Laenen, B., Konečná, V., Fracassetti, M., ... Kolár, F. (2021). Genomic basis of parallel adaptation varies with divergence in Arabidopsis and its relatives. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(21). https://doi.org/10.1073/pnas.2022713118

Chevin, L. M., Lande, R., & Mace, G. M. (2010). Adaptation, plasticity, and extinction in a changing environment: Towards a predictive theory. *PLoS Biology*, *8*(4). https://doi.org/10.1371/journal.pbio.1000357

Conti, L., Block, S., Parepa, M., Münkemüller, T., Thuiller, W., Acosta, A. T. R., ... Carboni, M. (2018). Functional trait differences and trait plasticity mediate biotic resistance to potential plant invaders. *Journal of Ecology*, *106*(4), 1607–1620. https://doi.org/10.1111/1365-2745.12928

Cui, H., Töpper, J. P., Yang, Y., Vandvik, V., & Wang, G. (2018). Plastic population effects and conservative leaf traits in a reciprocal transplant experiment simulating climate warming in the himalayas. *Frontiers in Plant Science*, *9*(July), 1–11. https://doi.org/10.3389/fpls.2018.01069

De Kort, H., Panis, B., Helsen, K., Douzet, R., Janssens, S. B., & Honnay, O. (2020). Pre-adaptation to climate change through topography-driven phenotypic plasticity. *Journal of Ecology*, *108*(4), 1465–1474. https://doi.org/10.1111/1365-2745.13365

Dewitt, T. J. (1998). *Costs and limits of phenotypic plasticity : Tests with morphology and life history in a freshwater snail.*

Diggle, P. K. (2002). A developmental morphologist's perspective on plasticity. *Evolutionary Ecology*, *16*(3), 267–283. https://doi.org/10.1023/A:1019680527788

Erschbamer, B. (2018). *Natural selection drives parallel divergence in the mountain plant*. 1355–1367. https://doi.org/10.1111/oik.05364

Fischer, M. C., Rellstab, C., Tedder, A., Zoller, S., Gugerli, F., Shimizu, K. K., … Widmer, A. (2013). Population genomic footprints of selection and associations with climate in natural populations of Arabidopsis halleri from the Alps. *Molecular Ecology*, *22*(22), 5594–5607. https://doi.org/10.1111/mec.12521

Flood, P. J., & Hancock, A. M. (2017). The genomic basis of adaptation in plants. *Current Opinion in Plant Biology*, *36*, 88–94. https://doi.org/10.1016/j.pbi.2017.02.003

Franklin, O. D., & Morrissey, M. B. (2017). Inference of selection gradients using performance measures as fitness proxies. *Methods in Ecology and Evolution*, *8*(6), 663–677. https://doi.org/10.1111/2041-210X.12737

Gandon, S., & Michalakis, Y. (2002). Local adaptation, evolutionary potential and host-parasite coevolution: Interactions between migration, mutation, population size and generation time. *Journal of Evolutionary Biology*, *15*(3), 451–462. https://doi.org/10.1046/j.1420-9101.2002.00402.x

Gao, S. B., Mo, L. D., Zhang, L. H., Zhang, J. L., Wu, J. B., Wang, J. L., … Gao, Y. B. (2018). Phenotypic plasticity vs. local adaptation in quantitative traits differences of Stipa grandis in semi-arid steppe, China. *Scientific Reports*, *8*(1), 1–8. https://doi.org/10.1038/s41598-018-21557-w

Ghalambor, C. K., McKay, J. K., Carroll, S. P., & Reznick, D. N. (2007). Adaptive versus non-adaptive phenotypic plasticity and the potential for contemporary adaptation in new environments. *Functional Ecology*, *21*(3), 394–407. https://doi.org/10.1111/j.1365-2435.2007.01283.x

Google Earth, version 9.140.0.5. (2021). *47°29'37"N, 19°04'26"E*. Retrieved from https://earth.google.com/web/@47.25347821,19.90005054,97.98596741a,1101351.62664324d,30.00001879y,0h,0t,0r

Gray, G. R., Chauvin, L. P., Sarhan, F., & Huner, N. P. A. (1997). Cold acclimation and freezing tolerance. A complex interaction of light and temperature. *Plant Physiology*, *114*(2), 467–474. https://doi.org/10.1104/pp.114.2.467

Gulisija, D., Kim, Y., & Plotkin, J. B. (2016). Phenotypic plasticity promotes balanced polymorphism in periodic environments by a genomic storage effect. *Genetics*, *202*(4), 1437–1448. https://doi.org/10.1534/genetics.115.185702

Hall, M. C., & Willis, J. H. (2006). Divergent Selection on Flowering Time Contributes To Local Adaptation in Mimulus Guttatus Populations. *Evolution*, *60*(12), 2466. https://doi.org/10.1554/05-688.1

Hämälä, T., & Savolainen, O. (2018). Local adaptation under gene flow: Recombination, conditional neutrality and genetic trade-offs shape genomic patterns in Arabidopsis lyrata. *BioRxiv*, 1–50. https://doi.org/10.1101/374900

Hämälä, T., & Savolainen, O. (2019). Genomic Patterns of Local Adaptation under Gene Flow in Arabidopsis lyrata. *Molecular Biology and Evolution*, *36*(11), 2557–2571. https://doi.org/10.1093/molbev/msz149

Harder, L. D., & Johnson, S. D. (2005). Adaptive plasticity of floral display size in animal-pollinated plants. *Proceedings of the Royal Society B: Biological Sciences*, *272*(1581), 2651–2657. https://doi.org/10.1098/rspb.2005.3268

Herman, J. J., Spencer, H. G., Donohue, K., & Sultan, S. E. (2014). How stable "should" epigenetic modifications be? Insights from adaptive plasticity and bet hedging. *Evolution*, *68*(3), 632–643. https://doi.org/10.1111/evo.12324

Hodgins, K. A., & Yeaman, S. (2019). Mating system impacts the genetic architecture of adaptation to heterogeneous environments. *New Phytologist*, *224*(3), 1201–1214. https://doi.org/10.1111/nph.16186

Honjo, M. N., & Kudoh, H. (2019). Arabidopsis halleri: A perennial model system for studying population differentiation and local adaptation. *AoB PLANTS*, *11*(6), 1–13. https://doi.org/10.1093/aobpla/plz076

Horikoshi, M., & Tang, Y. (2018). *ggfortify: Data Visualization Tools for Statistical*

Analysis Results. Retrieved from https://cran.r-project.org/package=ggfortify

Izawa, T. (2007). Adaptation of flowering-time by natural and artificial selection in Arabidopsis and rice. *Journal of Experimental Botany*, *58*(12), 3091–3097. https://doi.org/10.1093/jxb/erm159

Johansson, D., Pereyra, R. T., Rafajlović, M., & Johannesson, K. (2017). Reciprocal transplants support a plasticity-first scenario during colonisation of a large hyposaline basin by a marine macro alga. *BMC Ecology*, *17*(1), 1–9. https://doi.org/10.1186/s12898-017-0124-1

Keller, F., & Körner, C. (2003). The Role of Photoperiodism in Alpine Plant Development. *Arctic, Antarctic, and Alpine Research*, *35*(3), 361–368. https://doi.org/10.1657/1523-0430(2003)035[0361:TROPIA]2.0.CO;2

Knotek, A., Konečná, V., Wos, G., Požárová, D., Šrámková, G., Bohutínská, M., … Kolář, F. (2020). Parallel Alpine Differentiation in Arabidopsis arenosa. *Frontiers in Plant Science*, *11*(December), 1–12. https://doi.org/10.3389/fpls.2020.561526

Kolář, F., Lučanová, M., Záveská, E., Fuxová, G., Mandáková, T., Španiel, S., … Marhold, K. (2016). Ecological segregation does not drive the intricate parapatric distribution of diploid and tetraploid cytotypes of the Arabidopsis arenosa group (Brassicaceae). *Biological Journal of the Linnean Society*, *119*(3), 673–688. https://doi.org/10.1111/bij.12479

Konečná, V., Yant, L., & Kolář, F. (2020). The Evolutionary Genomics of Serpentine Adaptation. *Frontiers in Plant Science*, *11*(December). https://doi.org/10.3389/fpls.2020.574616

Koutecký, P. (2015). MorphoTools: a set of R functions for morphometric analysis. *Plant Systematics and Evolution*, *301*(4), 1115–1121. https://doi.org/10.1007/s00606-014-1153-2

Kubota, S., Iwasaki, T., Hanada, K., Nagano, A. J., Fujiyama, A., Toyoda, A., … Morinaga, S. I. (2015). A Genome Scan for Genes Underlying Microgeographic-Scale Local Adaptation in a Wild Arabidopsis Species. *PLoS Genetics*, *11*(7), 1–27. https://doi.org/10.1371/journal.pgen.1005361

Leimu, R., & Fischer, M. (2008). A meta-analysis of local adaptation in plants. *PLoS ONE*, *3*(12), 1–8. https://doi.org/10.1371/journal.pone.0004010

Lind, M. I., & Johansson, F. (2009). Costs and limits of phenotypic plasticity in Island populations of the common frog Rana Temporaria under divergent selection pressures. *Evolution*, *63*(6), 1508–1518. https://doi.org/10.1111/j.1558-5646.2009.00647.x

Lovell, J. T., Grogan, K., Sharbel, T. F., & McKay, J. K. (2014). Mating system and environmental variation drive patterns of adaptation in Boechera spatifolia (Brassicaceae). *Molecular Ecology*, *23*(18), 4486–4497. https://doi.org/10.1111/mec.12879

Ma, L., Sun, X., Kong, X., Galvan, J. V., Li, X., Yang, S., ... Hu, X. (2015). Physiological, biochemical and proteomics analysis reveals the adaptation strategies of the alpine plant Potentilla saundersiana at altitude gradient of the Northwestern Tibetan Plateau. *Journal of Proteomics*, *112*, 63–82. https://doi.org/10.1016/j.jprot.2014.08.009

Ma, L., Yang, L., Zhao, J., Wei, J., Kong, X., Wang, C., ... Hu, X. (2015). Comparative proteomic analysis reveals the role of hydrogen sulfide in the adaptation of the alpine plant Lamiophlomis rotata to altitude gradient in the Northern Tibetan Plateau. *Planta*, *241*(4), 887–906. https://doi.org/10.1007/s00425-014-2209-9

Matesanz, S., Gianoli, E., & Valladares, F. (2010). Global change and the evolution of phenotypic plasticity in plants. *Annals of the New York Academy of Sciences*, *1206*, 35–55. https://doi.org/10.1111/j.1749-6632.2010.05704.x

McIntyre, P. J., & Strauss, S. Y. (2014). Phenotypic and transgenerational plasticity promote local adaptation to sun and shade environments. *Evolutionary Ecology*, *28*(2), 229–246. https://doi.org/10.1007/s10682-013-9670-y

Merilä, J., & Hendry, A. P. (2014). Climate change, adaptation, and phenotypic plasticity: The problem and the evidence. *Evolutionary Applications*, *7*(1), 1–14. https://doi.org/10.1111/eva.12137

Měs\’\iček, J., Goliašová, K., & Š\’\ipošová, H. (2002). Cardaminopsis (CA Mey.) Hayek. *Flóra Slovenska*, *4*, 388–415.

Metlen, K. L., Aschehoug, E. T., & Callaway, R. M. (2009). Plant behavioural ecology: Dynamic plasticity in secondary metabolites. *Plant, Cell and Environment*, *32*(6), 641–653. https://doi.org/10.1111/j.1365-3040.2008.01910.x

Molina-Montenegro, M. A., Atala, C., & Gianoli, E. (2010). Phenotypic plasticity and performance of Taraxacum officinale (dandelion) in habitats of contrasting environmental heterogeneity. *Biological Invasions*, *12*(7), 2277–2284. https://doi.org/10.1007/s10530-009-9638-6

Monnahan, P., Kolář, F., Baduel, P., Sailer, C., Koch, J., Horvath, R., ... Yant, L.

(2019). Pervasive population genomic consequences of genome duplication in Arabidopsis arenosa. *Nature Ecology and Evolution*, *3*(3), 457–468. https://doi.org/10.1038/s41559-019-0807-4

Murren, C. J., Auld, J. R., Callahan, H., Ghalambor, C. K., Handelsman, C. A., Heskel, M. A., … Schlichting, C. D. (2015). Constraints on the evolution of phenotypic plasticity: Limits and costs of phenotype and plasticity. *Heredity*, Vol. 115, pp. 293–301. https://doi.org/10.1038/hdy.2015.8

Nielsen, R. (2005). Molecular signatures of natural selection. *Annual Review of Genetics*, *39*, 197–218. https://doi.org/10.1146/annurev.genet.39.073003.112420

Ometto, L., Li, M., Bresadola, L., Barbaro, E., Neteler, M., & Varotto, C. (2015). Demographic history, population structure, and local adaptation in alpine populations of Cardamine impatiens and Cardamine resedifolia. *PLoS ONE*, *10*(5), 1–25. https://doi.org/10.1371/journal.pone.0125199

Oostra, V., Saastamoinen, M., Zwaan, B. J., & Wheat, C. W. (2018). Strong phenotypic plasticity limits potential for evolutionary responses to climate change. *Nature Communications*, *9*(1). https://doi.org/10.1038/s41467-018-03384-9

Palacio-López, K., Beckage, B., Scheiner, S., & Molofsky, J. (2015). The ubiquity of phenotypic plasticity in plants: A synthesis. *Ecology and Evolution*, *5*(16), 3389–3400. https://doi.org/10.1002/ece3.1603

Pigliucci, M., & Schlichting, C. D. (1995). Reaction norms of Arabidopsis (Brassicaceae). III. Response to nutrients in 26 populations from a worldwide collection. *American Journal of Botany*, *82*(9), 1117–1125. https://doi.org/10.2307/2446064

Poncet, B. N., Herrmann, D., Gugerli, F., Taberlet, P., Holderegger, R., Gielly, L., … Manel, S. (2010). Tracking genes of ecological relevance using a genome scan in two independent regional population samples of Arabis alpina. *Molecular Ecology*, *19*(14), 2896–2907. https://doi.org/10.1111/j.1365-294X.2010.04696.x

Pyhäjärvi, T., Hufford, M. B., Mezmouk, S., & Ross-Ibarra, J. (2013). Complex patterns of local adaptation in teosinte. *Genome Biology and Evolution*, *5*(9), 1594–1609. https://doi.org/10.1093/gbe/evt109

R Core Team. (2021). *R: A Language and Environment for Statistical Computing*. Retrieved from https://www.r-project.org/

Ralph, P. L., & Coop, G. (2015). The role of standing variation in geographic convergent adaptation. *American Naturalist*, *186*(october), S5–S23. https://doi.org/10.1086/682948

Rellstab, C., Fischer, M. C., Zoller, S., Graf, R., Tedder, A., Shimizu, K. K., … Gugerli, F. (2017). Local adaptation (mostly) remains local: Reassessing environmental associations of climate-related candidate SNPs in Arabidopsis halleri. *Heredity*, *118*(2), 193–201. https://doi.org/10.1038/hdy.2016.82

Rellstab, Christian, Zoller, S., Sailer, C., Tedder, A., Gugerli, F., Shimizu, K. K., … Fischer, M. C. (2020). Genomic signatures of convergent adaptation to Alpine environments in three Brassicaceae species. *Molecular Ecology*, *29*(22), 4350–4365. https://doi.org/10.1111/mec.15648

Relyea, R. A. (2002). Costs of phenotypic plasticity. *American Naturalist*, *159*(3), 272–282. https://doi.org/10.1086/338540

Romero Navarro, J. A., Willcox, M., Burgueño, J., Romay, C., Swarts, K., Trachsel, S., … Buckler, E. S. (2017). A study of allelic diversity underlying flowering-time adaptation in maize landraces. *Nature Genetics*, *49*(3), 476–480. https://doi.org/10.1038/ng.3784

RStudio Team. (2021). *RStudio: Integrated Development Environment for R*. Retrieved from http://www.rstudio.com/

Santamaría, L., Figuerola, J., Pilon, J. J., Mjelde, M., Green, A. J., De Boer, T., … Gornall, R. J. (2003). Plant performance across latitude: The role of plasticity and local adaptation in an aquatic plant. *Ecology*, *84*(9), 2454–2461. https://doi.org/10.1890/02-0431

Scheiner, Samuel M. Goodnight, C. J. (1983). The Comparison of Phenotypic Plasticity and Genetic Variation in Populations of the Grass Danthonia spicata Author (s): Samuel M . Scheiner and Charles J . Goodnight Reviewed work (s): Published by : Society for the Study of Evolution Stable URL : htt. *Society for the Study of Evolution*, *38*(4), 845–855.

Schindelin, J., Arganda-Carreras, I., Frise, E., Kaynig, V., Longair, M., Pietzsch, T., … Cardona, A. (2012). Fiji: An open-source platform for biological-image analysis. *Nature Methods*, *9*(7), 676–682. https://doi.org/10.1038/nmeth.2019

Schranz, M. E., & Osborn, T. C. (2004). De novo variation in life-history traits and responses to growth conditions of resynthesized polyploid Brassica napus (Brassicaceae). *American Journal of Botany*, *91*(2), 174–183.

https://doi.org/10.3732/ajb.91.2.174

Stamp, M. A., & Hadfield, J. D. (2020). The relative importance of plasticity versus genetic differentiation in explaining between population differences; a meta-analysis. *Ecology Letters*, *23*(10), 1432–1441. https://doi.org/10.1111/ele.13565

Stan Development Team. (2020). *{RStan}: the {R} interface to {Stan}*. Retrieved from http://mc-stan.org/

Stan Development Team. (2021). *Stan Modeling Language Users Guide and Reference Manual, 2.27*. Retrieved from http://mc-stan.org/

Sultan, S. E., Wilczek, A. M., Bell, D. L., & Hand, G. (1998). Physiological response to complex environments in annual Polygonum species of contrasting ecological breadth. *Oecologia*, *115*(4), 564–578. https://doi.org/10.1007/s004420050554

Taylor, J. F., Needham, M. P., North, B. P., Morgan, A., Thompson, K., & Migaud, H. (2007). The influence of ploidy on saltwater adaptation, acute stress response and immune function following seawater transfer in non-smolting rainbow trout. *General and Comparative Endocrinology*, *152*(2–3), 314–325. https://doi.org/10.1016/j.ygcen.2007.02.029

Valladares, F., Chico, J., Aranda, I., Balaguer, L., Dizengremel, P., Manrique, E., & Dreyer, E. (2002). The greater seedling high-light tolerance of Quercus robur over Fagus sylvatica is linked to a greater physiological plasticity. *Trees - Structure and Function*, *16*(6), 395–403. https://doi.org/10.1007/s00468-002-0184-4

Valladares, F., Wright, S. J., Lasso, E., Kitajima, K., & Pearcy, R. W. (2000). Plastic phenotypic response to light of 16 congeneric shrubs from a panamanian rainforest. *Ecology*, *81*(7), 1925–1936. https://doi.org/10.1890/0012-9658(2000)081[1925:PPRTLO]2.0.CO;2

Walters, R. J., & Berger, D. (2019). Implications of existing local (mal)adaptations for ecological forecasting under environmental change. *Evolutionary Applications*, *12*(7), 1487–1502. https://doi.org/10.1111/eva.12840

Wickham, H. (2016). *ggplot2: Elegant Graphics for Data Analysis*. Retrieved from https://ggplot2.tidyverse.org

Wickham, H. (2021). *tidyverse: Easily Install and Load the Tidyverse*. Retrieved from https://cran.r-project.org/package=tidyverse

Wittenberg, A., Anderson, J. V., & Berti, M. T. (2019). Winter and summer annual biotypes of camelina have different morphology and seed characteristics.

Industrial Crops and Products, *135*(March), 230–237. https://doi.org/10.1016/j.indcrop.2019.04.036

Wos, G., Bohutínská, M., Nosková, J., Mandáková, T., & Kolář, F. (2021). Parallelism in gene expression between foothill and alpine ecotypes in Arabidopsis arenosa. *Plant Journal*, *105*(5), 1211–1224. https://doi.org/10.1111/tpj.15105

Younginger, B. S., Sirová, D., Cruzan, M. B., & Ballhorn, D. J. (2017). Is biomass a reliable estimate of plant fitness? *Applications in Plant Sciences*, *5*(2), 1600094. https://doi.org/10.3732/apps.1600094

7 Supplements

Supplement 1 Coordinates of places of collection.

Population	Latitude	Longitude
AA253	47.27778	14.32139
AA065	45.602	24.62263889
AA222	45.59535	24.63458
AA084	49.162	20.15419444
AA090	49.20652778	20.21505556
AA168	49.204509	19.735202
AA087	49.19702778	19.74477778
AA254	47.36444	14.68083
AA255	47.28417	14.68194
AA067	45.44163889	25.22394444
AA016	48.96030556	20.38327778
AA171	49.00716	20.286407
AA208	49.043514	20.180772
AA229	49.183171	19.541024
AA252	47.18194	14.33694
AA251	45.42667	25.21327

Supplement 2 Complete dataset, shown by populations for clarity of tables.

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
1	HH016_12L01	AA016	F	VT	HH	105.38	334.01	72.64	1.00	4.00	100.00	328.57	1452.04	33.15	7.56	4.20
2	HH016_13L03	AA016	F	VT	HH	214.02		44.15	1.00	0.00	214.00	293.24	576.56	32.67	6.86	3.69
3	HH016_13L0B	AA016	F	VT	HH	115.44	675.91	184.17	1.00	8.00	459.00	389.70	3297.83	39.25	6.29	3.43
4	HH016_14L05	AA016	F	VT	HH	70.50	299.39	36.95	1.00	6.00	156.00	346.54	1481.98	30.12	8.04	3.70
5	HH016_16L07	AA016	F	VT	HH	85.68	365.02	48.59	1.00	8.00	236.00	304.41	2162.74	33.40	7.36	4.49
6	HH016_16L0B	AA016	F	VT	HH	33.10	346.44	166.81	1.00	3.00	220.00	396.87	2003.46	28.70	7.07	4.93
7	HH016_17L10	AA016	F	VT	HH	371.65	315.70	96.99	1.00	4.00	121.00	354.34	581.12	52.02	6.00	3.55
8	HL016_12L01	AA016	F	VT	HL	68.14	495.22	37.87	1.00	8.00	253.00	406.59	2508.58	54.61	7.50	3.98
9	HL016_12L02	AA016	F	VT	HL	68.04	206.24	39.23	1.00	3.00	109.00	358.37	1045.03	66.97	7.11	3.91
10	HL016_12L0B	AA016	F	VT	HL	144.06	220.79	18.44	1.00	2.00	136.00	448.62	1475.97	69.76	5.84	3.51
11	HL016_13L03	AA016	F	VT	HL	18.09	356.80		1.00	5.00	243.00	302.26	1942.81	45.54	6.62	4.11
12	HL016_13L04	AA016	F	VT	HL	16.45	96.78	28.48	1.00	2.00	77.00	266.54	764.98	46.59	6.50	3.90
13	HL016_13L0B	AA016	F	VT	HL	29.53	167.91	16.33	1.00	5.00	97.00	287.06	1098.12	32.91	7.83	4.00
14	HL016_14L05	AA016	F	VT	HL	120.19	245.99	41.16	1.00	3.00	174.00	373.41	1671.02	48.66	7.82	4.73
15	HL016_14L06	AA016	F	VT	HL	21.55	181.96	37.33	1.00	4.00	113.00	328.09	1428.67	26.74	6.88	4.25
16	HL016_14L0B	AA016	F	VT	HL	65.35	79.35	25.84	1.00	2.00	32.00	343.37	403.92	49.77	8.08	4.05
17	HL016_16L07	AA016	F	VT	HL	155.95	288.84	47.33	1.00	5.00	243.00	332.75	1862.54	45.41	7.16	3.62
18	HL016_16L08	AA016	F	VT	HL	105.87	40.84	26.63	1.00	2.00	28.00	472.68	747.36	44.65	7.24	4.51
19	HL016_17L09	AA016	F	VT	HL	75.76	345.80	27.13	1.00	4.00	165.00	380.80	2032.92	45.14	7.39	4.65
20	HL016_17L10	AA016	F	VT	HL	68.41	218.79	38.11	1.00	3.00	110.00	447.05	1244.74	43.70	7.24	3.85
21	LH016_12L01	AA016	F	VT	LH	173.88	51.69	61.17	1.00	1.00	2.00	48.00	49.50	30.00		
22	LH016_13L03	AA016	F	VT	LH	161.86	188.03	58.51	1.00	8.00	84.00	221.48	949.27	24.30	6.83	4.32
23	LH016_13L0B	AA016	F	VT	LH	148.47	183.71	93.52	1.00	8.00	75.00	137.30	760.55	36.90	6.33	4.01
24	LH016_14L05	AA016	F	VT	LH	115.01	114.15	59.30	1.00	7.00	21.00	69.34	191.73	31.90	5.97	3.40
25	LH016_16L07	AA016	F	VT	LH	136.24	124.79	67.64	1.00	8.00	41.00	86.59	361.77	31.10	7.13	3.77
26	LH016_17L09	AA016	F	VT	LH	116.42	189.73	77.78	1.00	6.00	68.00	130.03	684.85	29.20	7.19	3.98
27	LL016_12L01	AA016	F	VT	LL	204.12	38.27	65.42	1.00	2.00	6.00	52.43	64.12	53.18	6.82	4.85
28	LL016_12L02	AA016	F	VT	LL	83.01	136.39	41.12	1.00	2.00	17.00	139.70	303.68	46.91		
29	LL016_13L03	AA016	F	VT	LL	28.22	41.50		1.00	3.00	11.00	147.21	233.15	34.96	5.69	3.11
30	LL016_13L04	AA016	F	VT	LL	68.11	97.87	47.27	1.00	5.00	22.00	257.44	534.90	45.96	7.86	5.05
31	LL016_13L0B	AA016	F	VT	LL	103.21	18.70	31.55	0.00	1.00	0.00	50.98	50.98	42.65		
32	LL016_14L05	AA016	F	VT	LL	246.58	5.59	59.97	0.00	0.00	0.00	7.90	7.90	56.96		
33	LL016_14L06	AA016	F	VT	LL	28.39	159.86	27.79	1.00	4.00	44.00	180.77	554.01	33.98	6.95	4.04
34	LL016_16L07	AA016	F	VT	LL	145.67	19.86	41.95	0.00	1.00	0.00	11.71	11.71	47.03		
35	LL016_16L08	AA016	F	VT	LL	206.59	7.51	45.52	0.00	1.00	0.00	7.80	7.80	53.04		
36	LL016_17L09	AA016	F	VT	LL	155.58	75.01	46.69	1.00	1.00	20.00	216.22	84.55	49.00	5.96	3.52
37	LL016_17L0B	AA016	F	VT	LL	87.18	112.94	42.95	1.00	3.00	37.00	180.01	213.52	49.67	8.32	4.53
38	LL016_17L10	AA016	F	VT	LL	192.79	65.52	43.27	1.00	1.00	10.00	87.06	333.26	51.87	10.00	4.93

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
1	HH016_12L01	15.08	7.16	8.00	0.00	3.30	512.03	0.17	1.88	4.66	5.81	4.29	6.24	5.79	7.28	8.19
2	HH016_13L03	4.83	2.02	3.00	0.00	2.52	258.17	0.21		5.37		3.79	5.55	5.68	6.36	3.92
3	HH016_13L0B	14.91	5.15	8.00	3.00	4.28	975.52	0.23	2.26	4.75	6.52	5.22	6.88	5.97	8.10	10.48
4	HH016_14L05	13.00	5.10	4.00	1.00	2.85	406.84	0.10	2.79	4.26	5.70	3.61	6.01	5.85	7.30	10.10
5	HH016_16L07	16.10	5.10	4.00	0.00	3.15	499.29	0.11	2.72	4.45	5.90	3.88	6.21	5.72	7.68	10.22
6	HH016_16L0B	12.06	5.04	6.00	1.00	2.46	546.35	0.44	1.73	3.50	5.85	5.12	6.30	5.98	7.60	19.55
7	HH016_17L10	21.15	6.44	8.00	0.00	3.51	784.34	0.14	0.67	5.92	5.75	4.57	6.66	5.87	6.36	5.72
8	HL016_12L01	24.36	6.61	5.00	0.00	2.45	601.23	0.07	4.67	4.22	6.21	3.63	6.40	6.01	7.83	34.37
9	HL016_12L02	38.99	9.74	7.00	2.00	2.20	313.51	0.14	1.92	4.22	5.33	3.67	5.75	5.88	6.95	51.77
10	HL016_12L0B	22.43	5.74	7.00	0.00	1.93	383.29	0.05	1.36	4.97	5.40	2.91	5.95	6.11	7.30	26.53
11	HL016_13L03				0.00					2.90	5.88			5.71	7.57	90.03
12	HL016_13L04	28.80	8.47	3.00	0.00	1.72	141.71	0.25	2.15	2.80	4.57	3.35	4.95	5.59	6.64	103.65
13	HL016_13L0B	14.74	5.61	4.00	0.00	1.75	213.77	0.08	3.66	3.39	5.12	2.79	5.36	5.66	7.00	28.80
14	HL016_14L05	17.32	9.11	5.00	0.00	3.17	407.34	0.11	1.52	4.79	5.51	3.72	6.01	5.92	7.42	15.47
15	HL016_14L06	10.91	3.52	7.00	2.00	1.64	240.84	0.18	3.09	3.07	5.20	3.62	5.48	5.79	7.26	26.05
16	HL016_14L0B	34.51	9.76	3.00	1.00	1.94	170.54	0.18	0.87	4.18	4.37	3.25	5.14	5.84	6.00	29.76
17	HL016_16L07	19.86	6.83	7.00	0.00	2.58	492.12	0.11	1.42	5.05	5.67	3.86	6.20	5.81	7.53	10.38
18	HL016_16L08	22.50	5.02	7.00	1.00	2.31	173.34	0.18	0.31	4.66	3.71	3.28	5.16	6.16	6.62	14.79
19	HL016_17L09	27.83	6.93	4.00	0.00	2.15	448.69	0.06	3.36	4.33	5.85	3.30	6.11	5.94	7.62	21.12
20	HL016_17L10	20.20	8.17	5.00	0.00	2.06	325.31	0.13	2.05	4.23	5.39	3.64	5.78	6.10	7.13	21.93
21	LH016_12L01	12.36	4.83	4.00	4.00	3.77	286.74	0.27	0.22	5.16	3.95	4.11	5.66	3.87	3.90	4.07
22	LH016_13L03	13.01	4.43	1.00	3.00	2.44	408.40	0.17	0.85	5.09	5.24	4.07	6.01	5.40	6.86	2.87
23	LH016_13L0B	13.00	5.56	6.00	4.00	3.10	425.70	0.28	0.76	5.00	5.21	4.54	6.05	4.92	6.63	7.20
24	LH016_14L05	13.97	3.05	4.00	5.00	2.99	288.46	0.26	0.65	4.75	4.74	4.08	5.66	4.24	5.26	6.95
25	LH016_16L07	11.70	3.39	6.00	3.00	3.46	328.67	0.26	0.61	4.91	4.83	4.21	5.80	4.46	5.89	5.58
26	LH016_17L09	11.55	3.87	6.00	2.00	3.35	383.93	0.25	0.98	4.76	5.25	4.35	5.95	4.87	6.53	5.75
27	LL016_12L01	20.00	6.82	8.00	3.00	2.90	307.81	0.27	0.14	5.32	3.64	4.18	5.73	3.96	4.16	10.88
28	LL016_12L02						260.52	0.19	1.10	4.42	4.92	3.72	5.56	4.94	5.72	20.82
29	LL016_13L03	18.55	5.54	3.00	2.00	1.60				3.34	3.73			4.99	5.45	34.02
30	LL016_13L04	17.78	9.11	3.00	1.00	2.60	213.25	0.28	0.85	4.22	4.58	3.86	5.36	5.55	6.28	24.35
31	LL016_13L0B	17.49	9.54	6.00	2.00	1.70	153.46	0.26	0.14	4.64	2.93	3.45	5.03	3.93	3.93	13.84
32	LL016_14L05	24.45	8.68	7.00	3.00	2.80	312.14	0.24	0.02	5.51	1.72	4.09	5.74	2.07	2.07	10.34
33	LL016_14L06	16.30	5.78	4.00	3.00	2.20	216.04	0.15	2.85	3.35	5.07	3.32	5.38	5.20	6.32	31.94
34	LL016_16L07	19.20	7.55	4.00	1.00	2.20	207.48	0.25	0.11	4.98	2.99	3.74	5.34	2.46	2.46	11.92
35	LL016_16L08	20.62	10.06	4.00	1.00	2.78	259.62	0.21	0.03	5.33	2.02	3.82	5.56	2.05	2.05	10.70
36	LL016_17L09	23.32	11.92	2.00	3.00	2.80	277.28	0.20	0.37	5.05	4.32	3.84	5.63	5.38	4.44	12.12
37	LL016_17L0B	22.08	9.06	10.00	1.00	2.90	243.07	0.21	0.87	4.47	4.73	3.76	5.49	5.19	5.36	22.23
38	LL016_17L10	20.59	8.85	3.00	3.00	2.10	301.58	0.17	0.28	5.26	4.18	3.77	5.71	4.47	5.81	10.96

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
39	HH065_01L01	AA065	A	FG	HH	494.55	108.24	134.53	1.00	18.00	135.00	29.14	254.07	38.17	8.20	5.19
40	HH065_02L03	AA065	A	FG	HH	612.62	15.04	126.46	1.00	3.00	14.00	8.33	29.77	39.28	8.36	4.59
41	HH065_03L05	AA065	A	FG	HH	519.92	87.44		1.00	6.00	74.00	76.19	159.24	42.52	7.52	4.55
42	HH065_03L0B	AA065	A	FG	HH	340.56	0.00	152.38	0.00	0.00	0.00	0.00	0.00	38.00	7.25	4.85
43	HH065_05L07	AA065	A	FG	HH	105.19	7.14		1.00	1.00	14.00	15.81	15.81	31.40	6.96	5.12
44	HH065_06L09	AA065	A	FG	HH	110.40	4.33	116.77	1.00	3.00	9.00	6.75	12.85	68.17		
45	HH065_06L0B	AA065	A	FG	HH	372.24	23.33	157.08	1.00	5.00	43.00	22.68	46.24	44.74	7.82	4.23
46	HL065_01L01	AA065	A	FG	HL	116.23	1.90	76.97	1.00	2.00	6.00	7.72	12.71	46.19	6.43	4.11
47	HL065_01L02	AA065	A	FG	HL	105.85	23.10	50.60	1.00	5.00	33.00	15.88	38.05	40.27	6.56	4.45
48	HL065_01L0B	AA065	A	FG	HL	228.61	7.47	63.70	0.00	1.00	0.00	3.45	3.45	57.12		
49	HL065_02L03	AA065	A	FG	HL	130.18	40.97	22.47	1.00	6.00	43.00	18.80	36.69	59.09	8.48	4.15
50	HL065_02L04	AA065	A	FG	HL	230.54	0.00	55.30	0.00	0.00	0.00	0.00	0.00	58.03	8.18	4.62
51	HL065_03L05	AA065	A	FG	HL	149.70	15.39	68.78	1.00	5.00	17.00	13.91	47.41	60.03	8.98	5.37
52	HL065_03L06	AA065	A	FG	HL	206.60	18.80	94.26	1.00	4.00	15.00	5.87	24.15	72.35	8.88	4.93
53	HL065_05L07	AA065	A	FG	HL	217.89		79.90	1.00	3.00	9.00	6.00	21.80	61.52	9.16	5.44
54	HL065_05L08	AA065	A	FG	HL	146.35	0.00	65.16	0.00	0.00	0.00	0.00	0.00	46.33	6.85	4.43
55	HL065_05L0B	AA065	A	FG	HL		2.63	62.92	1.00	2.00	3.00	11.01	24.39	52.11	9.26	6.61
56	HL065_06L09	AA065	A	FG	HL	260.39	0.00	73.42	0.00	0.00	0.00	0.00	0.00	49.64	8.80	5.25
57	HL065_06L0B	AA065	A	FG	HL	182.14	10.17	37.73	1.00	3.00	7.00	8.90	8.90	54.65	9.11	5.43
58	HL065_06L10	AA065	A	FG	HL	186.92	0.00	46.74	0.00	0.00	0.00	0.00	0.00	48.68		
59	LH065_01L02	AA065	A	FG	LH	225.85	13.36		1.00	3.00	9.00	2.35	20.16	31.10	7.80	4.89
60	LH065_02L03	AA065	A	FG	LH	244.88	62.70	77.18	1.00	10.00	63.00	2.35	44.06	36.90	8.47	4.98
61	LH065_03L05	AA065	A	FG	LH	226.64	36.97	84.91	1.00	4.00	20.00	2.35	29.32	32.66	8.73	5.55
62	LH065_05L07	AA065	A	FG	LH	236.22	85.67	85.24	1.00	5.00	30.00	2.35	33.21	34.00	8.75	5.80
63	LH065_05L0B	AA065	A	FG	LH	246.69	48.61	88.75	1.00	10.00	40.00	2.35	42.78	30.80	8.72	5.62
64	LH065_06L09	AA065	A	FG	LH	378.42	0.00	108.57	0.00	0.00	0.00	0.00	0.00	38.20	9.25	6.36
65	LL065_01L01	AA065	A	FG	LL	203.23	14.58	41.87	1.00	1.00	3.00	2.33	2.33	54.77		
66	LL065_05L07	AA065	A	FG	LL	119.49	7.70	42.54	1.00	1.00	4.00	4.56	4.56	41.96	9.27	6.16
67	LL065_06L03	AA065	A	FG	LL	278.96	9.21	57.74	0.00	1.00	0.00	11.10	11.10	54.54		
68	LL065_06L05	AA065	A	FG	LL	134.43	14.38	29.37	1.00	1.00	7.00	9.71	9.71	55.94	8.22	4.91
69	LL065_06L09	AA065	A	FG	LL	120.26	4.35	48.37	0.00	0.00	0.00	4.30	4.30	45.87		
70	LL065_06L10	AA065	A	FG	LL	214.00	0.00	68.95	0.00	0.00	0.00	0.00	0.00	43.68		
71	LL065_06L11	AA065	A	FG	LL	249.56	20.29	48.78	0.00	1.00	6.00	14.80	14.80	57.45	9.85	5.70

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
39	HH065_01L01	14.77	4.53	1.00	0.00	5.57	737.32	0.22	0.17	6.20	4.68	4.90	6.60	3.37	5.54	2.31
40	HH065_02L03	15.70	5.61	3.00	1.00	4.46	754.12	0.20	0.02	6.42	2.71	4.84	6.63	2.12	3.39	1.98
41	HH065_03L05	18.71	5.51	1.00	1.00	3.30				6.25	4.47			4.33	5.07	2.73
42	HH065_03L0B	13.21	4.62	2.00	3.00	5.18	492.94	0.45		5.83		5.03	6.20			3.33
43	HH065_05L07	12.57	5.25	1.00						4.66	1.97			2.76	2.76	7.36
44	HH065_06L09	11.26	4.78	1.00			231.50	1.02	0.02	4.70	1.47	4.76	5.44	1.91	2.55	33.06
45	HH065_06L0B	15.22	4.09	3.00	0.00	4.35	552.65	0.40	0.04	5.92	3.15	5.06	6.31	3.12	3.83	4.22
46	HL065_01L01	14.71	5.28	1.00	4.00	3.53	195.10	0.65	0.01	4.76	0.64	4.34	5.27	2.04	2.54	14.42
47	HL065_01L02	18.04	4.91	1.00	1.00	2.31	179.55	0.39	0.15	4.66	3.14	3.92	5.19	2.77	3.64	12.03
48	HL065_01L0B	31.20	9.45	1.00	3.00	3.09	299.78	0.27	0.03	5.43	2.01	4.15	5.70	1.24	1.24	11.21
49	HL065_02L03	35.75	7.53	1.00	0.00	2.35	193.62	0.13	0.27	4.87	3.71	3.11	5.27	2.93	3.60	21.06
50	HL065_02L04	20.97	6.70	8.00	0.00	2.64	285.84	0.24		5.44		4.01	5.66			11.47
51	HL065_03L05	11.52	3.73	2.00	1.00	3.73	233.87	0.42	0.07	5.01	2.73	4.23	5.45	2.63	3.86	18.91
52	HL065_03L06	25.41	7.65	5.00	3.00	3.45	319.66	0.42	0.06	5.33	2.93	4.55	5.77	1.77	3.18	19.90
53	HL065_05L07	18.23	5.06	1.00	2.00	3.48	297.79	0.37		5.38		4.38	5.70	1.79	3.08	13.64
54	HL065_05L08	17.36	5.79	1.00	4.00	2.85	211.51	0.45		4.99		4.18	5.35			11.52
55	HL065_05L0B	23.12	6.44	1.00	5.00	3.02					0.97	4.14		2.40	3.19	
56	HL065_06L09	28.63	8.39	1.00	2.00	2.72	333.81	0.28		5.56		4.30	5.81			7.43
57	HL065_06L0B	23.92	8.59	1.00	2.00	2.29	230.04	0.20	0.05	5.20	2.32	3.63	5.44	2.19	2.19	12.88
58	HL065_06L10	20.33	7.28	1.00	3.00	2.69	233.66	0.25		5.23		3.84	5.45			9.96
59	LH065_01L02	14.47	4.38	1.00	2.00	3.15				5.42	2.59			0.85	3.00	3.36
60	LH065_02L03	9.25	3.56	1.00	1.00	3.43	384.76	0.25	0.19	5.50	4.14	4.35	5.95	0.85	3.79	4.37
61	LH065_03L05	11.88	4.92	1.00	2.00	2.94	348.52	0.32	0.12	5.42	3.61	4.44	5.85	0.85	3.38	3.70
62	LH065_05L07	11.68	5.21	1.00	1.00	3.66	407.13	0.26	0.27	5.46	4.45	4.45	6.01	0.85	3.50	3.84
63	LH065_05L0B	11.19	4.63	1.00	0.00	4.00	384.05	0.30	0.14	5.51	3.88	4.49	5.95	0.85	3.76	3.02
64	LH065_06L09	11.20	3.82	1.00	9.00	2.93	486.99	0.29		5.94		4.69	6.19			3.03
65	LL065_01L01	29.71	9.30	1.00	3.00	2.48	259.68	0.19	0.06	5.31	2.68	3.73	5.56	0.85	0.85	11.59
66	LL065_05L07	19.76	6.82	2.00	3.00		169.73	0.33	0.05	4.78	2.04	3.75	5.13	1.52	1.52	11.57
67	LL065_06L03	21.13	7.89	6.00	5.00	2.31	345.91	0.20	0.03	5.63	2.22	4.06	5.85	2.41	2.41	8.38
68	LL065_06L05	25.34	7.07	1.00	2.00	2.19	178.18	0.20	0.09	4.90	2.67	3.38	5.18	2.27	2.27	18.28
69	LL065_06L09	16.79	6.47	2.00	1.00	2.62	172.98	0.39	0.03	4.79	1.47	3.88	5.15	1.46	1.46	13.74
70	LL065_06L10	18.75	6.87	3.00	2.00	2.13	282.95	0.32		5.37		4.23	5.65			7.00
71	LL065_06L11	27.50	9.47	1.00	2.00	2.57	318.63	0.18	0.07	5.52	3.01	3.89	5.76	2.69	2.69	10.39

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
72	HH067_01L01	AA067	F	FG	HH	313.04	0.00	139.38	0.00	0.00	0.00	0.00	0.00	51.84		
73	HH067_01L02	AA067	F	FG	HH	361.26	0.00	96.30	0.00	0.00	0.00	0.00	0.00	48.39		
74	HH067_04L04	AA067	F	FG	HH	620.85	0.00	185.27	0.00	0.00	0.00	0.00	0.00	50.58		
75	HH067_04L0B	AA067	F	FG	HH	569.38	0.00	158.05	0.00	0.00	0.00	0.00	0.00	48.39		
76	HH067_09L07	AA067	F	FG	HH	434.34	0.00	111.40	0.00	0.00	0.00	0.00	0.00	51.17		
77	HH067_09L08	AA067	F	FG	HH	327.68	0.00	98.26	0.00	0.00	0.00	0.00	0.00	43.46		
78	HH067_09L0B	AA067	F	FG	HH	489.71	0.00	63.22	0.00	0.00	0.00	0.00	0.00	51.85		
79	HL067_04L03	AA067	F	FG	HL	455.86	0.00	94.01	0.00	0.00	0.00	0.00	0.00	62.06		
80	HL067_08L05	AA067	F	FG	HL	319.59	0.00	102.25	0.00	0.00	0.00	0.00	0.00	58.64		
81	HL067_09L07	AA067	F	FG	HL	256.34	0.00	92.61	0.00	0.00	0.00	0.00	0.00	56.00		
82	HL067_09L08	AA067	F	FG	HL	197.22	0.00	31.16	0.00	0.00	0.00	0.00	0.00	59.63		
83	LH067_01L01	AA067	F	FG	LH	179.62	126.40	74.49	1.00	5.00	9.00	53.32	58.35	42.20	7.42	3.64
84	LH067_04L03	AA067	F	FG	LH	220.79	46.38	123.16	1.00	1.00	18.00	78.84	88.15	37.30	8.25	4.73
85	LH067_04L04	AA067	F	FG	LH	139.64	142.86	83.87	1.00	5.00	28.00	95.65	246.11	34.10	9.46	5.68
86	LH067_09L05	AA067	F	FG	LH	259.52	52.51	64.12	1.00	1.00	17.00	83.37	89.19	38.80	8.16	3.92
87	LH067_09L07	AA067	F	FG	LH	239.30	9.01	52.85	1.00	2.00	6.00	6.30	34.76	36.10	6.35	3.79
88	LH067_09L08	AA067	F	FG	LH	137.13	0.00	52.09	0.00	0.00	0.00	0.00	0.00	38.00		
89	LH067_09L0B	AA067	F	FG	LH	257.91	1.81	38.77	1.00	1.00	2.00	7.82	14.17	49.30		
90	LL067_01L02	AA067	F	FG	LL	65.45	0.00	13.98	0.00	0.00	0.00	0.00	0.00	39.29		
91	LL067_04L04	AA067	F	FG	LL	199.71	112.57	55.42	0.00	1.00	0.00	25.17	25.17	65.58		
92	LL067_08L06	AA067	F	FG	LL	226.94	22.06	36.18	0.00	0.00	0.00	7.20	7.20	53.12		
93	LL067_09L07	AA067	F	FG	LL	242.14	0.00	41.04	0.00	0.00	0.00	0.00	0.00	55.93		
94	LL067_09L08	AA067	F	FG	LL	242.92	0.00	49.23	0.00	0.00	0.00	0.00	0.00	54.89		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
72	HH067_01L01	20.98	5.39	10.00	0.00	4.38	452.42	0.45		5.75		4.94	6.11			6.74
73	HH067_01L02	25.07	5.46	10.00	0.00	4.40	457.56	0.27		5.89		4.57	6.13			5.09
74	HH067_04L04	22.29	7.02	7.00	0.00	5.20	806.12	0.30		6.43		5.22	6.69			3.24
75	HH067_04L0B	26.32	5.39	10.00	1.00	4.03	727.43	0.28		6.34		5.06	6.59			3.23
76	HH067_09L07	19.98	7.29	4.00	0.00	4.45	545.74	0.26		6.07		4.71	6.30			4.73
77	HH067_09L08	17.93	5.77	6.00	0.00	4.40	425.94	0.30		5.79		4.59	6.05			4.53
78	HH067_09L0B	21.46	6.55	1.00	0.00	3.94	552.93	0.13		6.19		4.15	6.32			4.31
79	HL067_04L03	27.48	9.93	14.00	1.00	4.06	549.87	0.21		6.12		4.54	6.31			6.64
80	HL067_08L05	24.05	6.31	10.00	0.00	3.85	421.84	0.32		5.77		4.63	6.04			8.45
81	HL067_09L07	27.38	9.05	6.00	0.00	4.01	348.95	0.36		5.55		4.53	5.85			9.61
82	HL067_09L08	31.12	8.34	10.00	0.00	2.19	228.38	0.16		5.28		3.44	5.43			14.16
83	LH067_01L01	15.16	5.61	9.00	0.00	3.63	380.51	0.24	0.50	5.19	4.84	4.31	5.94	3.98	4.07	7.79
84	LH067_04L03	16.89	5.24	10.00	2.00	3.55	390.33	0.46	0.13	5.40	3.84	4.81	5.97	4.37	4.48	4.95
85	LH067_04L04	18.76	6.02	8.00	1.00	3.32	366.37	0.30	0.64	4.94	4.96	4.43	5.90	4.56	5.51	6.54
86	LH067_09L05	18.59	6.78	6.00	0.00	3.61	376.15	0.21	0.16	5.56	3.96	4.16	5.93	4.42	4.49	4.56
87	LH067_09L07	15.00	5.68	7.00	3.00	3.68	301.16	0.21	0.03	5.48	2.20	3.97	5.71	1.84	3.55	4.28
88	LH067_09L08	14.77	6.02	8.00	2.00	2.96	189.22	0.38		4.92		3.95	5.24			8.27
89	LH067_09L0B	20.92	6.91	6.00	0.00	3.48	298.49	0.15	0.01	5.55	0.59	3.66	5.70	2.06	2.65	7.40
90	LL067_01L02	17.36	7.11	1.00	1.00	1.68	79.43	0.21		4.18		2.64	4.37			18.52
91	LL067_04L04	28.09	10.83	7.00	8.00	3.60	367.70	0.18	0.44	5.30	4.72	4.01	5.91	3.23	3.23	16.91
92	LL067_08L06	25.16	10.02	7.00	1.00	2.22	285.18	0.15	0.08	5.42	3.09	3.59	5.65	1.97	1.97	9.77
93	LL067_09L07	27.81	15.76	3.00	1.00	2.90	283.18	0.17		5.49		3.71	5.65			10.15
94	LL067_09L08	23.10	10.80	6.00	1.00	2.42	292.15	0.20		5.49		3.90	5.68			9.74

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
95	HH084_03L01	AA084	A	VT	HH	96.07	8.63	162.56	1.00	1.00	8.00	31.32	31.32	35.12	7.53	4.46
96	HH084_03L0B	AA084	A	VT	HH	395.44	25.03	96.62	1.00	4.00	25.00	5.62	64.31	45.29	8.59	4.90
97	HH084_10L04	AA084	A	VT	HH	409.91	0.00	142.37	0.00	0.00	0.00	0.00	0.00	44.89	9.06	5.33
98	HH084_14L05	AA084	A	VT	HH	275.20	128.63	159.63	1.00	5.00	179.00	76.24	261.67	46.63	6.48	4.05
99	HH084_15L08	AA084	A	VT	HH	343.75	121.05	132.51	1.00	6.00	103.00	54.19	222.18	44.32	9.02	4.97
100	HH084_15L0B	AA084	A	VT	HH	502.12	0.00	177.66	0.00	0.00	0.00	0.00	0.00	45.62		
101	HH084_17L09	AA084	A	VT	HH	372.67	47.43	103.67	1.00	5.00	58.00	69.29	229.95	39.14	9.27	5.42
102	HL084_03L01	AA084	A	VT	HL	151.40	95.41	74.81	1.00	6.00	70.00	251.15	296.06	52.79	8.64	4.35
103	HL084_03L02	AA084	A	VT	HL	234.26	6.59	83.97	1.00	4.00	7.00	6.61	5.08	47.51		
104	HL084_03L0B	AA084	A	VT	HL	180.75	95.24	61.77	1.00	4.00	67.00	165.35	388.98	48.22	8.53	4.89
105	HL084_10L03	AA084	A	VT	HL	170.36	13.42	36.49	1.00	4.00	15.00	6.85	9.65	60.05	10.09	4.95
106	HL084_10L04	AA084	A	VT	HL	227.57	42.43	56.93	1.00	3.00	30.00	63.01	85.24	62.18	9.14	5.31
107	HL084_14L05	AA084	A	VT	HL	283.77	4.20	71.76	0.00	1.00	0.00	9.43	9.43	60.87		
108	HL084_14L06	AA084	A	VT	HL	179.30	37.53	62.03	1.00	4.00	35.00	34.74	121.29	56.63	7.32	4.11
109	HL084_14L0B	AA084	A	VT	HL	205.91	21.88	52.88	1.00	2.00	20.00	38.33	41.63	59.14	8.67	4.39
110	HL084_15L07	AA084	A	VT	HL	285.18	39.04	57.32	1.00	4.00	25.00	51.30	90.76	61.88	9.79	4.30
111	HL084_15L08	AA084	A	VT	HL	293.98	52.68	71.64	1.00	4.00	31.00	73.98	130.35	56.05	10.22	6.14
112	HL084_17L09	AA084	A	VT	HL	289.31	6.28	54.05	1.00	2.00	7.00	34.49	35.43	57.71	10.25	4.84
113	HL084_17L0B	AA084	A	VT	HL	273.41	155.75	37.93	1.00	1.00	87.00	375.76	271.42	56.96	9.83	5.34
114	HL084_17L10	AA084	A	VT	HL	130.42	46.07	26.82	1.00	3.00	35.00	124.54	333.62	46.70	8.75	4.85
115	LH084_03L01	AA084	A	VT	LH	293.56	33.15	92.38	1.00	7.00	30.00	18.23	55.76	37.00	9.23	4.89
116	LH084_03L02	AA084	A	VT	LH	271.23	37.98	120.18	1.00	5.00	23.00	22.41	30.97	33.70	9.02	5.03
117	LH084_10L03	AA084	A	VT	LH	281.06	9.87	78.54	1.00	3.00	13.00	2.70	29.99	35.90	8.88	5.06
118	LH084_10L0B	AA084	A	VT	LH	259.36	140.60	141.35	1.00	7.00	58.00	46.34	221.99	36.30	8.96	5.10
119	LH084_14L05	AA084	A	VT	LH	246.51	34.25	79.39	1.00	5.00	38.00	26.10	73.33	34.50	6.12	3.65
120	LH084_14L06	AA084	A	VT	LH	326.99	0.00	114.45	0.00	0.00	0.00	0.00	0.00	37.10		
121	LH084_14L11	AA084	A	VT	LH	144.04	0.00	66.73	0.00	0.00	0.00	0.00	0.00	25.80	6.46	3.75
122	LL084_03L02	AA084	A	VT	LL	341.89	0.00	79.35	0.00	0.00	0.00	0.00	0.00	53.71	10.64	5.12
123	LL084_10L03	AA084	A	VT	LL	153.80	0.00	50.62	0.00	0.00	0.00	0.00	0.00	45.26		
124	LL084_10L04	AA084	A	VT	LL	190.90	0.00	43.99	0.00	0.00	0.00	0.00	0.00	46.83		
125	LL084_14L05	AA084	A	VT	LL	58.85	0.00	27.59	0.00	0.00	0.00	0.00	0.00	40.93		
126	LL084_14L06	AA084	A	VT	LL	77.39	5.12	32.46	1.00	1.00	3.00	13.42	13.42	41.90	6.72	4.22
127	LL084_14L07	AA084	A	VT	LL	81.09	0.00		0.00	0.00	0.00	0.00	0.00	35.44		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
95	HH084_03L01	21.61	8.72				267.26	1.55	0.03	4.57	2.16	5.09	5.59	3.44	3.44	10.08
96	HH084_03L0B	17.08	6.00	1.00	1.00	3.24	517.09	0.23	0.05	5.98	3.22	4.57	6.25	1.73	4.16	4.07
97	HH084_10L04	14.59	5.79	2.00	5.00	4.15	552.28	0.35		6.02		4.96	6.31			3.86
98	HH084_14L05	15.47	5.91	1.00	2.00	4.70	563.46	0.40	0.30	5.62	4.86	5.07	6.33	4.33	5.57	6.21
99	HH084_15L08	14.57	6.21	1.00	0.00	4.40	597.31	0.29	0.25	5.84	4.80	4.89	6.39	3.99	5.40	4.49
100	HH084_15L0B	23.47	4.60	1.00	0.00	3.22	679.78	0.35		6.22		5.18	6.52			3.26
101	HH084_17L09	14.70	4.58	3.00	5.00	3.11	523.77	0.25	0.10	5.92	3.86	4.64	6.26	4.24	5.44	3.23
102	HL084_03L01				0.00	2.31	321.62	0.30	0.42	5.02	4.56	4.31	5.77	5.53	5.69	14.46
103	HL084_03L02	19.06	7.54	1.00	2.00	2.92	324.82	0.35	0.02	5.46	1.89	4.43	5.78	1.89	1.63	7.57
104	HL084_03L0B	18.35	8.11	1.00	1.00	2.09	337.76	0.22	0.39	5.20	4.56	4.12	5.82	5.11	5.96	10.10
105	HL084_10L03	23.90	7.79	1.00	2.00	2.27	220.27	0.20	0.06	5.14	2.60	3.60	5.39	1.92	2.27	16.63
106	HL084_10L04	23.66	6.63	1.00	4.00	2.28	326.93	0.21	0.15	5.43	3.75	4.04	5.79	4.14	4.45	13.34
107	HL084_14L05				4.00	3.11	359.73	0.25	0.01	5.65	1.44	4.27	5.89	2.24	2.24	10.25
108	HL084_14L06	23.34	6.44	1.00	5.00	2.74	278.86	0.29	0.16	5.19	3.63	4.13	5.63	3.55	4.80	14.05
109	HL084_14L0B	32.90	8.55	2.00	2.00	2.12	280.67	0.23	0.08	5.33	3.09	3.97	5.64	3.65	3.73	13.34
110	HL084_15L07	30.63	6.63	1.00	0.00	2.55	381.54	0.18	0.11	5.65	3.66	4.05	5.94	3.94	4.51	10.55
111	HL084_15L08	9.79	3.36	1.00	4.00	2.88	418.30	0.21	0.14	5.68	3.96	4.27	6.04	4.30	4.87	8.39
112	HL084_17L09	25.33	7.69	2.00	3.00	1.85	349.64	0.18	0.02	5.67	1.84	3.99	5.86	3.54	3.57	9.04
113	HL084_17L0B	22.31	7.92	5.00	1.00	1.88	467.09	0.09	0.50	5.61	5.05	3.64	6.15	5.93	5.60	9.32
114	HL084_17L10	24.28	6.45	6.00	1.00	1.51	203.31	0.15	0.29	4.87	3.83	3.29	5.31	4.82	5.81	13.14
115	LH084_03L01	12.60	4.98	1.00	2.00	3.03	419.09	0.28	0.09	5.68	3.50	4.53	6.04	2.90	4.02	3.66
116	LH084_03L02	10.42	5.21	3.00	4.00	3.74	429.39	0.39	0.10	5.60	3.64	4.79	6.06	3.11	3.43	3.29
117	LH084_10L03	19.32	4.32	1.00	3.00	3.22	369.47	0.27	0.03	5.64	2.29	4.36	5.91	0.99	3.40	3.60
118	LH084_10L0B	17.79	6.00	2.00	2.00	3.38	541.31	0.35	0.35	5.56	4.95	4.95	6.29	3.84	5.40	3.99
119	LH084_14L05	16.63	5.48	3.00	3.00	3.03	360.15	0.28	0.11	5.51	3.53	4.37	5.89	3.26	4.29	3.79
120	LH084_14L06	13.95	5.80	1.00	7.00	3.94	441.44	0.35		5.79		4.74	6.09			3.31
121	LH084_14L11	9.78	4.67	1.00	3.00	3.03	210.77	0.46		4.97		4.20	5.35			3.63
122	LL084_03L02	24.30	9.06	3.00	4.00	3.26	421.24	0.23		5.83		4.37	6.04			6.63
123	LL084_10L03	19.98	6.66	1.00	4.00	2.78	204.42	0.33		5.04		3.92	5.32			10.46
124	LL084_10L04	17.70	7.45	3.00	5.00	1.97	234.89	0.23		5.25		3.78	5.46			9.02
125	LL084_14L05	21.53	6.52	1.00	1.00	2.40	86.44	0.47		4.07		3.32	4.46			22.35
126	LL084_14L06	21.43	9.14	1.00	1.00	2.23	114.97	0.39	0.05	4.35	1.63	3.48	4.74	2.60	2.60	17.81
127	LL084_14L07	15.20	6.21	1.00	1.00	1.91				4.40						12.17

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
128	HH087_04L01	AA087	A	ZT	HH	484.13	113.50	133.00	1.00	6.00	85.00	70.58	341.33	42.86	7.55	4.44
129	HH087_04L02	AA087	A	ZT	HH	243.58	90.74	146.46	1.00	8.00	50.00	123.59	271.91	41.21	8.10	5.32
130	HH087_06X06	AA087	A	ZT	HH	511.35	15.59	107.88	1.00	2.00	9.00	31.36	32.29	51.33	8.06	4.21
131	HH087_06X0B	AA087	A	ZT	HH	343.65	6.11	137.87	1.00	1.00	4.00	26.43	29.41	46.48		
132	HH087_07X07	AA087	A	ZT	HH	416.49	8.56	132.84	1.00	1.00	2.00	27.64	30.34	52.41	8.45	5.22
133	HH087_07X08	AA087	A	ZT	HH	601.10	18.24		1.00	3.00	5.00	29.72	32.70	65.55		
134	HH087_07X0B	AA087	A	ZT	HH	473.48	73.48	116.19	1.00	3.00	55.00	119.45	302.66	49.99	8.66	4.60
135	HL087_04L01	AA087	A	ZT	HL	253.24	7.08	65.01	0.00	1.00	0.00	6.30	6.30	77.57	9.55	5.30
136	HL087_04L02	AA087	A	ZT	HL	347.42	16.10	36.84	1.00	4.00	14.00	20.22	22.77	69.26	8.36	5.49
137	HL087_04L11	AA087	A	ZT	HL	230.20	16.48	106.19	1.00	2.00	6.00	7.90	12.30	64.51		
138	HL087_06X04	AA087	A	ZT	HL	169.72	6.24	46.54	1.00	1.00	1.00	8.90	8.90	69.12		
139	HL087_06X05	AA087	A	ZT	HL	147.44	14.81	76.41	1.00	1.00	1.00	6.70	6.70	81.50	7.23	5.01
140	HL087_06X06	AA087	A	ZT	HL	175.23	39.09	83.61	1.00	1.00	8.00	21.76	30.81	88.56	8.95	4.75
141	HL087_06X0B	AA087	A	ZT	HL	157.94		58.57	1.00	1.00	3.00	35.80		70.36	9.07	5.56
142	HL087_06X12	AA087	A	ZT	HL	210.99	0.00	63.04	0.00	0.00	0.00	0.00	0.00	59.82		
143	HL087_06X1B	AA087	A	ZT	HL	165.90	143.08	70.57	1.00	4.00	68.00	16.62	554.66	95.92		
144	HL087_07X07	AA087	A	ZT	HL	327.59	0.00		0.00	0.00	0.00	0.00	0.00	83.56		
145	HL087_07X08	AA087	A	ZT	HL	233.26	0.00	92.69	0.00	0.00	0.00	0.00	0.00	76.91		
146	HL087_07X0B	AA087	A	ZT	HL	242.20	3.32	82.12	0.00	1.00	0.00	7.12	7.12	79.60		
147	HL087_07X10	AA087	A	ZT	HL		0.00	129.02	0.00	0.00	0.00	0.00	0.00	65.88		
148	LH087_04L01	AA087	A	ZT	LH	244.98	84.80	107.54	1.00	6.00	28.00	41.32	119.37	41.70	9.19	5.03
149	LH087_05X04	AA087	A	ZT	LH	196.80	5.38	110.77	0.00	1.00	0.00	8.90	8.90	38.30		
150	LH087_07X08	AA087	A	ZT	LH	250.34	5.57	93.31	1.00	2.00	2.00	12.60	22.60	44.50	8.70	5.13
151	LH087_08X09	AA087	A	ZT	LH	239.12	0.00	87.12	0.00	0.00	0.00	0.00	0.00	36.10		
152	LL087_05X03	AA087	A	ZT	LL	220.43	7.17	52.40	1.00	3.00	4.00	15.10	23.90	57.22	8.33	4.61
153	LL087_05X04	AA087	A	ZT	LL	204.17	5.87	42.49	0.00	0.00	0.00	12.00	12.00	62.39		
154	LL087_07X07	AA087	A	ZT	LL	131.80	0.00	48.31	0.00	0.00	0.00	0.00	0.00	61.08		
155	LL087_07X08	AA087	A	ZT	LL	113.59	16.68	44.68	1.00	1.00	2.00	37.31	37.31	70.20	9.23	6.12

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
128	HH087_04L01	11.10	4.92	5.00	0.00	3.54	730.63	0.22	0.18	6.18	4.73	4.89	6.59	4.26	5.83	2.98
129	HH087_04L02	20.73	5.44	6.00	0.00	3.81	480.78	0.44	0.23	5.50	4.51	4.99	6.18	4.82	5.61	5.48
130	HH087_06X06	28.90	5.54	7.00	3.00	3.39	634.82	0.20	0.03	6.24	2.75	4.68	6.45	3.45	3.47	4.05
131	HH087_06X0B	21.64	5.26	7.00	5.00	3.79	487.63	0.39	0.01	5.84	1.81	4.93	6.19	3.27	3.38	4.94
132	HH087_07X07	25.84	4.66	6.00	10.00	3.84	557.89	0.31	0.02	6.03	2.15	4.89	6.32	3.32	3.41	5.18
133	HH087_07X08	30.33	6.44	7.00	3.00	4.04				6.40	2.90			3.39	3.49	5.61
134	HH087_07X0B	19.25	3.85	9.00	2.00	4.09	663.15	0.21	0.12	6.16	4.30	4.76	6.50	4.78	5.71	4.14
135	HL087_04L01	29.13	11.01	8.00	4.00	2.97	325.33	0.25	0.02	5.53	1.96	4.17	5.78	1.84	1.84	18.66
136	HL087_04L02	35.29	8.70	9.00	1.00	3.91	400.36	0.10	0.04	5.85	2.78	3.61	5.99	3.01	3.13	10.84
137	HL087_04L11	28.52	8.58	4.00	3.00	4.33	352.87	0.43	0.05	5.44	2.80	4.67	5.87	2.07	2.51	14.20
138	HL087_06X04	27.58	7.64	10.00	4.00	1.85	222.50	0.26	0.03	5.13	1.83	3.84	5.40	2.19	2.19	22.11
139	HL087_06X05	27.16	6.07	6.00	5.00	2.06	238.66	0.47	0.07	4.99	2.70	4.34	5.48	1.90	1.90	35.38
140	HL087_06X06	38.09	6.52	8.00	3.00	2.72	297.93	0.39	0.15	5.17	3.67	4.43	5.70	3.08	3.43	35.15
141	HL087_06X0B	33.44	7.51	8.00	3.00	2.09	216.51	0.37		5.06		4.07	5.38	3.58		24.62
142	HL087_06X12	35.12	8.81	12.00	3.00	3.22	274.03	0.30		5.35		4.14	5.61			13.32
143	HL087_06X1B	41.82	9.03	10.00	3.00	2.19	379.55	0.23	0.61	5.11	4.96	4.26	5.94	2.81	6.32	43.56
144	HL087_07X07	31.18	8.00	6.00	4.00	3.82				5.79						16.74
145	HL087_07X08	43.60	8.09	7.00	4.00	3.04	325.95	0.40		5.45		4.53	5.79			19.92
146	HL087_07X0B	31.74	9.76	5.00	5.00	1.94	327.64	0.33	0.01	5.49	1.20	4.41	5.79	1.96	1.96	20.55
147	HL087_07X10	26.20	7.77	6.00	5.00	2.96						4.86				
148	LH087_04L01	15.37	5.98	4.00	3.00	3.84	437.32	0.33	0.24	5.50	4.44	4.68	6.08	3.72	4.78	5.57
149	LH087_05X04	18.81	3.31	6.00	6.00	3.15	312.95	0.55	0.02	5.28	1.68	4.71	5.75	2.19	2.19	5.85
150	LH087_07X08	17.27	6.31	4.00	9.00	3.58	349.22	0.36	0.02	5.52	1.72	4.54	5.86	2.53	3.12	6.21
151	LH087_08X09	16.12	4.76	8.00	3.00	2.58	326.24	0.36		5.48		4.47	5.79			4.28
152	LL087_05X03	20.58	6.79	8.00	6.00	2.00	280.00	0.23	0.03	5.40	1.97	3.96	5.63	2.71	3.17	11.67
153	LL087_05X04	26.22	6.93	5.00	4.00	2.48	252.53	0.20	0.02	5.32	1.77	3.75	5.53	2.48	2.48	14.97
154	LL087_07X07	28.67	7.33	7.00	4.00	1.67	180.11	0.37		4.88		3.88	5.19			22.23
155	LL087_07X08	29.78	9.06	5.00	3.00	1.95	174.95	0.34	0.11	4.73	2.81	3.80	5.16	3.62	3.62	34.07

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
156	HH090_15L01	AA090	A	VT	HH	107.78	16.75	171.68	1.00	1.00	10.00	36.80	36.80	28.26	6.01	4.43
157	HH090_20L03	AA090	A	VT	HH	289.30	57.30	102.07	1.00	6.00	35.00	35.21	104.16	40.77	10.50	5.87
158	HH090_26L05	AA090	A	VT	HH	205.56	165.37	131.43	1.00	8.00	146.00	142.62	386.89	41.06	9.47	5.71
159	HH090_26L0B	AA090	A	VT	HH	238.00	122.06	56.44	1.00	8.00	85.00	67.90	401.85	40.06	8.77	5.03
160	HH090_30L07	AA090	A	VT	HH	106.25	14.76	120.17	1.00	1.00	7.00	25.00	25.00	35.55	8.72	5.27
161	HH090_30L0B	AA090	A	VT	HH	338.07	89.53	166.89	1.00	3.00	41.00	72.56	249.63	40.37	8.51	4.79
162	HH090_32L09	AA090	A	VT	HH	199.29	149.56	103.63	1.00	11.00	139.00	111.37	458.52	33.69	7.07	4.70
163	HL090_15L01	AA090	A	VT	HL	253.17	4.68	82.25	1.00	1.00	5.00	12.45	15.90	54.30	6.16	3.81
164	HL090_20L03	AA090	A	VT	HL	190.87	34.62	67.11	1.00	2.00	23.00	35.00	67.06	66.68	9.40	5.16
165	HL090_26L02	AA090	A	VT	HL	246.76	44.84	55.95	1.00	3.00	21.00	55.48	95.01	63.13	9.50	4.94
166	HL090_26L04	AA090	A	VT	HL	90.69	160.14	48.02	1.00	5.00	98.00	321.68	769.38	62.57	8.60	4.92
167	HL090_26L05	AA090	A	VT	HL	253.47	44.54	67.65	1.00	3.00	35.00	82.07	172.26	57.39	9.17	5.79
168	HL090_26L06	AA090	A	VT	HL	37.18	138.59	35.30	1.00	8.00	61.00	208.48	434.38	45.48	7.24	4.65
169	HL090_26L0B	AA090	A	VT	HL	175.65	79.72	66.57	1.00	6.00	70.00	93.62	340.62	61.38		
170	HL090_26L1B	AA090	A	VT	HL	184.77	20.88	71.95	1.00	2.00	8.00	91.13	0.69	64.84	8.98	5.87
171	HL090_30L07	AA090	A	VT	HL	61.02	102.77	48.93	1.00	5.00	93.00	247.75	585.68	53.87	8.97	4.04
172	HL090_30L08	AA090	A	VT	HL	304.47	45.15	57.38	1.00	3.00	25.00	28.04	54.50	70.08		
173	HL090_30L0B	AA090	A	VT	HL	152.62	35.00	40.38	1.00	5.00	17.00	23.80	43.32	64.59	8.53	5.25
174	HL090_32L09	AA090	A	VT	HL	179.17	34.48	36.77	1.00	4.00	15.00	46.79	87.01	55.08	8.49	4.70
175	LH090_20L03	AA090	A	VT	LH	248.27	47.58	87.08	1.00	6.00	29.00	16.32	22.77	37.00	7.48	5.00
176	LH090_26L06	AA090	A	VT	LH	207.22	83.29	98.87	1.00	10.00	47.00	28.41	141.97	35.30	7.72	4.99
177	LH090_30L07	AA090	A	VT	LH	331.89	47.20	78.23	1.00	8.00	23.00	24.92	142.03	37.30	7.83	4.58
178	LH090_30L08	AA090	A	VT	LH	274.00	11.82		0.00	1.00	0.00	6.70	6.70	35.70		
179	LH090_32L09	AA090	A	VT	LH	141.28	31.84	97.80	1.00	2.00	13.00	46.74	75.37	33.50	7.88	5.55
180	LH090_32L0B	AA090	A	VT	LH	304.30	27.03	117.35	1.00	6.00	15.00	24.83	81.32	33.50	9.52	4.65
181	LL090_26L06	AA090	A	VT	LL	112.30	24.49	47.04	1.00	1.00	7.00	28.86	28.86	49.71	7.71	5.70

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
156	HH090_15L01	10.75	5.30	2.00			296.21	1.38	0.06	4.68	2.82	5.15	5.69	3.61	3.61	5.82
157	HH090_20L03	16.63	3.83	1.00	1.00	3.11	448.67	0.29	0.15	5.67	4.05	4.63	6.11	3.56	4.65	4.51
158	HH090_26L05	21.76	5.63	1.00	2.00	4.32	502.36	0.35	0.49	5.33	5.11	4.88	6.22	4.96	5.96	6.44
159	HH090_26L0B	16.88	4.20	1.00	1.00	3.48	416.50	0.16	0.41	5.47	4.80	4.03	6.03	4.22	6.00	5.30
160	HH090_30L07	17.77	6.61	1.00			241.18	0.99	0.07	4.67	2.69	4.79	5.49	3.22	3.22	9.34
161	HH090_30L0B	14.86	5.44	1.00	4.00	3.39	594.49	0.39	0.18	5.82	4.49	5.12	6.39	4.28	5.52	3.79
162	HH090_32L09	16.13	2.51	1.00	0.00	2.73	452.48	0.30	0.49	5.29	5.01	4.64	6.11	4.71	6.13	4.47
163	HL090_15L01	20.25	6.35	1.00	7.00	2.12	340.10	0.32	0.01	5.53	1.54	4.41	5.83	2.52	2.77	9.15
164	HL090_20L03	28.18	7.73	1.00	0.00	2.45	292.60	0.30	0.13	5.25	3.54	4.21	5.68	3.56	4.21	18.30
165	HL090_26L02	32.94	10.31	1.00	3.00	2.25	347.55	0.19	0.15	5.51	3.80	4.02	5.85	4.02	4.55	12.69
166	HL090_26L04	28.39	7.62	1.00	2.00	2.12	298.85	0.19	1.15	4.51	5.08	3.87	5.70	5.77	6.65	33.90
167	HL090_26L05	21.45	7.01	1.00	3.00	2.41	365.66	0.23	0.14	5.54	3.80	4.21	5.90	4.41	5.15	10.21
168	HL090_26L06	16.03	4.87	1.00	0.00	1.89	211.07	0.20	1.91	3.62	4.93	3.56	5.35	5.34	6.07	43.69
169	HL090_26L0B	27.31	8.25	1.00	2.00	2.46	321.94	0.26	0.33	5.17	4.38	4.20	5.77	4.54	5.83	16.85
170	HL090_26L1B	29.21	7.41	1.00	4.00	2.10	277.60	0.35	0.08	5.22	3.04	4.28	5.63	4.51	-0.37	17.87
171	HL090_30L07	26.50	7.87	1.00	2.00	2.41	212.72	0.30	0.93	4.11	4.63	3.89	5.36	5.51	6.37	37.35
172	HL090_30L08	35.12	8.14	3.00	4.00	2.69	407.00	0.16	0.12	5.72	3.81	4.05	6.01	3.33	4.00	12.67
173	HL090_30L0B	32.01	8.82	1.00	1.00	1.92	228.00	0.22	0.18	5.03	3.56	3.70	5.43	3.17	3.77	21.47
174	HL090_32L09	28.09	7.61	1.00	2.00	2.42	250.42	0.17	0.16	5.19	3.54	3.60	5.52	3.85	4.47	13.30
175	LH090_20L03	15.79	4.53	4.00	0.00	2.61	382.93	0.29	0.14	5.51	3.86	4.47	5.95	2.79	3.13	4.33
176	LH090_26L06	17.85	3.32	1.00	2.00	3.31	389.38	0.34	0.27	5.33	4.42	4.59	5.96	3.35	4.96	4.72
177	LH090_30L07	16.38	5.44	2.00	3.00	3.04	457.32	0.21	0.12	5.80	3.85	4.36	6.13	3.22	4.96	3.29
178	LH090_30L08	15.17	4.84	1.00	14.00	3.04				5.61	2.47			1.90	1.90	3.65
179	LH090_32L09	17.80	5.68	1.00	2.00	3.53	270.92	0.56	0.13	4.95	3.46	4.58	5.60	3.84	4.32	6.24
180	LH090_32L0B	11.19	3.37	1.00	9.00	4.82	448.68	0.35	0.06	5.72	3.30	4.77	6.11	3.21	4.40	2.90
181	LL090_26L06	19.90	7.48	1.00	2.00	1.96	183.83	0.34	0.15	4.72	3.20	3.85	5.21	3.36	3.36	17.28

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
182	HH168_01L01	AA168	A	ZT	HH	589.71	148.42	149.10	1.00	7.00	89.00	115.61	546.68	42.56	9.54	6.49
183	HH168_02L03	AA168	A	ZT	HH	554.10	4.42	137.33	1.00	1.00	2.00	23.06	26.06	38.98	8.90	5.66
184	HH168_03L06	AA168	A	ZT	HH	724.39	29.56	194.62	1.00	3.00	11.00	68.15	97.32	46.22	6.74	4.86
185	HH168_03L0B	AA168	A	ZT	HH	629.80	6.13	147.82	1.00	1.00	8.00	3.10	19.16	48.78	7.65	4.79
186	HH168_04L08	AA168	A	ZT	HH	548.00	4.31	181.11	1.00	1.00	6.00	21.69	23.48	43.35	9.79	6.67
187	HH168_05L0B	AA168	A	ZT	HH	405.67		163.67	1.00	1.00	10.00	25.88	25.88	39.43	7.43	5.26
188	HH168_05L10	AA168	A	ZT	HH	842.40	0.00		0.00	0.00	0.00	0.00	0.00	42.93	8.79	5.54
189	HL168_01L01	AA168	A	ZT	HL	282.94	116.35	61.89	1.00	3.00	29.00	300.07	522.89	67.56	9.48	5.82
190	HL168_01L02	AA168	A	ZT	HL	267.65	0.00	87.94	0.00	0.00	0.00	0.00	0.00	67.56		
191	HL168_03L05	AA168	A	ZT	HL	298.77	34.63	57.07	1.00	5.00	13.00	59.31	75.22	69.37	10.77	6.39
192	HL168_04L07	AA168	A	ZT	HL	104.76	103.91	23.25	1.00	2.00	32.00	278.88	347.70	64.33	8.81	4.76
193	HL168_04L08	AA168	A	ZT	HL	275.17	98.60	76.29	1.00	2.00	29.00	264.44	481.56	63.42	10.06	6.21
194	HL168_04L10	AA168	A	ZT	HL	149.61	62.94	36.72	1.00	3.00	21.00	136.22	219.71	55.82	8.33	4.59
195	HL168_05L09	AA168	A	ZT	HL	118.21	105.54	40.51	1.00	4.00	48.00	291.38	413.85	61.21	8.07	5.02
196	LH168_01L01	AA168	A	ZT	LH	239.40	47.83	74.96	1.00	3.00	19.00	89.29	114.73	40.70	9.35	5.47
197	LH168_01L02	AA168	A	ZT	LH	397.48	36.79	77.04	1.00	1.00	3.00	11.00	2.82	44.10	8.74	5.00
198	LH168_03L05	AA168	A	ZT	LH	222.71	0.00	33.83	0.00	0.00	0.00	0.00	0.00	37.00		
199	LH168_04L07	AA168	A	ZT	LH	182.88	81.41	58.22	1.00	6.00	39.00	51.52	229.74	31.90	8.09	4.73
200	LH168_05L09	AA168	A	ZT	LH	395.28	0.00	73.46	0.00	0.00	0.00	0.00	0.00	45.80		
201	LH168_05L10	AA168	A	ZT	LH	203.35	12.25	53.06	1.00	1.00	1.00	3.10	3.10	37.40		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
182	HH168_01L01	20.78	2.93	4.00	3.00	4.20	887.23	0.20	0.20	6.38	5.00	5.00	6.79	4.75	6.30	2.41
183	HH168_02L03	17.27	6.35	4.00	2.00	4.77	695.85	0.25	0.01	6.32	1.49	4.92	6.55	3.14	3.26	2.15
184	HH168_03L06	22.04	5.71	7.00	5.00	4.13	948.57	0.26	0.03	6.59	3.39	5.27	6.85	4.22	4.58	2.32
185	HH168_03L0B	21.83	5.80	2.00	3.00	4.33	783.75	0.23	0.01	6.45	1.81	5.00	6.66	1.13	2.95	2.97
186	HH168_04L08	15.50	7.56	3.00	4.00	4.82	733.42	0.33	0.01	6.31	1.46	5.20	6.60	3.08	3.16	2.69
187	HH168_05L0B	15.67	7.07	3.00	3.00	4.65	569.34	0.40		6.01		5.10	6.34	3.25	3.25	3.01
188	HH168_05L10	15.87	6.90	4.00	6.00	4.84				6.74						1.72
189	HL168_01L01	26.08	5.97	5.00	0.00	2.34	461.18	0.16	0.34	5.65	4.76	4.13	6.13	5.70	6.26	12.67
190	HL168_01L02	25.84	7.25	7.00	4.00	2.28	355.59	0.33		5.59		4.48	5.87			13.39
191	HL168_03L05	29.17	7.56	6.00	3.00	2.31	390.47	0.17	0.10	5.70	3.54	4.04	5.97	4.08	4.32	12.65
192	HL168_04L07	32.54	6.24	4.00	1.00	1.55	231.92	0.11	0.81	4.65	4.64	3.15	5.45	5.63	5.85	31.02
193	HL168_04L08	34.56	7.42	8.00	2.00	1.91	450.06	0.20	0.28	5.62	4.59	4.33	6.11	5.58	6.18	11.48
194	HL168_04L10	22.71	7.76	5.00	0.00	1.83	249.27	0.17	0.34	5.01	4.14	3.60	5.52	4.91	5.39	16.36
195	HL168_05L09	34.41	8.01	5.00	1.00	2.19	264.26	0.18	0.66	4.77	4.66	3.70	5.58	5.67	6.03	24.89
196	LH168_01L01	17.91	5.25	6.00	0.00	2.90	362.19	0.26	0.15	5.48	3.87	4.32	5.89	4.49	4.74	5.43
197	LH168_01L02	16.35	6.07	7.00	2.00	3.71	511.31	0.18	0.08	5.99	3.61	4.34	6.24	2.40	1.04	3.84
198	LH168_03L05	17.21	5.10	2.00	3.00	1.79	256.54	0.15		5.41		3.52	5.55			4.83
199	LH168_04L07	14.72	5.53	5.00	0.00	3.42	322.51	0.22	0.34	5.21	4.40	4.06	5.78	3.94	5.44	4.37
200	LH168_05L09	20.33	7.58	4.00	8.00	3.13	468.74	0.19		5.98		4.30	6.15			4.17
201	LH168_05L10	15.62	5.68	5.00	4.00	2.80	268.66	0.25	0.05	5.31	2.51	3.97	5.59	1.13	1.13	5.40

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
202	HH171_03L01	AA171	F	ZT	HH	95.95	308.63	200.45	1.00	7.00	102.00	304.00	1006.05	34.13	8.23	3.60
203	HH171_07L03	AA171	F	ZT	HH	121.73	717.23	89.51	1.00	22.00	515.00	236.03	4657.49	38.77	8.11	3.96
204	HH171_10L05	AA171	F	ZT	HH	32.16	674.95	97.19	1.00	17.00	373.00	220.90	3405.06	33.88	7.19	3.77
205	HH171_14L08	AA171	F	ZT	HH	120.07	674.42	83.57	1.00	18.00	364.00	347.93	3432.39	29.02	8.58	4.38
206	HH171_14L0B	AA171	F	ZT	HH	71.90	331.73	56.58	1.00	6.00	105.00	320.33	580.20	44.03	8.26	4.17
207	HH171_29L09	AA171	F	ZT	HH	73.97	586.17	68.48	1.00	9.00	316.00	305.83	1885.97	33.50	7.81	4.66
208	HH171_29L0B	AA171	F	ZT	HH	174.99	609.50	100.22	1.00	18.00	461.00	272.13	6079.92	38.78	6.29	3.25
209	HL171_03L01	AA171	F	ZT	HL	79.67	220.56	42.86	1.00	5.00	101.00	429.24	1809.19	75.11	7.03	3.36
210	HL171_03L02	AA171	F	ZT	HL	68.79	508.65	46.16	1.00	12.00	322.00	517.43	2724.10	52.20	8.44	4.42
211	HL171_07L03	AA171	F	ZT	HL	67.03	279.17	46.87	1.00	7.00	156.00	310.28	4367.70	77.11	8.19	3.88
212	HL171_07L04	AA171	F	ZT	HL	65.65	192.75	28.16	1.00	5.00	151.00	307.06	1633.23	40.46	8.41	4.46
213	HL171_07L0B	AA171	F	ZT	HL	89.35	245.59	33.06	1.00	5.00	138.00	353.85	1756.90	65.82	8.32	4.60
214	HL171_10L05	AA171	F	ZT	HL	43.02	182.89	30.76	1.00	4.00	42.00	327.28	1456.09	62.27	8.16	3.79
215	HL171_10L06	AA171	F	ZT	HL	41.65	293.95	38.72	1.00	6.00	203.00	330.33	2157.31	50.98	7.74	4.24
216	HL171_10L0B	AA171	F	ZT	HL	49.37	252.15	34.99	1.00	5.00	122.00	317.33	1946.36	62.44	8.05	4.09
217	HL171_14L07	AA171	F	ZT	HL	110.06	293.62	44.62	1.00	5.00	154.00	408.73	1367.69	62.09	8.75	4.30
218	HL171_14L08	AA171	F	ZT	HL				1.00	4.00	128.00	368.75	1739.06	78.86		
219	HL171_29L09	AA171	F	ZT	HL	105.39	339.55	47.57	1.00	7.00	203.00	392.64	1966.99	69.72	8.18	4.41
220	HL171_29L0B	AA171	F	ZT	HL	58.67	259.58	35.66	1.00	4.00	169.00	273.14	1823.08	53.88	7.54	5.06
221	HL171_29L10	AA171	F	ZT	HL	91.81	406.81	37.25	1.00	6.00	228.00	317.17	1816.18	60.48	7.15	4.53
222	LH171_03L01	AA171	F	ZT	LH	125.75	248.61	85.69	1.00	9.00	63.00	82.99	804.81	31.50	8.44	4.66
223	LH171_07L03	AA171	F	ZT	LH	82.40	234.92	86.63	1.00	10.00	115.00	91.89	672.04	27.20	9.42	4.48
224	LH171_10L05	AA171	F	ZT	LH	123.21	169.81	99.02	1.00	7.00	61.00	95.22	473.45	39.10	6.98	4.25
225	LH171_14L07	AA171	F	ZT	LH	99.95	176.13	82.78	1.00	9.00	48.00	106.06	481.37	34.90	8.01	4.60
226	LH171_29L0B	AA171	F	ZT	LH	93.35	275.42	77.05	1.00	14.00	87.00	126.35	1097.21	27.40	5.42	3.02
227	LH171_29L10	AA171	F	ZT	LH	51.46	252.85	53.74	1.00	11.00	117.00	141.84	874.45	31.70	7.74	4.34
228	LL171_03L01	AA171	F	ZT	LL	142.97	122.07	55.86	1.00	1.00	21.00	269.96	269.96	64.53	8.64	4.62
229	LL171_03L02	AA171	F	ZT	LL	104.16	116.92	34.91	1.00	3.00	11.00	127.15	269.45	56.39	9.16	4.52
230	LL171_07L03	AA171	F	ZT	LL	156.93	58.25	35.13	1.00	2.00	16.00	111.55	142.11	52.06	7.59	3.55
231	LL171_07L04	AA171	F	ZT	LL				1.00	5.00	30.00	110.71	483.80	42.43	6.81	3.73
232	LL171_07L1B	AA171	F	ZT	LL				1.00	1.00	8.00	28.41	28.41	49.39		
233	LL171_10L05	AA171	F	ZT	LL	50.19	28.72	32.63	1.00	2.00	6.00	7.50	7.50	51.68		
234	LL171_10L06	AA171	F	ZT	LL	95.23	172.63	68.78	1.00	5.00	74.00	203.41	742.27	54.18	8.60	4.30
235	LL171_14L07	AA171	F	ZT	LL	194.94	0.00	58.54	0.00	0.00	0.00	0.00	0.00	65.76		
236	LL171_14L08	AA171	F	ZT	LL	44.09	229.43	35.24	1.00	6.00	47.00	241.34	869.39	41.39	8.60	5.39
237	LL171_14L0B	AA171	F	ZT	LL	185.93	96.50	48.82	1.00	3.00	15.00	67.60	260.41	61.06		
238	LL171_29L09	AA171	F	ZT	LL	106.47	117.15	48.03	1.00	3.00	16.00	126.89	154.86	59.31	9.05	5.47
239	LL171_29L0B	AA171	F	ZT	LL	66.19	130.07	51.75	1.00	5.00	25.00	125.67	389.69	48.63	8.38	3.98
240	LL171_29L10	AA171	F	ZT	LL	198.97	27.78	45.71	0.00	1.00	0.00	40.25	40.25	65.98		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
202	HH171_03L01	15.59	7.70	3.00	1.00	2.63	605.03	0.50	1.04	4.56	5.73	5.30	6.41	5.72	6.91	9.54
203	HH171_07L03	14.47	4.93	1.00	0.00	3.20	928.47	0.11	3.40	4.80	6.58	4.49	6.83	5.46	8.45	9.70
204	HH171_10L05	15.28	3.80	4.00	3.00	3.02	804.30	0.14	5.22	3.47	6.51	4.58	6.69	5.40	8.13	28.03
205	HH171_14L08	9.65	3.27	3.00	8.00	4.11	878.06	0.11	3.31	4.79	6.51	4.43	6.78	5.85	8.14	5.51
206	HH171_14L0B	21.59	8.84	3.00	1.00	3.28	460.21	0.14	2.58	4.28	5.80	4.04	6.13	5.77	6.36	21.18
207	HH171_29L09	13.72	4.66	4.00	1.00	3.38	728.62	0.10	4.11	4.30	6.37	4.23	6.59	5.72	7.54	11.92
208	HH171_29L0B	11.09	3.73	4.00	3.00	5.05	884.71	0.13	2.21	5.16	6.41	4.61	6.79	5.61	8.71	6.75
209	HL171_03L01	42.98	9.72	5.00	1.00	2.09	343.09	0.14	1.80	4.38	5.40	3.76	5.84	6.06	7.50	55.62
210	HL171_03L02	26.15	7.27	5.00	1.00	2.41	623.60	0.08	4.42	4.23	6.23	3.83	6.44	6.25	7.91	31.12
211	HL171_07L03	31.84	10.50	8.00			393.07	0.14	2.45	4.21	5.63	3.85	5.97	5.74	8.38	69.66
212	HL171_07L04	13.83	3.56	5.00	1.00	1.55	286.56	0.11	2.05	4.18	5.26	3.34	5.66	5.73	7.40	19.58
213	HL171_07L0B	33.43	8.80	7.00	3.00	1.75	368.00	0.10	2.01	4.49	5.50	3.50	5.91	5.87	7.47	38.08
214	HL171_10L05	39.76	10.25	4.00	0.00	2.04	256.67	0.14	2.48	3.76	5.21	3.43	5.55	5.79	7.28	70.79
215	HL171_10L06	30.98	5.17	7.00	2.00	2.37	374.32	0.12	3.66	3.73	5.68	3.66	5.93	5.80	7.68	49.01
216	HL171_10L0B	38.51	9.19	4.00	3.00	2.48	336.51	0.12	2.99	3.90	5.53	3.56	5.82	5.76	7.57	62.03
217	HL171_14L07	31.72	5.90	7.00	0.00	2.25	448.30	0.11	1.90	4.70	5.68	3.80	6.11	6.01	7.22	27.51
218	HL171_14L08													5.91	7.46	
219	HL171_29L09	30.06	7.92	4.00	1.00	2.41	492.51	0.11	2.22	4.66	5.83	3.86	6.20	5.97	7.58	36.23
220	HL171_29L0B	27.87	7.96	5.00	1.00	2.40	353.91	0.11	2.75	4.07	5.56	3.57	5.87	5.61	7.51	38.86
221	HL171_29L10	29.60	7.46	5.00	0.00	2.79	535.87	0.07	3.15	4.52	6.01	3.62	6.28	5.76	7.50	31.29
222	LH171_03L01	13.69	6.88	2.00	1.00	3.48	460.05	0.23	1.18	4.83	5.52	4.45	6.13	4.42	6.69	6.20
223	LH171_07L03	10.05	3.85	1.00	2.00	2.88	403.95	0.27	1.39	4.41	5.46	4.46	6.00	4.52	6.51	7.05
224	LH171_10L05	13.08	5.80	7.00	1.00	3.65	392.04	0.34	0.76	4.81	5.13	4.60	5.97	4.56	6.16	9.75
225	LH171_14L07	17.25	3.41	7.00	2.00	2.54	358.86	0.30	0.96	4.60	5.17	4.42	5.88	4.66	6.18	9.57
226	LH171_29L0B	9.96	3.81	3.00	2.00	3.24	445.82	0.21	1.62	4.54	5.62	4.34	6.10	4.84	7.00	6.32
227	LH171_29L10	10.22	3.71	5.00	1.00	2.90	358.05	0.18	2.40	3.94	5.53	3.98	5.88	4.95	6.77	15.34
228	LL171_03L01	37.69	10.37	5.00	5.00	2.95	320.90	0.21	0.61	4.96	4.80	4.02	5.77	5.60	5.60	22.88
229	LL171_03L02	28.27	9.82	5.00	7.00	1.89	255.99	0.16	0.84	4.65	4.76	3.55	5.55	4.85	5.60	23.97
230	LL171_07L03	22.51	9.42	5.00	7.00	2.22	250.31	0.16	0.30	5.06	4.06	3.56	5.52	4.71	4.96	13.57
231	LL171_07L04	17.67	8.38	5.00	2.00	1.67								4.71	6.18	
232	LL171_07L1B													3.35	3.35	
233	LL171_10L05	20.45	7.04	5.00	4.00	1.36	111.54	0.41	0.35	3.92	3.36	3.49	4.71	2.01	2.01	41.79
234	LL171_10L06	21.93	6.69	4.00	4.00	3.24	336.64	0.26	1.05	4.56	5.15	4.23	5.82	5.32	6.61	24.21
235	LL171_14L07	31.64	9.33	6.00	11.00	2.15	253.48	0.30		5.27		4.07	5.54			17.42
236	LL171_14L08	15.50	7.05	5.00	2.00	1.63	308.76	0.13	2.89	3.79	5.44	3.56	5.73	5.49	6.77	30.52
237	LL171_14L0B	27.66	7.92	6.00	5.00	1.92	331.25	0.17	0.41	5.23	4.57	3.89	5.80	4.21	5.56	15.75
238	LL171_29L09	29.06	12.63	8.00	3.00	2.65	271.65	0.21	0.76	4.67	4.76	3.87	5.60	4.84	5.04	25.95
239	LL171_29L0B	18.55	6.10	5.00	3.00	2.18	248.01	0.26	1.10	4.19	4.87	3.95	5.51	4.83	5.97	28.06
240	LL171_29L10	29.70	10.47	9.00	11.00	1.91	272.46	0.20	0.11	5.29	3.32	3.82	5.61	3.70	3.70	17.18

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
241	HH208_05L01	AA208	F	VT	HH	204.80	456.09	78.40	1.00	11.00	337.00	210.04	1511.25	40.60	5.96	3.29
242	HH208_06L03	AA208	F	VT	HH	91.50	233.97	88.72	1.00	3.00	76.00	388.33	1161.24	30.91	7.34	4.64
243	HH208_09X06	AA208	F	VT	HH	167.76	596.26	119.27	1.00	19.00	500.00	241.70	3499.96	32.25	8.05	4.53
244	HH208_10X08	AA208	F	VT	HH	79.71	560.41	126.55	1.00	6.00	327.00	419.39	506.48	46.74	6.00	3.56
245	HH208_10X0B	AA208	F	VT	HH	62.18	209.94	46.31	1.00	6.00	173.00	234.17	1214.48	29.18	7.72	5.18
246	HH208_11X09	AA208	F	VT	HH	76.12	442.59	82.89	1.00	7.00	247.00	320.10	2132.36	34.39	8.13	4.83
247	HH208_11X0B	AA208	F	VT	HH	58.04	241.91	63.59	1.00	5.00	226.00	306.10	1237.43	29.01	7.70	4.70
248	HL208_05L01	AA208	F	VT	HL	62.43	266.62	43.68	1.00	7.00	197.00	335.64	2101.45	49.00	6.59	3.43
249	HL208_05L02	AA208	F	VT	HL	52.84	195.41	26.91	1.00	6.00	158.00	365.38	1841.17	45.89	7.84	4.42
250	HL208_05L0B	AA208	F	VT	HL	56.14	180.33	30.22	1.00	2.00	96.00	411.46	1061.01	62.49	7.36	4.23
251	HL208_06L03	AA208	F	VT	HL	56.79	205.75	24.25	1.00	4.00	100.00	390.95	1619.26	64.26	6.76	4.13
252	HL208_06L04	AA208	F	VT	HL	78.28	204.27	62.48	1.00	4.00	107.00	402.93	1510.34	53.80	7.10	4.25
253	HL208_06L0B	AA208	F	VT	HL	55.72	205.64	50.59	1.00	4.00	95.00	451.64	1482.84	63.95	7.17	4.37
254	HL208_09X05	AA208	F	VT	HL	70.76	350.69	27.80	1.00	7.00	299.00	310.69	2737.24	49.39	7.12	4.49
255	HL208_09X06	AA208	F	VT	HL	108.54	337.81	74.58	1.00	4.00	184.00	445.01	1988.39	65.37	7.35	4.52
256	HL208_10X07	AA208	F	VT	HL	48.80	319.78	43.60	1.00	7.00	190.00	336.50	1757.18	50.16	6.62	3.89
257	HL208_10X08	AA208	F	VT	HL	42.20	263.79	38.10	1.00	4.00	195.00	310.79	1966.63	56.21	7.10	4.20
258	HL208_10X0B	AA208	F	VT	HL	56.11	301.66	31.42	1.00	11.00	293.00	300.91	2358.81	65.48	6.59	4.55
259	HL208_11X09	AA208	F	VT	HL				1.00	6.00	208.00	338.18	1681.70	38.12	6.63	3.41
260	HL208_11X10	AA208	F	VT	HL	96.88	343.57	84.39	1.00	7.00	243.00	390.72	2648.85	52.52	6.27	3.86
261	LH208_05L01	AA208	F	VT	LH	73.60	179.28	45.90	1.00	18.00	101.00	91.92	685.92	14.80	6.97	3.30
262	LH208_06L04	AA208	F	VT	LH	97.27	202.82	57.84	1.00	12.00	108.00	117.37	70.72	23.20	5.83	3.95
263	LH208_09X05	AA208	F	VT	LH	210.27	10.28	52.24	1.00	1.00	7.00	67.97	536.40	41.60	7.98	5.34
264	LH208_09X0B	AA208	F	VT	LH	195.33	144.47	84.24	1.00	10.00	62.00	95.78	905.47	31.30	4.83	2.97
265	LH208_10X09	AA208	F	VT	LH	114.88	172.14	72.43	1.00	10.00	61.00	94.63	770.44	38.20	6.57	4.23
266	LH208_11X09	AA208	F	VT	LH	121.80	166.92	62.52	1.00	11.00	89.00	113.93	925.60	28.80	5.33	3.28
267	LL208_05L01	AA208	F	VT	LL	133.82	114.10	67.90	1.00	5.00	35.00	140.73	454.11	49.97	7.65	3.70
268	LL208_05L02	AA208	F	VT	LL	140.10	99.42	37.98	1.00	4.00	36.00	130.44	462.47	44.94	6.80	3.49
269	LL208_06L03	AA208	F	VT	LL	89.48	79.41	44.33	1.00	3.00	25.00	150.68	327.99	42.13	7.63	4.45
270	LL208_06L04	AA208	F	VT	LL	29.38	88.02	26.99	1.00	4.00	26.00	135.42	448.13	33.26	6.35	3.09
271	LL208_06L0B	AA208	F	VT	LL	11.39	95.26	24.22	1.00	3.00	34.00	226.42	451.51	22.65	6.87	3.93
272	LL208_09X05	AA208	F	VT	LL	80.92	20.45	22.32	0.00	1.00	0.00	60.71	60.71	53.81		
273	LL208_09X06	AA208	F	VT	LL	92.56	87.27	46.38	1.00	4.00	14.00	192.28	255.15	53.84	6.19	3.91
274	LL208_09X0B	AA208	F	VT	LL	158.14	51.29	68.11	0.00	3.00	0.00	18.65	27.81	54.13	7.80	5.03
275	LL208_10X07	AA208	F	VT	LL	119.03	204.91	58.57	1.00	5.00	36.00	199.51	742.20	61.11	6.95	4.27
276	LL208_10X08	AA208	F	VT	LL	102.58	55.83	36.75	1.00	4.00	15.00	167.00	169.99	52.74	8.65	5.36
277	LL208_11X09	AA208	F	VT	LL	107.67	29.99	45.30	1.00	4.00	2.00	43.43	96.94	47.11	7.15	3.90
278	LL208_11X10	AA208	F	VT	LL	135.93	85.18	35.74	1.00	2.00	16.00	168.12	170.00	53.38	9.60	5.63

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
241	HH208_05L01	21.71	4.94	4.00	2.00	3.21	739.29	0.12	1.61	5.32	6.12	4.36	6.61	5.35	7.32	6.32
242	HH208_06L03	13.38	6.04	6.00	0.00	2.65	414.19	0.27	1.30	4.52	5.46	4.49	6.03	5.96	7.06	8.20
243	HH208_09X06	14.26	4.90	6.00	0.00	4.60	883.29	0.16	2.08	5.12	6.39	4.78	6.78	5.49	8.16	4.87
244	HH208_10X08	16.92	5.18	7.00	1.00		766.67	0.20	2.72	4.38	6.33	4.84	6.64	6.04	6.23	21.53
245	HH208_10X0B	12.75	3.98	4.00	1.00	2.21	318.43	0.17	1.94	4.13	5.35	3.84	5.76	5.46	7.10	10.75
246	HH208_11X09	14.49	5.59	9.00	0.00	3.75	601.60	0.16	2.78	4.33	6.09	4.42	6.40	5.77	7.66	12.20
247	HH208_11X0B	10.09	4.68	7.00	0.00	2.76	363.54	0.21	1.99	4.06	5.49	4.15	5.90	5.72	7.12	11.39
248	HL208_05L01	7.58	1.88	5.00	4.00	2.38	372.73	0.13	2.51	4.13	5.59	3.78	5.92	5.82	7.65	30.21
249	HL208_05L02	20.50	6.48	5.00	1.00	2.21	275.16	0.11	2.45	3.97	5.28	3.29	5.62	5.90	7.52	31.30
250	HL208_05L0B	31.10	7.71	5.00	0.00	1.70	266.69	0.13	2.09	4.03	5.19	3.41	5.59	6.02	6.97	54.63
251	HL208_06L03	30.47	10.05	4.00	1.00	2.25	286.79	0.09	2.54	4.04	5.33	3.19	5.66	5.97	7.39	57.10
252	HL208_06L04	24.94	7.27	4.00	2.00	2.05	345.03	0.22	1.45	4.36	5.32	4.13	5.84	6.00	7.32	29.04
253	HL208_06L0B	34.12	10.28	5.00	1.00	2.24	311.95	0.19	1.93	4.02	5.33	3.92	5.74	6.11	7.30	57.64
254	HL208_09X05	17.31	5.35	6.00	8.00	2.12	449.25	0.07	3.56	4.26	5.86	3.33	6.11	5.74	7.91	27.07
255	HL208_09X06	23.39	7.63	6.00	2.00	3.24	520.93	0.17	1.84	4.69	5.82	4.31	6.26	6.10	7.60	30.92
256	HL208_10X07	19.93	5.09	8.00	6.00	2.78	412.18	0.12	3.46	3.89	5.77	3.78	6.02	5.82	7.47	40.50
257	HL208_10X08	26.36	7.65	8.00	3.00	3.62	344.09	0.12	3.28	3.74	5.58	3.64	5.84	5.74	7.58	58.81
258	HL208_10X0B	20.83	7.03	4.00	2.00	2.00	389.19	0.09	3.45	4.03	5.71	3.45	5.96	5.71	7.77	60.01
259	HL208_11X09	13.79	4.77	3.00										5.82	7.43	
260	HL208_11X10	20.88	8.30	6.00	9.00	3.02	524.84	0.19	1.90	4.57	5.84	4.44	6.26	5.97	7.88	22.36
261	LH208_05L01	10.40	3.89	8.00	1.00	2.64	298.78	0.18	1.50	4.30	5.19	3.83	5.70	4.52	6.53	2.34
262	LH208_06L04	7.74	4.12	3.00	0.00	2.76	357.93	0.19	1.31	4.58	5.31	4.06	5.88	4.77	4.26	4.35
263	LH208_09X05	15.82	5.78	5.00	3.00	2.83	272.79	0.24	0.04	5.35	2.33	3.96	5.61	4.22	6.28	6.46
264	LH208_09X0B	12.99	5.17	8.00	3.00	3.36	424.04	0.25	0.52	5.27	4.97	4.43	6.05	4.56	6.81	3.94
265	LH208_10X09	16.23	5.63	6.00	0.00	2.81	359.45	0.25	0.92	4.74	5.15	4.28	5.88	4.55	6.65	9.98
266	LH208_11X09	10.22	3.94	4.00	0.00	2.76	351.24	0.22	0.91	4.80	5.12	4.14	5.86	4.74	6.83	5.35
267	LL208_05L01	22.14	6.61	5.00	4.00	2.63	315.82	0.27	0.57	4.90	4.74	4.22	5.76	4.95	6.12	14.65
268	LL208_05L02	23.98	8.89	6.00	5.00	2.38	277.50	0.16	0.56	4.94	4.60	3.64	5.63	4.87	6.14	11.32
269	LL208_06L03	16.60	9.43	3.00	3.00	2.31	213.22	0.26	0.59	4.49	4.37	3.79	5.36	5.02	5.79	15.58
270	LL208_06L04	12.88	4.04	5.00	3.00	1.81	144.39	0.23	1.56	3.38	4.48	3.30	4.97	4.91	6.11	29.57
271	LL208_06L0B	10.50	3.72	2.00	0.00	1.67	130.87	0.23	2.68	2.43	4.56	3.19	4.87	5.42	6.11	35.38
272	LL208_09X05	25.33	6.76	7.00	2.00	1.87	123.69	0.22	0.20	4.39	3.02	3.11	4.82	4.11	4.11	28.11
273	LL208_09X06	26.79	8.10	5.00	2.00	2.65	226.21	0.26	0.63	4.53	4.47	3.84	5.42	5.26	5.54	24.60
274	LL208_09X0B	27.63	6.79	8.00	3.00	2.97	277.54	0.33	0.23	5.06	3.94	4.22	5.63	2.93	3.33	14.55
275	LL208_10X07	27.69	7.44	8.00	1.00	2.91	382.51	0.18	1.15	4.78	5.32	4.07	5.95	5.30	6.61	24.64
276	LL208_10X08	23.00	6.48	13.00	2.00	2.24	195.16	0.23	0.40	4.63	4.02	3.60	5.27	5.12	5.14	21.30
277	LL208_11X09	21.38	7.79	7.00	2.00	2.71	182.96	0.33	0.20	4.68	3.40	3.81	5.21	3.77	4.57	16.19
278	LL208_11X10	23.13	8.18	6.00	2.00	2.35	256.85	0.16	0.50	4.91	4.44	3.58	5.55	5.12	5.14	16.46

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
279	HH222_13L01	AA222	A	FG	HH	764.30	0.00	136.83	0.00	0.00	0.00	0.00	0.00	41.59		
280	HH222_13L0B	AA222	A	FG	HH	207.87	11.52	94.07	0.00	1.00	0.00	6.78	6.78	32.94		
281	HH222_15L03	AA222	A	FG	HH	568.12	0.60	132.26	1.00	4.00	17.00	5.78	1.13	38.63	7.34	4.77
282	HH222_17L06	AA222	A	FG	HH	262.28	0.00	123.70	0.00	0.00	0.00	0.00	0.00	43.35		
283	HH222_17L0B	AA222	A	FG	HH	278.95	0.00	71.56	0.00	0.00	0.00	0.00	0.00	34.55		
284	HH222_20L07	AA222	A	FG	HH	421.69	0.00	93.51	0.00	0.00	0.00	0.00	0.00	37.10	6.41	3.63
285	HH222_22L10	AA222	A	FG	HH	370.79	1.26	133.64	1.00	2.00	4.00	23.00	0.44	40.18	8.25	4.21
286	HL222_13L01	AA222	A	FG	HL	124.62	6.75	7.04	0.00	1.00	0.00	13.40	13.40	43.48		
287	HL222_13L02	AA222	A	FG	HL	119.59	6.80	22.85	0.00	1.00	0.00	7.80	7.80	52.76		
288	HL222_15L03	AA222	A	FG	HL	72.86	3.27	17.37	1.00	1.00	4.00	10.48	10.48	37.28	8.68	4.36
289	HL222_15L04	AA222	A	FG	HL	204.91	7.52	65.17	1.00	3.00	14.00	26.81	57.98	57.13	7.85	4.61
290	HL222_15L0B	AA222	A	FG	HL	162.96	11.83	76.92	1.00	2.00	11.00	17.85	22.34	62.61	7.18	4.89
291	HL222_17L05	AA222	A	FG	HL	217.11	3.24	83.06	1.00	1.00	9.00	16.10	16.10	56.33	8.34	4.27
292	HL222_17L06	AA222	A	FG	HL	167.07	10.50	55.49	1.00	1.00	9.00	30.05	30.05	84.68	7.02	3.83
293	HL222_20L07	AA222	A	FG	HL	244.59	0.00	54.58	0.00	0.00	0.00	0.00	0.00	58.03		
294	HL222_20L08	AA222	A	FG	HL	91.35	0.00	17.64	0.00	0.00	0.00	0.00	0.00	36.06		
295	HL222_20L0B	AA222	A	FG	HL	183.26	0.00	60.18	0.00	0.00	0.00	0.00	0.00	40.30		
296	HL222_22L09	AA222	A	FG	HL	238.51	0.00	43.84	0.00	0.00	0.00	0.00	0.00	47.38		
297	HL222_22L0B	AA222	A	FG	HL	233.82	0.00	73.39	0.00	0.00	0.00	0.00	0.00	65.47	8.26	4.63
298	HL222_22L10	AA222	A	FG	HL	161.61	0.00	52.39	0.00	0.00	0.00	0.00	0.00	38.75		
299	LH222_13L02	AA222	A	FG	LH	384.82	0.00	77.94	0.00	0.00	0.00	0.00	0.00	28.90	6.98	4.28
300	LH222_15L03	AA222	A	FG	LH	146.10	222.30		1.00	4.00	10.00	15.08	51.78	24.00	6.57	3.95
301	LH222_17L05	AA222	A	FG	LH	266.92	23.54	71.09	1.00	3.00	8.00	6.65	11.05	32.70	6.91	4.42
302	LH222_17L0B	AA222	A	FG	LH	307.65	16.04	65.65	1.00	1.00	4.00	6.65	15.61	35.90		
303	LH222_20L07	AA222	A	FG	LH	231.78	0.00	44.55	0.00	0.00	0.00	0.00	0.00	28.70		
304	LH222_22L09	AA222	A	FG	LH	417.04	0.00	52.75	0.00	0.00	0.00	0.00	0.00	35.60	8.23	3.60
305	LL222_13L02	AA222	A	FG	LL	231.32	8.46	51.12	0.00	0.00	0.00	12.30	12.30	59.12		
306	LL222_15L03	AA222	A	FG	LL	210.42	4.68		1.00	1.00	1.00	8.70	8.70	34.05		
307	LL222_15L04	AA222	A	FG	LL	124.30	11.69	39.71	1.00	1.00	7.00	12.31	12.31	43.62	7.16	4.64
308	LL222_17L06	AA222	A	FG	LL	93.59	11.58	30.69	1.00	1.00	4.00	13.60	13.60	40.13	5.84	2.07
309	LL222_20L05	AA222	A	FG	LL	113.08	20.14	31.55	1.00	1.00	10.00	19.19	19.19	39.32	8.18	4.79
310	LL222_20L07	AA222	A	FG	LL	137.51	7.66	39.17	1.00	1.00	4.00	8.47	8.47	43.86	7.51	4.07
311	LL222_20L08	AA222	A	FG	LL	198.31	9.24	36.47	0.00	0.00	0.00	5.60	5.60	37.12		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
279	HH222_13L01	13.91	3.98	7.00	7.00	4.79	901.13	0.18		6.64		4.92	6.80			1.78
280	HH222_13L0B	12.83	3.91	5.00	1.00	3.21	313.46	0.43	0.04	5.34	2.44	4.54	5.75	1.91	1.91	4.10
281	HH222_15L03	9.80	3.98	2.00	3.00	5.67	700.98	0.23	0.00	6.34	-0.51	4.88	6.55	1.75	0.12	2.06
282	HH222_17L06	21.13	4.31	4.00	2.00	3.49	385.98	0.47		5.57		4.82	5.96			5.63
283	HH222_17L0B	16.44	3.16	3.00	2.00	5.31	350.51	0.26		5.63		4.27	5.86			3.36
284	HH222_20L07	11.43	4.07	6.00	2.00	3.56	515.20	0.22		6.04		4.54	6.24			2.56
285	HH222_22L10	9.99	4.26	3.00	3.00	3.88	505.69	0.36	0.00	5.92	0.23	4.90	6.23	3.14	-0.82	3.42
286	HL222_13L01	22.13	6.41	5.00	0.00	1.64	138.41	0.05	0.05	4.83	1.91	1.95	4.93	2.60	2.60	11.92
287	HL222_13L02	21.06	4.94	8.00	0.00	1.79	149.24	0.18	0.05	4.78	1.92	3.13	5.01	2.05	2.05	18.28
288	HL222_15L03	14.90	5.41	3.00	1.00	1.87	93.50	0.23	0.04	4.29	1.18	2.85	4.54	2.35	2.35	14.98
289	HL222_15L04	18.60	4.28	3.00	2.00	2.55	277.60	0.31	0.03	5.32	2.02	4.18	5.63	3.29	4.06	12.51
290	HL222_15L0B	24.32	5.59	2.00	3.00	2.89	251.71	0.44	0.05	5.09	2.47	4.34	5.53	2.88	3.11	18.89
291	HL222_17L05	23.03	6.99	1.00	2.00	3.53	303.41	0.38	0.01	5.38	1.18	4.42	5.72	2.78	2.78	11.48
292	HL222_17L06	38.53	6.49	3.00	4.00	2.53	233.06	0.31	0.05	5.12	2.35	4.02	5.45	3.40	3.40	33.71
293	HL222_20L07	29.22	5.72	7.00	2.00	2.11	299.17	0.22		5.50		4.00	5.70			10.81
294	HL222_20L08	13.35	4.40	4.00	1.00	1.99	108.99	0.19		4.51		2.87	4.69			11.18
295	HL222_20L0B	13.17	4.54	3.00	1.00	3.11	243.44	0.33		5.21		4.10	5.49			6.96
296	HL222_22L09	17.56	5.04	5.00	1.00	2.00	282.35	0.18		5.47		3.78	5.64			7.39
297	HL222_22L0B	22.54	5.55	7.00	3.00	2.08	307.21	0.31		5.45		4.30	5.73			14.40
298	HL222_22L10	13.18	4.28	3.00	3.00	2.99	214.00	0.32		5.09		3.96	5.37			7.30
299	LH222_13L02	12.84	4.03	6.00	0.00	2.59	462.76	0.20		5.95		4.36	6.14			1.70
300	LH222_15L03	8.43	4.56	1.00	0.00	2.23				4.98	5.40			2.71	3.95	3.10
301	LH222_17L05	13.54	4.85	3.00	3.00	3.33	361.55	0.24	0.07	5.59	3.16	4.26	5.89	1.89	2.40	3.15
302	LH222_17L0B	13.45	5.06	3.00	0.00	2.56	389.34	0.20	0.04	5.73	2.78	4.18	5.96	1.89	2.75	3.29
303	LH222_20L07	11.00	3.82	3.00	3.00	2.52	276.33	0.19		5.45		3.80	5.62			2.79
304	LH222_22L09	12.34	3.85	6.00	1.00	1.91	469.79	0.13		6.03		3.97	6.15			2.39
305	LL222_13L02	24.98	8.75	4.00	6.00	1.70	290.90	0.21	0.03	5.44	2.14	3.93	5.67	2.51	2.51	11.87
306	LL222_15L03	12.63	7.16	1.00	4.00	1.56				5.35	1.54			2.16	2.16	4.33
307	LL222_15L04	17.89	7.07	5.00	4.00	2.37	175.70	0.29	0.07	4.82	2.46	3.68	5.17	2.51	2.51	12.02
308	LL222_17L06	16.90	5.20	1.00	4.00	1.65	135.86	0.29	0.09	4.54	2.45	3.42	4.91	2.61	2.61	13.52
309	LL222_20L05	16.16	6.57	2.00	2.00	1.57	164.77	0.24	0.14	4.73	3.00	3.45	5.10	2.95	2.95	10.74
310	LL222_20L07	12.22	6.12	4.00	3.00	1.78	184.34	0.27	0.04	4.92	2.04	3.67	5.22	2.14	2.14	10.99
311	LL222_20L08	13.01	6.19	5.00	5.00	1.36	244.02	0.18	0.04	5.29	2.22	3.60	5.50	1.72	1.72	5.46

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
312	HH229_09L02	AA229	F	FG	HH	144.89	222.00	125.03	1.00	5.00	138.00	318.88	1325.39	32.86	5.94	3.73
313	HH229_12L03	AA229	F	ZT	HH	409.35	297.98	86.03	1.00	5.00	88.00	345.50	949.94	39.41	8.23	3.97
314	HH229_15L05	AA229	F	ZT	HH	396.41	525.92	148.29	1.00	7.00	160.00	343.07	1907.10	43.01	8.42	4.36
315	HH229_15L0B	AA229	F	ZT	HH	122.25	543.29	170.17	1.00	5.00	306.00	270.76	2144.54	37.01	7.41	4.74
316	HH229_19L08	AA229	F	ZT	HH	268.26	460.38	83.56	1.00	9.00	253.00	349.26	1805.80	45.88	8.39	4.33
317	HH229_39L0B	AA229	F	ZT	HH	106.45	219.41	111.04	1.00	3.00	79.00	436.93	981.91	33.26	8.29	4.07
318	HH229_39L10	AA229	F	ZT	HH	377.03	80.25	119.31	1.00	1.00	44.00	374.73	379.46	44.14	8.48	3.54
319	HL229_09L01	AA229	F	ZT	HL	102.85	329.83	97.33	1.00	8.00	214.00	302.08	2218.90	55.80	7.34	4.04
320	HL229_09L02	AA229	F	ZT	HL	211.99	210.68	96.67	1.00	2.00	108.00	380.77	1048.24	51.35	8.04	3.99
321	HL229_12L03	AA229	F	ZT	HL	210.72	86.86	91.10	1.00	1.00	38.00	340.19	338.71	60.64	8.67	4.45
322	HL229_12L04	AA229	F	ZT	HL	74.91	424.94	69.05	1.00	2.00	110.00	517.87	2128.13	60.71	7.97	4.74
323	HL229_12L0B	AA229	F	ZT	HL				1.00	1.00	21.00	354.77	354.77	72.62	8.57	4.40
324	HL229_15L05	AA229	F	ZT	HL	146.66	359.20	66.47	1.00	4.00	108.00	528.65	1391.34	56.15	7.82	5.59
325	HL229_15L06	AA229	F	ZT	HL	137.96	163.17	51.81	1.00	4.00	82.00	345.21	1087.07	43.12	7.76	4.58
326	HL229_19L07	AA229	F	ZT	HL	117.93	270.04	54.67	1.00	3.00	111.00	329.90	1683.69	55.13		
327	HL229_19L08	AA229	F	ZT	HL	152.70	266.09	46.03	1.00	2.00	58.00	589.65	1132.82	44.77	7.79	5.10
328	HL229_19L0B	AA229	F	ZT	HL				1.00	1.00	15.00	262.11	262.11	70.32		
329	HL229_39L09	AA229	F	ZT	HL		79.22	49.09	1.00	6.00	209.00	507.22	2194.31	31.53	8.55	4.94
330	HL229_39L0B	AA229	F	ZT	HL	91.82	258.94	39.61	1.00	3.00	111.00	547.14	1886.03	70.01	7.96	3.91
331	HL229_39L10	AA229	F	ZT	HL	102.88	352.18	66.05	1.00	3.00	115.00	444.82	1857.01	37.56	9.12	4.75
332	LH229_09L01	AA229	F	ZT	LH	83.29	226.08	49.81	1.00	9.00	85.00	93.33	814.90	28.80	8.03	4.48
333	LH229_12L03	AA229	F	ZT	LH	108.83	190.47	101.97	1.00	7.00	50.00	106.06	582.30	31.20	7.85	4.20
334	LH229_15L05	AA229	F	ZT	LH	110.96	292.25	104.75	1.00	10.00	110.00	115.23	749.80	32.90	7.84	4.08
335	LH229_19L07	AA229	F	ZT	LH	239.86	15.61		0.00	5.00	1.00	20.19	23.80	45.10		
336	LH229_19L0B	AA229	F	ZT	LH	168.52	163.47	72.54	1.00	11.00	52.00	131.71	695.42	44.20	8.58	5.38
337	LH229_39L09	AA229	F	ZT	LH	178.05	98.99	109.17	1.00	8.00	45.00	99.81	430.84	38.70	8.49	3.68
338	LL229_09L01	AA229	F	ZT	LL	81.68	91.66	33.62	1.00	3.00	27.00	117.33	315.37	34.19	7.09	3.65
339	LL229_09L02	AA229	F	ZT	LL	37.27	105.69		1.00	2.00	17.00	168.51	375.51	32.14	7.93	4.52
340	LL229_12L03	AA229	F	ZT	LL	60.47	175.03	40.21	1.00	3.00	53.00	189.29	704.25	50.70	7.85	4.06
341	LL229_12L04	AA229	F	ZT	LL	58.57	155.61	53.57	1.00	3.00	28.00	120.29	350.13	35.29	7.87	4.84
342	LL229_15L05	AA229	F	ZT	LL	171.91	23.30	44.64	1.00	1.00	3.00	11.43	11.43	50.54	9.80	5.12
343	LL229_15L06	AA229	F	ZT	LL	60.66	118.65	46.36	1.00	2.00	22.00	172.85	333.37	50.61	7.15	4.31
344	LL229_15L09	AA229	F	ZT	LL	94.50	84.80	45.98	1.00	3.00	18.00	163.88	295.02	52.29	8.59	4.90
345	LL229_15L0B	AA229	F	ZT	LL	53.48	73.54	37.42	1.00	3.00	13.00	106.17	196.72	46.76	7.55	3.74
346	LL229_19L07	AA229	F	ZT	LL	112.75	147.84	46.05	1.00	3.00	42.00	202.80	492.97	35.71	8.38	4.09
347	LL229_19L08	AA229	F	ZT	LL	198.38	14.09	48.89	1.00	2.00	5.00	52.13	55.26	48.72	9.32	4.50
348	LL229_19L0B	AA229	F	ZT	LL	107.80	137.26	46.88	1.00	4.00	28.00	125.27	429.70	48.57	8.60	4.59
349	LL229_19L10	AA229	F	ZT	LL	179.06	82.29	44.67	1.00	5.00	18.00	176.54	314.73	54.19	8.59	4.37

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
312	HH229_09L02	16.91	6.03	8.00	1.00	3.32	491.92	0.34	0.82	4.98	5.40	4.83	6.20	5.76	7.19	5.85
313	HH229_12L03	18.09	4.76	5.00	1.00	4.39	793.36	0.12	0.60	6.01	5.70	4.45	6.68	5.84	6.86	2.98
314	HH229_15L05	21.76	5.66	5.00	0.00	4.96	1070.62	0.16	0.97	5.98	6.27	5.00	6.98	5.84	7.55	3.66
315	HH229_15L0B	12.78	5.96	5.00	0.00	4.89	835.71	0.26	1.86	4.81	6.30	5.14	6.73	5.60	7.67	8.80
316	HH229_19L08	18.30	5.75	6.00	0.00	3.93	812.20	0.11	1.31	5.59	6.13	4.43	6.70	5.86	7.50	6.16
317	HH229_39L0B	16.24	5.91	7.00	0.00	2.98	436.90	0.34	1.01	4.67	5.39	4.71	6.08	6.08	6.89	8.16
318	HH229_39L10	23.60	5.25	7.00	0.00	4.00	576.59	0.26	0.16	5.93	4.39	4.78	6.36	5.93	5.94	4.06
319	HL229_09L01	24.59	8.81	9.00	1.00	3.53	530.01	0.22	1.65	4.63	5.80	4.58	6.27	5.71	7.70	23.78
320	HL229_09L02	19.50	6.53	3.00	3.00	3.13	519.34	0.23	0.68	5.36	5.35	4.57	6.25	5.94	6.95	9.77
321	HL229_12L03	33.79	9.46	8.00	4.00	2.63	388.68	0.31	0.29	5.35	4.46	4.51	5.96	5.83	5.83	13.71
322	HL229_12L04	32.64	9.67	7.00	3.00	3.20	568.90	0.14	2.95	4.32	6.05	4.23	6.34	6.25	7.66	38.64
323	HL229_12L0B	47.91	11.00	11.00	1.00	1.73								5.87	5.87	
324	HL229_15L05	38.85	10.61	7.00	2.00	3.64	572.33	0.13	1.69	4.99	5.88	4.20	6.35	6.27	7.24	16.88
325	HL229_15L06	27.57	8.67	5.00	1.00	3.68	352.94	0.17	0.86	4.93	5.09	3.95	5.87	5.84	6.99	10.58
326	HL229_19L07						442.64	0.14	1.56	4.77	5.60	4.00	6.09	5.80	7.43	20.24
327	HL229_19L08	21.73	5.80	6.00	1.00	2.31	464.82	0.11	1.34	5.03	5.58	3.83	6.14	6.38	7.03	10.31
328	HL229_19L0B													5.57	5.57	
329	HL229_39L09	13.09	5.45	4.00	1.00	2.22					4.37	3.89		6.23	7.69	
330	HL229_39L0B	41.55	9.09	9.00	3.00	2.19	390.37	0.11	1.97	4.52	5.56	3.68	5.97	6.30	7.54	41.92
331	HL229_39L10	18.04	6.35	10.00	5.00	3.06	521.11	0.15	2.08	4.63	5.86	4.19	6.26	6.10	7.53	10.77
332	LH229_09L01	12.92	5.42	7.00	2.00	2.41	359.18	0.16	1.70	4.42	5.42	3.91	5.88	4.54	6.70	7.82
333	LH229_12L03	13.71	7.33	5.00	2.00	3.79	401.27	0.34	0.90	4.69	5.25	4.62	5.99	4.66	6.37	7.03
334	LH229_15L05	12.17	4.12	5.00	0.00	3.55	507.96	0.26	1.35	4.71	5.68	4.65	6.23	4.75	6.62	7.66
335	LH229_19L07	19.32	5.10	11.00	2.00	2.92				5.48	2.75			3.01	3.17	6.66
336	LH229_19L0B	14.79	6.10	7.00	0.00	3.18	404.53	0.22	0.68	5.13	5.10	4.28	6.00	4.88	6.54	9.11
337	LH229_39L09	12.50	5.01	5.00	2.00	3.94	386.21	0.39	0.34	5.18	4.60	4.69	5.96	4.60	6.07	6.61
338	LL229_09L01	22.88	10.43	5.00	5.00	1.86	206.96	0.19	0.79	4.40	4.52	3.52	5.33	4.76	5.75	11.24
339	LL229_09L02	17.42	6.01	7.00	1.00	1.40				3.62	4.66			5.13	5.93	21.77
340	LL229_12L03	28.32	7.97	6.00	1.00	2.70	275.71	0.17	1.74	4.10	5.16	3.69	5.62	5.24	6.56	33.38
341	LL229_12L04	29.58	8.93	12.00	2.00	2.78	267.75	0.25	1.39	4.07	5.05	3.98	5.59	4.79	5.86	16.70
342	LL229_15L05	28.48	8.36	9.00	6.00	2.72	239.85	0.23	0.11	5.15	3.15	3.80	5.48	2.44	2.44	11.67
343	LL229_15L06	25.32	9.15	10.00	3.00	2.21	225.67	0.26	1.11	4.11	4.78	3.84	5.42	5.15	5.81	33.16
344	LL229_15L09	23.69	8.14	9.00	5.00	1.89	225.28	0.26	0.60	4.55	4.44	3.83	5.42	5.10	5.69	22.72
345	LL229_15L0B	33.78	11.94	3.00	1.00	1.89	164.44	0.29	0.81	3.98	4.30	3.62	5.10	4.67	5.28	32.11
346	LL229_19L07	15.14	6.35	4.00	4.00	2.66	306.64	0.18	0.93	4.73	5.00	3.83	5.73	5.31	6.20	8.88
347	LL229_19L08	21.90	8.69	6.00	3.00	2.35	261.36	0.23	0.06	5.29	2.65	3.89	5.57	3.95	4.01	9.40
348	LL229_19L0B	21.90	9.12	8.00	1.00	2.76	291.94	0.19	0.89	4.68	4.92	3.85	5.68	4.83	6.06	17.19
349	LL229_19L10	30.76	8.09	7.00	2.00	2.65	306.02	0.17	0.37	5.19	4.41	3.80	5.72	5.17	5.75	12.88

pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
AA251	F	FG	HH	382.80	93.96	159.45	1.00	2.00	43.00	270.33	284.56	57.41	9.15	4.35
AA251	F	FG	HH	506.82	160.55	121.68	1.00	5.00	59.00	350.15	363.88	41.46	7.73	5.10
AA251	F	FG	HH	310.95	211.03	168.78	1.00	4.00	115.00	289.45	622.84	37.14	9.57	4.91
AA251	F	FG	HH	487.06	0.00	191.98	0.00	0.00	0.00	0.00	0.00	50.00		
AA251	F	FG	HH	459.44	14.87	225.87	1.00	1.00	10.00	5.98	10.90	47.12	7.43	3.00
AA251	F	FG	HH	573.01	0.00	218.53	0.00	0.00	0.00	0.00	0.00	43.43		
AA251	F	FG	HH	405.69	5.15	209.80	1.00	1.00	3.00	8.79	19.71	51.57	7.94	3.91
AA251	F	FG	HL	113.55	388.35	111.66	1.00	7.00	182.00	480.29	2394.53	53.07	7.12	4.02
AA251	F	FG	HL	113.21	90.54	63.62	1.00	1.00	25.00	225.30	225.30	59.09	10.17	4.75
AA251	F	FG	HL	182.32	56.57	122.84	1.00	1.00	33.00	184.02	178.34	57.26	7.10	3.28
AA251	F	FG	HL	290.37	4.40	106.02	1.00	1.00	5.00	20.10	20.10	59.62	8.80	5.14
AA251	F	FG	HL	208.32		105.72	0.00	0.00	0.00	0.00	0.00	54.86		
AA251	F	FG	HL	149.85	241.03	112.88	1.00	1.00	87.00	559.92	1159.47	63.15	9.52	3.79
AA251	F	FG	HL	493.24	29.14	122.12	1.00	1.00	20.00	107.08	107.08	68.20	9.55	4.54
AA251	F	FG	HL	91.12	207.44	138.09	1.00	3.00	113.00	441.61	1023.25	54.39	6.81	3.82
AA251	F	FG	HL		3.15	220.12	0.00	1.00	0.00	5.60	5.60	48.06		
AA251	F	FG	HL	256.00	0.00	101.56	0.00	0.00	0.00	0.00	0.00	51.03		
AA251	F	FG	HL	156.30	17.11	125.11	1.00	1.00	6.00	7.79	7.79	56.84	9.00	4.67
AA251	F	FG	HL	133.76	0.00	52.30	0.00	0.00	0.00	0.00	0.00	49.79		
AA251	F	FG	HL	215.95	8.16	62.42	0.00	1.00	0.00	11.40	11.40	49.03		
AA251	F	FG	LH	203.09	63.03	73.18	1.00	5.00	25.00	71.82	189.64	39.30	9.87	4.58
AA251	F	FG	LH	189.10	108.13	117.99	1.00	7.00	57.00	78.78	303.14	44.80	9.10	4.20
AA251	F	FG	LH	267.43	4.03	99.62	1.00	1.00	6.00	13.47	20.06	36.60	7.43	3.18
AA251	F	FG	LH	205.75	4.77	114.14	1.00	1.00	1.00	7.80	7.80	42.30		
AA251	F	FG	LH	208.07	69.44	105.78	1.00	5.00	24.00	43.21	149.15	39.80	7.72	3.34
AA251	F	FG	LH	176.65	39.51	111.08	1.00	3.00	17.00	70.41	129.62	32.50	8.98	5.17
AA251	F	FG	LL	25.60	20.89	23.40	1.00	1.00	6.00	72.41	72.41	41.00	8.62	4.34
AA251	F	FG	LL	59.95	124.13	42.87	1.00	2.00	23.00	231.34	280.82	39.00	10.85	5.39
AA251	F	FG	LL	68.55	116.16	29.20	1.00	3.00	32.00	227.90	372.51	47.89	8.44	5.03
AA251	F	FG	LL	45.90	105.25	50.74	1.00	1.00	24.00	23.41	23.41	44.59	8.86	4.79
AA251	F	FG	LL	108.19	27.80	41.92	1.00	1.00	3.00	26.59	26.59	48.74	9.08	4.26
AA251	F	FG	LL	62.14	39.93	36.11	1.00	1.00	7.00	111.14	111.14	37.94	10.47	5.36
AA251	F	FG	LL	110.47	149.79	46.56	1.00	4.00	28.00	221.58	369.95	60.01	10.50	4.94
AA251	F	FG	LL	48.10	84.73	35.51	1.00	1.00	9.00	170.54	170.54	49.61	7.16	4.01
AA251	F	FG	LL	203.16	19.24	49.64	0.00	0.00	0.00	9.20	9.20	55.95		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
350	HH251_02L01	20.25	4.57	3.00	0.00	4.50	636.21	0.33	0.17	5.95	4.54	5.07	6.46	5.60	5.65	6.76
351	HH251_03L03	17.83	4.75	5.00	3.00	4.36	789.05	0.18	0.26	6.23	5.08	4.80	6.67	5.86	5.90	2.66
352	HH251_05L05	16.88	5.99	4.00	1.00	4.51	690.76	0.32	0.44	5.74	5.35	5.13	6.54	5.67	6.43	3.48
353	HH251_05L0B	24.85	6.08	9.00	0.00	5.87	679.04	0.39		6.19		5.26	6.52			4.03
354	HH251_06L07	17.37	6.05	11.00	0.00	7.03	700.18	0.48	0.02	6.13	2.70	5.42	6.55	1.79	2.39	3.80
355	HH251_08L0B	12.62	5.57	6.00	0.00	5.07	791.54	0.38		6.35		5.39	6.67			2.59
356	HH251_08L10	15.44	5.13	8.00	0.00	4.89	620.64	0.51	0.01	6.01	1.64	5.35	6.43	2.17	2.98	5.15
357	HL251_02L01	22.26	5.98	7.00	4.00	3.12	613.56	0.22	1.72	4.73	5.96	4.72	6.42	6.17	7.78	19.48
358	HL251_02L02	20.66	5.68	10.00	3.00	3.08	267.37	0.31	0.51	4.73	4.51	4.15	5.59	5.42	5.42	24.22
359	HL251_02L0B	20.07	7.42	8.00	3.00	3.37	361.73	0.51	0.19	5.21	4.04	4.81	5.89	5.22	5.18	14.12
360	HL251_03L03	22.71	8.35	8.00	1.00	3.74	400.79	0.36	0.01	5.67	1.48	4.66	5.99	3.00	3.00	9.61
361	HL251_03L04	21.52	7.88	6.00	1.00	3.46	314.04	0.51		5.34		4.66	5.75			11.35
362	HL251_05L05	30.71	8.64	7.00	3.00	3.12	503.76	0.29	0.92	5.01	5.48	4.73	6.22	6.33	7.06	20.90
363	HL251_05L06	34.00	8.76	8.00	3.00	4.09	644.50	0.23	0.05	6.20	3.37	4.81	6.47	4.67	4.67	7.41
364	HL251_06L07	10.47	3.70	4.00	3.00	3.22	436.65	0.46	0.91	4.51	5.33	4.93	6.08	6.09	6.93	25.50
365	HL251_06L08	23.67	6.52	13.00	0.00	3.69					1.15	5.39		1.72	1.72	
366	HL251_06L0B	23.18	8.15	8.00	1.00	3.92	357.56	0.40		5.55		4.62	5.88			7.99
367	HL251_08L09	25.17	6.82	5.00	2.00	4.27	298.52	0.72	0.06	5.05	2.84	4.83	5.70	2.05	2.05	16.24
368	HL251_08L0B	28.04	11.76	2.00	1.00	2.78	186.06	0.39		4.90		3.96	5.23			14.56
369	HL251_08L10	21.95	6.99	11.00	0.00	3.48	286.53	0.28	0.03	5.38	2.10	4.13	5.66	2.43	2.43	8.74
370	LH251_02L01	18.79	6.48	4.00	0.00	3.32	339.30	0.27	0.23	5.31	4.14	4.29	5.83	4.27	5.25	5.97
371	LH251_03L03	18.16	7.10	4.00	0.00	3.72	415.22	0.40	0.35	5.24	4.68	4.77	6.03	4.37	5.71	8.34
372	LH251_05L05	14.31	5.17	5.00	2.00	3.76	371.08	0.37	0.01	5.59	1.39	4.60	5.92	2.60	3.00	3.93
373	LH251_06L07	19.24	7.80	5.00	3.00	3.99	324.66	0.54	0.01	5.33	1.56	4.74	5.78	2.05	2.05	6.83
374	LH251_06L0B	18.43	6.68	4.00	2.00	4.12	383.29	0.38	0.22	5.34	4.24	4.66	5.95	3.77	5.00	5.98
375	LH251_08L09	11.62	5.13	9.00	3.00	3.38	327.24	0.51	0.14	5.17	3.68	4.71	5.79	4.25	4.86	4.70
376	LL251_02L01	25.08	10.54	4.00	2.00	1.69	69.89	0.50	0.43	3.24	3.04	3.15	4.25	4.28	4.28	51.57
377	LL251_02L02	28.46	9.74	7.00	2.00	2.30	226.95	0.23	1.21	4.09	4.82	3.76	5.42	5.44	5.64	19.92
378	LL251_02L04				4.00	2.40	213.91	0.16	1.19	4.23	4.75	3.37	5.37	5.43	5.92	26.27
379	LL251_02L10	29.06	10.46	6.00	4.00	1.66	201.89	0.34	1.09	3.83	4.66	3.93	5.31	3.15	3.15	34.01
380	LL251_05L06	22.02	7.78	7.00	3.00	2.21	177.91	0.31	0.19	4.68	3.33	3.74	5.18	3.28	3.28	17.24
381	LL251_06L05	22.19	8.13	4.00	2.00	2.13	138.18	0.35	0.41	4.13	3.69	3.59	4.93	4.71	4.71	18.19
382	LL251_06L07	27.49	11.23	5.00	1.00	3.37	306.82	0.18	0.95	4.70	5.01	3.84	5.73	5.40	5.91	25.60
383	LL251_06L08	25.75	8.43	6.00	1.00	2.71	168.34	0.27	1.01	3.87	4.44	3.57	5.13	5.14	5.14	40.19
384	LL251_08L09	25.70	13.14	5.00	3.00	2.59	272.04	0.22	0.08	5.31	2.96	3.90	5.61	2.22	2.22	12.10

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
385	HH252_29L01	AA252	F	NT	HH	230.42	411.25	100.15	1.00	15.00	276.00	200.13	1750.66	32.89	5.90	3.36
386	HH252_31L03	AA252	F	NT	HH	94.08	334.92	95.77	1.00	4.00	133.00	314.97	1436.34	32.35	7.26	4.50
387	HH252_31L0B	AA252	F	NT	HH	254.31	459.91	94.30	1.00	6.00	183.00	314.29	1556.43	42.80	8.06	5.79
388	HH252_32L06	AA252	F	NT	HH	63.17	192.71		1.00	3.00	66.00	294.73	986.18	27.28	7.79	6.30
389	HH252_32L0B	AA252	F	NT	HH	390.42	368.06	120.43	1.00	10.00	180.00	336.62	1296.76	44.68	6.78	3.97
390	HH252_34L07	AA252	F	NT	HH	374.08	79.65	103.64	1.00	1.00	28.00	170.78	176.21	38.82		
391	HH252_36L09	AA252	F	NT	HH	123.41	167.90	87.58	1.00	2.00	56.00	304.20	782.81	36.19	7.16	4.22
392	HL252_29L01	AA252	F	NT	HL	110.67	372.07	58.68	1.00	8.00	234.00	315.20	2681.15	41.38	7.14	4.06
393	HL252_29L02	AA252	F	NT	HL	120.95	272.88	63.61	1.00	10.00	107.00	279.34	2038.96	45.81	6.81	3.93
394	HL252_31L04	AA252	F	NT	HL	55.37	248.99	43.77	1.00	5.00	110.00	326.54	1711.03	45.78	6.99	4.58
395	HL252_32L05	AA252	F	NT	HL	69.75	256.59	43.48	1.00	9.00	141.00	253.88	1877.14	45.52	6.64	3.70
396	HL252_32L06	AA252	F	NT	HL	135.58	188.00	71.52	1.00	4.00	112.00	354.88	1261.08	49.21	7.25	4.25
397	HL252_32L0B	AA252	F	NT	HL	151.18	192.52	73.63	1.00	3.00	70.00	346.53	1416.52	55.79	7.35	4.43
398	HL252_34L07	AA252	F	NT	HL	80.22	255.12	65.60	1.00	11.00	190.00	249.12	1987.32	35.65	5.36	3.34
399	HL252_34L08	AA252	F	NT	HL	86.33	240.83	55.71	1.00	6.00	157.00	243.21	1734.93	52.61	7.03	4.43
400	HL252_34L0B	AA252	F	NT	HL	48.89	163.77	34.74	1.00	7.00	88.00	300.53	1458.15	60.78	7.11	4.01
401	HL252_36L09	AA252	F	NT	HL	113.64	199.63	65.56	1.00	5.00	126.00	250.37	971.46	49.12	7.01	4.53
402	HL252_36L0B	AA252	F	NT	HL	90.18	116.95	34.42	1.00	4.00	50.00	260.17	753.09	61.27	7.06	4.03
403	HL252_36L10	AA252	F	NT	HL	55.71	153.60	22.53	1.00	5.00	96.00	233.64	871.72	38.69	7.51	4.38
404	LH252_29L01	AA252	F	NT	LH	97.25	78.90	74.12	1.00	5.00	38.00	89.13	330.42	32.10	6.94	3.59
405	LH252_31L04	AA252	F	NT	LH	49.78	153.15	54.21	1.00	6.00	47.00	112.37	535.81	29.10	8.20	5.92
406	LH252_31L0B	AA252	F	NT	LH	83.48	280.51	82.98	1.00	8.00	87.00	117.27	768.71	29.40	8.62	6.26
407	LH252_32L05	AA252	F	NT	LH	88.54	139.14	87.12	1.00	15.00	71.00	66.36	600.67	27.60	6.29	3.32
408	LH252_34L07	AA252	F	NT	LH	147.52	76.63	94.99	1.00	7.00	41.00	69.58	324.95	29.00	7.09	4.11
409	LH252_36L10	AA252	F	NT	LH	86.96	210.71	85.30	1.00	12.00	72.00	133.25	938.55	34.50	7.03	4.58
410	LL252_29L01	AA252	F	NT	LL	120.28	0.00	26.03	0.00	0.00	0.00	0.00	0.00	40.08		
411	LL252_29L02	AA252	F	NT	LL	139.16	47.37	56.54	1.00	2.00	11.00	113.64	189.75	54.23	7.22	4.06
412	LL252_29L09	AA252	F	NT	LL	131.02	47.33	56.73	1.00	4.00	16.00	86.18	153.03	62.65	6.93	3.70
413	LL252_31L03	AA252	F	NT	LL	88.39	42.72	26.32	1.00	1.00	10.00	104.58	104.58	47.41	9.80	6.55
414	LL252_31L04	AA252	F	NT	LL	78.68	181.44	41.88	1.00	6.00	41.00	246.90	757.34	47.78	8.69	6.73
415	LL252_31L0B	AA252	F	NT	LL	83.05	33.49	35.73	1.00	1.00	10.00	79.96	79.96	44.42	8.82	6.24
416	LL252_32L05	AA252	F	NT	LL	169.58	110.22	43.82	1.00	4.00	23.00	231.32	323.70	59.17	7.57	5.48
417	LL252_32L06	AA252	F	NT	LL	166.38	136.86	42.56	1.00	4.00	36.00	177.38	366.21	59.15	7.29	4.93
418	LL252_34L07	AA252	F	NT	LL	80.22	27.98	23.07	1.00	1.00	12.00	142.83	142.83	61.22	6.87	3.65
419	LL252_34L08	AA252	F	NT	LL	203.25	42.22	68.99	1.00	2.00	11.00	71.70	81.76	58.91	7.77	4.27
420	LL252_34L0B	AA252	F	NT	LL	98.45	40.57	28.38	1.00	1.00	10.00	121.42	121.42	53.00	7.89	4.15

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
385	HH252_29L01	11.13	3.05	3.00	2.00	4.07	741.82	0.16	1.24	5.44	6.02	4.61	6.61	5.30	7.47	3.69
386	HH252_31L03	14.01	4.63	4.00	1.00	3.29	524.77	0.22	1.76	4.54	5.81	4.56	6.26	5.75	7.27	8.73
387	HH252_31L0B	16.62	5.12	6.00	1.00	3.74	808.52	0.13	1.32	5.54	6.13	4.55	6.70	5.75	7.35	5.66
388	HH252_32L06	13.36	5.21	5.00	0.00	3.05				4.15	5.26			5.69	6.89	9.25
389	HH252_32L0B	15.96	4.03	3.00	1.00	4.36	878.91	0.16	0.72	5.97	5.91	4.79	6.78	5.82	7.17	4.02
390	HH252_34L07	20.76	5.17	3.00	0.00	4.04	557.37	0.23	0.17	5.92	4.38	4.64	6.32	5.14	5.17	3.16
391	HH252_36L09	11.13	5.95	5.00	1.00	3.11	378.89	0.30	0.80	4.82	5.12	4.47	5.94	5.72	6.66	8.34
392	HL252_29L01	16.71	4.96	3.00	2.00	2.87	541.42	0.12	2.20	4.71	5.92	4.07	6.29	5.75	7.89	12.15
393	HL252_29L02	23.54	5.42	1.00	2.00	2.98	457.44	0.16	1.48	4.80	5.61	4.15	6.13	5.63	7.62	13.63
394	HL252_31L04	16.33	6.53	4.00	0.00	2.49	348.13	0.14	2.51	4.01	5.52	3.78	5.85	5.79	7.44	29.73
395	HL252_32L05	11.02	5.34	5.00	1.00	2.06	369.82	0.13	2.27	4.24	5.55	3.77	5.91	5.54	7.54	23.33
396	HL252_32L06	29.87	11.33	2.00	1.00	2.84	395.10	0.22	0.91	4.91	5.24	4.27	5.98	5.87	7.14	14.03
397	HL252_32L0B	29.05	11.37	3.00	4.00	3.23	417.33	0.21	0.86	5.02	5.26	4.30	6.03	5.85	7.26	16.17
398	HL252_34L07	15.17	6.44	4.00	1.00	2.51	400.94	0.20	1.75	4.38	5.54	4.18	5.99	5.52	7.59	12.45
399	HL252_34L08	18.21	7.86	4.00	0.00	2.76	382.87	0.17	1.70	4.46	5.48	4.02	5.95	5.49	7.46	25.18
400	HL252_34L0B	33.01	10.74	1.00	0.00	2.30	247.40	0.16	1.96	3.89	5.10	3.55	5.51	5.71	7.28	59.35
401	HL252_36L09	25.80	10.82	2.00	2.00	2.43	378.83	0.21	1.11	4.73	5.30	4.18	5.94	5.52	6.88	16.68
402	HL252_36L0B	28.34	10.51	3.00	0.00	1.63	241.55	0.17	0.94	4.50	4.76	3.54	5.49	5.56	6.62	32.69
403	HL252_36L10	20.75	8.27	1.00	0.00	1.93	231.84	0.11	1.96	4.02	5.03	3.11	5.45	5.45	6.77	21.11
404	LH252_29L01	11.16	4.57	4.00	4.00	3.97	250.27	0.42	0.46	4.58	4.37	4.31	5.52	4.49	5.80	8.32
405	LH252_31L04	11.43	4.50	3.00	0.00	3.44	257.14	0.27	1.47	3.91	5.03	3.99	5.55	4.72	6.28	13.36
406	LH252_31L0B	12.07	4.93	3.00	1.00	3.19	446.97	0.23	1.69	4.42	5.64	4.42	6.10	4.76	6.64	8.13
407	LH252_32L05	12.39	4.21	3.00	4.00	3.74	314.80	0.38	0.79	4.48	4.94	4.47	5.75	4.20	6.40	6.76
408	LH252_34L07	14.99	5.08	2.00	5.00	3.90	319.14	0.42	0.32	4.99	4.34	4.55	5.77	4.24	5.78	4.48
409	LH252_36L10	21.86	7.50	7.00	3.00	2.89	382.97	0.29	1.22	4.47	5.35	4.45	5.95	4.89	6.84	10.75
410	LL252_29L01	23.22	7.69	2.00	3.00	2.81	146.31	0.22		4.79		3.26	4.99			10.49
411	LL252_29L02	25.08	7.98	7.00	4.00	3.33	243.07	0.30	0.24	4.94	3.86	4.03	5.49	4.73	5.25	16.59
412	LL252_29L09	28.56	9.95	3.00	3.00	2.56	235.08	0.32	0.25	4.88	3.86	4.04	5.46	4.46	5.03	23.53
413	LL252_31L03	19.18	6.71	2.00	3.00	2.44	157.43	0.20	0.37	4.48	3.75	3.27	5.06	4.65	4.65	19.97
414	LL252_31L04	17.49	8.82	3.00	1.00	2.78	302.00	0.16	1.50	4.37	5.20	3.73	5.71	5.51	6.63	22.79
415	LL252_31L0B	20.84	10.59	2.00	3.00	2.88	152.27	0.31	0.28	4.42	3.51	3.58	5.03	4.38	4.38	18.66
416	LL252_32L05	27.04	11.20	4.00	1.00	3.10	323.62	0.16	0.52	5.13	4.70	3.78	5.78	5.44	5.78	16.21
417	LL252_32L06	21.88	9.28	4.00	1.00	3.65	345.80	0.14	0.66	5.11	4.92	3.75	5.85	5.18	5.90	16.52
418	LL252_34L07	25.82	8.72	3.00	5.00	2.32	131.27	0.21	0.27	4.38	3.33	3.14	4.88	4.96	4.96	36.69
419	LL252_34L08	34.90	13.88	3.00	2.00	3.36	314.46	0.28	0.16	5.31	3.74	4.23	5.75	4.27	4.40	13.41
420	LL252_34L0B	24.24	8.82	5.00	4.00	2.30	167.40	0.20	0.32	4.59	3.70	3.35	5.12	4.80	4.80	22.41

	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
421	HH253_17L01	AA253	A	NT	HH	635.40	16.50	126.90	1.00	4.00	17.00	37.16	43.75	47.59	6.91	4.32
422	HH253_18L03	AA253	A	NT	HH	339.28	272.35	129.63	1.00	7.00	156.00	313.19	1222.26	40.51	7.07	3.48
423	HH253_18L0B	AA253	A	NT	HH	334.45	0.00	106.68	0.00	0.00	0.00	0.00	0.00	52.38		
424	HH253_33L05	AA253	A	NT	HH	682.76	5.36	157.49	1.00	1.00	7.00	19.08	20.60	49.20	8.98	4.78
425	HH253_36L07	AA253	A	NT	HH	390.00	68.69	109.24	1.00	6.00	19.00	30.65	37.38	45.24	7.88	5.04
426	HH253_37L09	AA253	A	NT	HH	556.54	11.46	165.44	1.00	1.00	4.00	46.14	52.45	55.37	8.25	4.65
427	HH253_37L0B	AA253	A	NT	HH	430.83	18.63	102.04	1.00	1.00	17.00	91.91	97.93	41.66	8.74	4.70
428	HL253_17L01	AA253	A	NT	HL	266.57	0.00	70.62	0.00	0.00	0.00	0.00	0.00	54.45		
429	HL253_17L02	AA253	A	NT	HL	216.02	0.00	23.13	0.00	0.00	0.00	0.00	0.00	55.79		
430	HL253_17L0B	AA253	A	NT	HL	235.01	0.00	59.52	0.00	0.00	0.00	0.00	0.00	63.48		
431	HL253_18L03	AA253	A	NT	HL	322.90	0.00	106.61	0.00	0.00	0.00	0.00	0.00	79.21		
432	HL253_18L04	AA253	A	NT	HL	184.99	0.00	46.26	0.00	0.00	0.00	0.00	0.00	62.19		
433	HL253_18L0B	AA253	A	NT	HL	427.17	0.00	141.12	0.00	0.00	0.00	0.00	0.00	65.70		
434	HL253_33L05	AA253	A	NT	HL	262.68	0.00	62.26	0.00	0.00	0.00	0.00	0.00	54.03		
435	HL253_33L06	AA253	A	NT	HL	177.73	174.26	39.80	1.00	3.00	52.00	486.66	1154.68	61.22	8.90	5.21
436	HL253_37L09	AA253	A	NT	HL	332.07	11.69	107.71	1.00	2.00	9.00	10.66	21.18	70.59		
437	HL253_37L0B	AA253	A	NT	HL	252.76	59.88	85.52	1.00	2.00	21.00	162.05	159.25	69.22	7.50	5.18
438	HL253_37L10	AA253	A	NT	HL	352.90	0.00	86.25	0.00	0.00	0.00	0.00	0.00	57.28		
439	LH253_17L01	AA253	A	NT	LH	329.81	7.66	79.18	0.00	1.00	0.00	3.10	3.10	36.30		
440	LH253_18L03	AA253	A	NT	LH	174.51	0.00	84.29	0.00	0.00	0.00	0.00	0.00	42.80		
441	LH253_33L05	AA253	A	NT	LH	383.53	30.16	44.54	1.00	3.00	8.00	17.54	36.55	41.80	8.40	6.22
442	LH253_36L07	AA253	A	NT	LH	342.95		68.54	0.00	1.00	0.00	5.40	5.40	34.70		
443	LH253_37L0B	AA253	A	NT	LH	395.05	18.11	94.78	0.00	0.00	0.00	2.40	2.40	41.00		
444	LH253_37L10	AA253	A	NT	LH	298.65	76.08		1.00	9.00	34.00	46.42	214.24	39.40	7.69	5.53
445	LL253_17L01	AA253	A	NT	LL	270.89	9.38	41.34	0.00	1.00	0.00	6.80	6.80	61.09		
446	LL253_17L02	AA253	A	NT	LL	157.29	44.40	25.57	0.00	1.00	0.00	5.67	5.67	50.75		
447	LL253_17L11	AA253	A	NT	LL	223.20	5.30		0.00	1.00	0.00	4.30	4.30	54.59		
448	LL253_17L12	AA253	A	NT	LL	14.68	6.34		0.00	0.00	0.00	5.67	5.67	17.58		
449	LL253_32L10	AA253	A	NT	LL	174.17	24.72	62.27	1.00	1.00	8.00	44.91	44.91	50.98	8.81	5.13
450	LL253_33L05	AA253	A	NT	LL	211.55	18.44	23.86	1.00	1.00	1.00	7.58	7.58	53.27	8.04	4.99
451	LL253_33L06	AA253	A	NT	LL	251.94	8.97	44.42	0.00	1.00	0.00	2.50	2.50	51.98		
452	LL253_37L09	AA253	A	NT	LL				0.00	1.00	0.00	17.12	17.12	57.71		
453	LL253_37L10	AA253	A	NT	LL				0.00	1.00	0.00	23.10	23.10	68.27		

	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
421	HH253_17L01	18.76	5.12	2.00	4.00	4.18	778.80	0.19	0.02	6.45	2.80	4.84	6.66	3.62	3.78	2.80
422	HH253_18L03	14.61	3.45	7.00	0.00	3.48	741.26	0.21	0.58	5.83	5.61	4.86	6.61	5.75	7.11	3.80
423	HH253_18L0B	21.06	3.83	4.00	0.00	4.03	441.13	0.32		5.81		4.67	6.09			6.44
424	HH253_33L05	21.39	6.97	3.00	4.00	3.19	845.61	0.23	0.01	6.53	1.68	5.06	6.74	2.95	3.03	2.78
425	HH253_36L07	14.35	4.67	16.00	6.00	2.85	567.93	0.24	0.14	5.97	4.23	4.69	6.34	3.42	3.62	4.12
426	HH253_37L09	18.81	5.09	2.00	5.00	3.95	733.44	0.29	0.02	6.32	2.44	5.11	6.60	3.83	3.96	4.33
427	HH253_37L0B	17.55	4.89	3.00	4.00	3.74	551.50	0.23	0.03	6.07	2.92	4.63	6.31	4.52	4.58	3.16
428	HL253_17L01	29.72	8.51	9.00	3.00	2.47	337.19	0.26		5.59		4.26	5.82			8.74
429	HL253_17L02	29.16	7.38	4.00	4.00	1.46	239.15	0.11		5.38		3.14	5.48			11.32
430	HL253_17L0B	30.10	8.62	1.00	2.00	2.19	294.53	0.25		5.46		4.09	5.69			13.47
431	HL253_18L03	32.49	6.25	6.00	4.00	3.33	429.51	0.33		5.78		4.67	6.06			15.26
432	HL253_18L04	25.91	5.88	5.00	2.00	2.24	231.25	0.25		5.22		3.83	5.44			16.42
433	HL253_18L0B	26.59	8.05	3.00	0.00	3.63	568.29	0.33		6.06		4.95	6.34			7.94
434	HL253_33L05	25.85	7.32	6.00	1.00	2.96	324.94	0.24		5.57		4.13	5.78			8.73
435	HL253_33L06	26.86	6.88	5.00	0.00	2.56	391.79	0.11	0.80	5.18	5.16	3.68	5.97	6.19	7.05	16.56
436	HL253_37L09	36.63	9.11	9.00	3.00	2.84	451.47	0.31	0.03	5.81	2.46	4.68	6.11	2.37	3.05	11.79
437	HL253_37L0B	35.08	8.07	4.00	2.00	2.40	398.16	0.27	0.18	5.53	4.09	4.45	5.99	5.09	5.07	14.89
438	HL253_37L10	28.22	7.55	4.00	1.00	2.58	439.15	0.24		5.87		4.46	6.08			7.30
439	LH253_17L01	15.55	5.27	1.00	13.00	2.75	416.65	0.23	0.02	5.80	2.04	4.37	6.03	1.13	1.13	3.14
440	LH253_18L03	14.66	5.44	12.00	3.00	3.00	258.80	0.48		5.16		4.43	5.56			8.24
441	LH253_33L05	16.99	6.14	2.00	7.00	3.23	458.23	0.11	0.07	5.95	3.41	3.80	6.13	2.86	3.60	3.58
442	LH253_36L07	12.48	6.01	1.00	9.00	2.91	411.49	0.20		5.84		4.23	6.02	1.69	1.69	2.76
443	LH253_37L0B	14.56	6.74	1.00	5.00	3.20	507.94	0.23	0.04	5.98	2.90	4.55	6.23	0.88	0.88	3.34
444	LH253_37L10	14.05	4.72	1.00	8.00	3.08				5.70	4.33			3.84	5.37	4.08
445	LL253_17L01	25.59	10.36	6.00	3.00	1.84	321.61	0.15	0.03	5.60	2.24	3.72	5.77	1.92	1.92	10.82
446	LL253_17L02	26.98	7.02	1.00	1.00	1.56	227.26	0.13	0.24	5.06	3.79	3.24	5.43	1.74	1.74	12.86
447	LL253_17L11	25.80	7.63	4.00	1.00	1.97				5.41	1.67			1.46	1.46	10.49
448	LL253_17L12	7.07	3.90	1.00	1.00	1.05				2.69	1.85			1.74	1.74	16.54
449	LL253_32L10	33.75	10.36	2.00	2.00	3.02	261.16	0.31	0.10	5.16	3.21	4.13	5.57	3.80	3.80	11.72
450	LL253_33L05	34.47	11.10	2.00	5.00	1.89	253.85	0.10	0.08	5.35	2.91	3.17	5.54	2.03	2.03	10.53
451	LL253_33L06	24.15	8.91	4.00	5.00	1.78	305.33	0.17	0.03	5.53	2.19	3.79	5.72	0.92	0.92	8.42
452	LL253_37L09													2.84	2.84	
453	LL253_37L10													3.14	3.14	

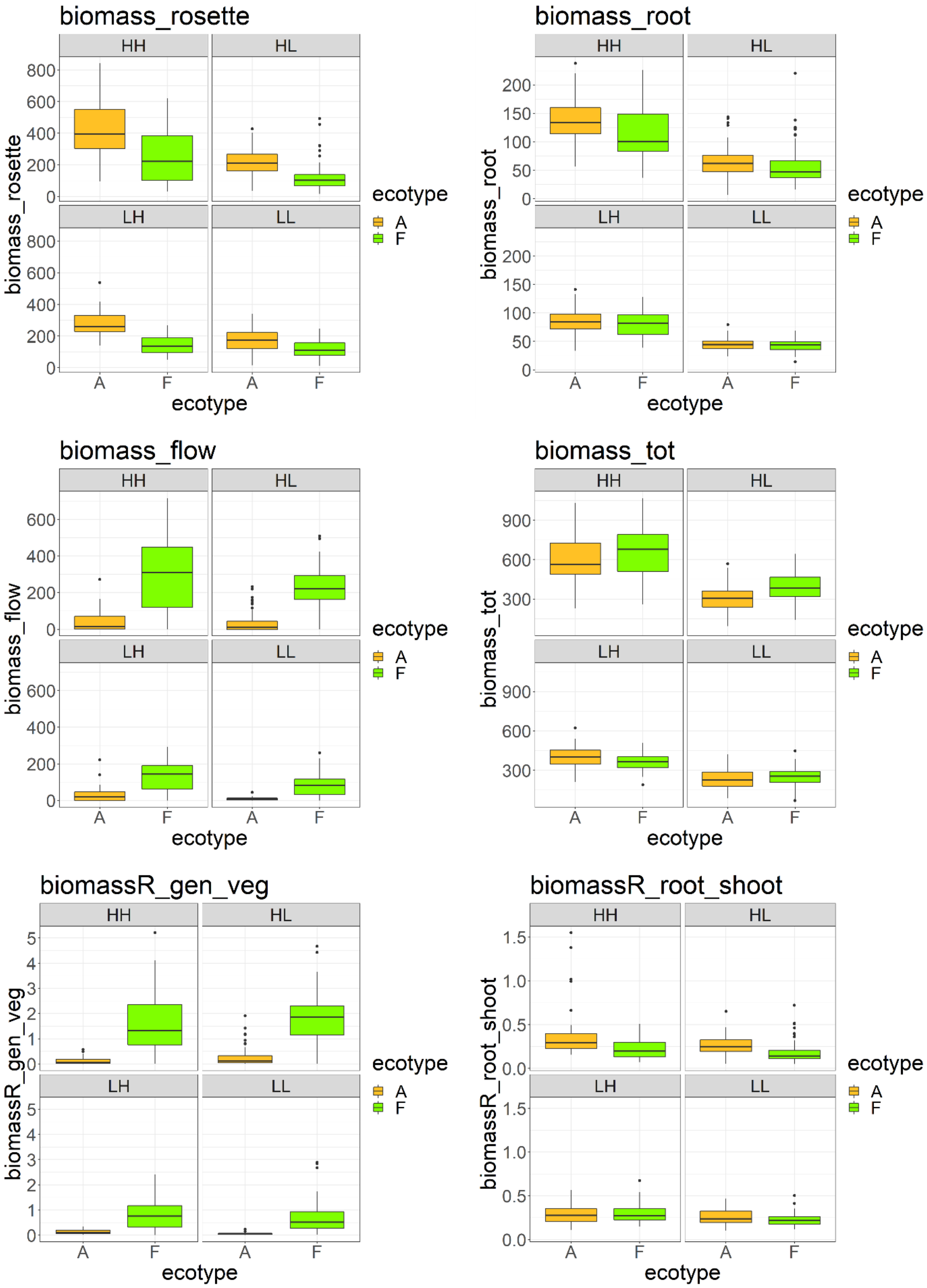
	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
454	HH254_01L02	AA254	A	NT	HH	450.89	133.76	99.53	1.00	3.00	92.00	279.71	593.12	42.41	7.93	5.34
455	HH254_01L0B	AA254	A	NT	HH	394.03	28.15	158.74	1.00	4.00	25.00	93.93	104.34	35.37	7.84	5.02
456	HH254_02L04	AA254	A	NT	HH		25.23	237.97	1.00	1.00	17.00	98.33	98.33	47.82	8.10	5.27
457	HH254_06G06	AA254	A	NT	HH	553.97	0.00	167.93	0.00	0.00	0.00	0.00	0.00	44.09		
458	HH254_06G0B	AA254	A	NT	HH	325.09	0.00	161.49	0.00	0.00	0.00	0.00	0.00	41.17		
459	HH254_07G07	AA254	A	NT	HH	810.81	0.00	220.43	0.00	0.00	0.00	0.00	0.00	49.57		
460	HH254_08G09	AA254	A	NT	HH	316.64	0.00	209.68	0.00	0.00	0.00	0.00	0.00	44.87		
461	HL254_01L01	AA254	A	NT	HL	100.26	92.26	47.89	1.00	4.00	54.00	238.09	355.34	44.38	8.53	5.22
462	HL254_01L02	AA254	A	NT	HL	198.28	97.35	60.76	1.00	7.00	63.00	203.80	453.96	41.83	6.58	4.03
463	HL254_02L03	AA254	A	NT	HL	193.76	18.78	46.87	1.00	4.00	17.00	39.25	43.28	56.37	7.62	5.02
464	HL254_02L04	AA254	A	NT	HL	131.97	232.99	32.06	1.00	7.00	126.00	352.19	1090.27	58.20	7.44	4.96
465	HL254_02L0B	AA254	A	NT	HL	132.52	219.88	51.78	1.00	10.00	157.00	200.79	1373.49	49.31	8.34	4.70
466	HL254_06G05	AA254	A	NT	HL	275.26	4.87	50.68	1.00	4.00	9.00	25.40	39.07	76.45	9.11	4.31
467	HL254_06G06	AA254	A	NT	HL	404.21	0.00	133.32	0.00	0.00	0.00	0.00	0.00	66.32		
468	HL254_06G0B	AA254	A	NT	HL	368.49	0.00	98.62	0.00	0.00	0.00	0.00	0.00	88.27		
469	HL254_07G07	AA254	A	NT	HL	280.82	1.40	63.58	0.00	1.00	0.00	3.40	3.40	68.79		
470	HL254_07G08	AA254	A	NT	HL	300.01	0.00	85.37	0.00	0.00	0.00	0.00	0.00	77.03	10.27	4.47
471	HL254_07G0B	AA254	A	NT	HL	301.44	0.00	58.50	0.00	0.00	0.00	0.00	0.00	73.63		
472	HL254_08G09	AA254	A	NT	HL	327.71	0.00	141.25	0.00	0.00	0.00	0.00	0.00	63.25		
473	HL254_08G10	AA254	A	NT	HL	361.81	0.00	143.85	0.00	0.00	0.00	0.00	0.00	73.16		
474	LH254_01L01	AA254	A	NT	LH	253.76	76.82	91.75	1.00	5.00	37.00	50.80	174.84	41.60	8.89	5.54
475	LH254_02L03	AA254	A	NT	LH	168.82	41.83	39.89	1.00	5.00	15.00	56.63	112.08	34.20	8.45	4.66
476	LH254_06G05	AA254	A	NT	LH	290.46	0.00	109.74	0.00	0.00	0.00	0.00	0.00	45.10		
477	LH254_07G07	AA254	A	NT	LH	539.09	0.00	83.77	0.00	0.00	0.00	0.00	0.00	43.20		
478	LH254_08G0B	AA254	A	NT	LH	338.94	0.00	132.70	0.00	0.00	0.00	0.00	0.00	52.80		
479	LH254_08G10	AA254	A	NT	LH	333.15	0.00	110.80	0.00	0.00	0.00	0.00	0.00	42.10		
480	LL254_01L02	AA254	A	NT	LL	146.40	8.39	63.40	0.00	1.00	0.00	5.10	5.10	51.39		
481	LL254_02L04	AA254	A	NT	LL	267.23	14.40	60.26	0.00	1.00	0.00	6.70	6.70	57.63		
482	LL254_06G05	AA254	A	NT	LL	258.64	4.03	46.62	0.00	1.00	0.00	9.10	9.10	58.85		
483	LL254_06G06	AA254	A	NT	LL	179.53	5.72	33.50	0.00	1.00	0.00	4.50	4.50	57.30		
484	LL254_06G07	AA254	A	NT	LL	136.12	10.01	39.47	0.00	1.00	0.00	3.60	3.60	47.02		
485	LL254_06G10	AA254	A	NT	LL	238.28	11.35	65.40	0.00	1.00	0.00	8.30	8.30	44.87		
486	LL254_06G11	AA254	A	NT	LL	142.07	1.78	45.64	0.00	1.00	0.00	6.70	6.70	58.49		
487	LL254_07G08	AA254	A	NT	LL				0.00	1.00	0.00	5.40	5.40	61.60		

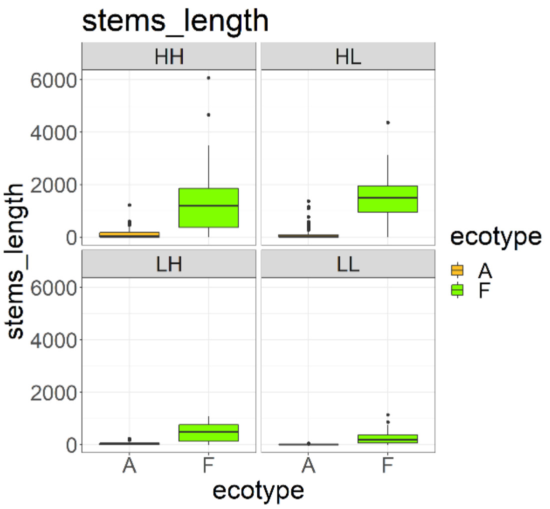
	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
454	HH254_01L02	18.64	4.94	1.00	4.00	3.27	684.18	0.17	0.24	6.11	4.90	4.60	6.53	5.63	6.39	3.13
455	HH254_01L0B	15.36	5.17	3.00	0.00	4.16	580.92	0.38	0.05	5.98	3.34	5.07	6.36	4.54	4.65	2.49
456	HH254_02L04	18.52	5.63	1.00							3.23	5.47		4.59	4.59	
457	HH254_06G06	19.14	5.55	1.00	0.00	4.13	721.90	0.30		6.32		5.12	6.58			2.76
458	HH254_06G0B	12.69	2.96	2.00	3.00	4.22	486.58	0.50		5.78		5.08	6.19			4.09
459	HH254_07G07	19.71	3.76	5.00	0.00	5.95	1031.24	0.27		6.70		5.40	6.94			2.38
460	HH254_08G09	20.54	5.83	4.00	1.00	4.63	526.32	0.66		5.76		5.35	6.27			4.99
461	HL254_01L01	20.14	5.36	1.00	0.00	2.25	240.41	0.25	0.62	4.61	4.52	3.87	5.48	5.47	5.87	15.43
462	HL254_01L02	18.96	5.76	1.00	2.00	2.46	356.39	0.21	0.38	5.29	4.58	4.11	5.88	5.32	6.12	6.93
463	HL254_02L03	24.81	6.29	1.00	3.00	2.41	259.41	0.22	0.08	5.27	2.93	3.85	5.56	3.67	3.77	12.88
464	HL254_02L04	21.70	5.36	3.00	0.00	2.45	397.02	0.09	1.42	4.88	5.45	3.47	5.98	5.86	6.99	20.16
465	HL254_02L0B	20.81	5.04	1.00	1.00	3.60	404.18	0.15	1.19	4.89	5.39	3.95	6.00	5.30	7.23	14.41
466	HL254_06G05	36.34	6.78	1.00	3.00	2.60	330.81	0.18	0.01	5.62	1.58	3.93	5.80	3.23	3.67	16.68
467	HL254_06G06	24.22	7.54	1.00	6.00	3.58	537.53	0.33		6.00		4.89	6.29			8.55
468	HL254_06G0B	36.11	9.45	1.00	5.00	3.46	467.11	0.27		5.91		4.59	6.15			16.61
469	HL254_07G07	36.09	7.63	5.00	3.00	2.70	345.80	0.23	0.00	5.64	0.34	4.15	5.85	1.22	1.22	13.24
470	HL254_07G08	42.57	8.30	6.00	4.00	2.80	385.38	0.28		5.70		4.45	5.95			15.54
471	HL254_07G0B				1.00	3.35	359.94	0.19		5.71		4.07	5.89			14.12
472	HL254_08G09	21.07	7.86	9.00	6.00	3.50	468.96	0.43		5.79		4.95	6.15			9.59
473	HL254_08G10	33.32	8.83	4.00	4.00	3.26	505.66	0.40		5.89		4.97	6.23			11.62
474	LH254_01L01	16.26	6.19	1.00	3.00	3.59	422.33	0.28	0.22	5.54	4.34	4.52	6.05	3.93	5.16	5.36
475	LH254_02L03	16.59	4.15	1.00	4.00	2.63	250.54	0.19	0.20	5.13	3.73	3.69	5.52	4.04	4.72	5.44
476	LH254_06G05	17.28	4.37	2.00	13.00	3.35	400.20	0.38		5.67		4.70	5.99			5.50
477	LH254_07G07	16.09	4.81	5.00	3.00	3.74	622.86	0.16		6.29		4.43	6.43			2.72
478	LH254_08G0B	23.25	7.83	6.00	9.00	4.18	471.64	0.39		5.83		4.89	6.16			6.46
479	LH254_08G10	19.69	6.38	5.00	5.00	4.34	443.95	0.33		5.81		4.71	6.10			4.18
480	LL254_01L02	24.18	7.56	8.00	5.00	1.58	218.19	0.41	0.04	4.99	2.13	4.15	5.39	1.63	1.63	14.17
481	LL254_02L04	30.51	10.06	2.00	3.00	3.35	341.89	0.21	0.04	5.59	2.67	4.10	5.83	1.90	1.90	9.76
482	LL254_06G05	26.34	6.55	4.00	4.00	2.80	309.29	0.18	0.01	5.56	1.39	3.84	5.73	2.21	2.21	10.52
483	LL254_06G06	29.04	8.33	1.00	3.00	2.36	218.75	0.18	0.03	5.19	1.74	3.51	5.39	1.50	1.50	14.36
484	LL254_06G07	28.95	10.12	1.00	4.00	2.34	185.60	0.27	0.06	4.91	2.30	3.68	5.22	1.28	1.28	12.76
485	LL254_06G10	22.71	9.20	3.00	2.00	2.79	315.03	0.26	0.04	5.47	2.43	4.18	5.75	2.12	2.12	6.64
486	LL254_06G11	30.13	6.60	1.00	1.00	2.44	189.49	0.32	0.01	4.96	0.58	3.82	5.24	1.90	1.90	18.91
487	LL254_07G08													1.69	1.69	

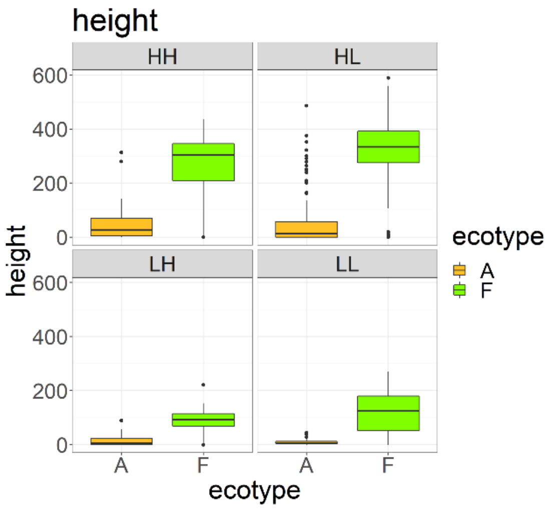
	ID	pop	ecotype	region	treatment	biomass_rosette	biomass_flow	biomass_root	flowering01	n_stems	n_flowers	height	stems_length	diameter	PL	PW
488	HH255_02L02	AA255	F	NT	HH	131.21	417.37	38.88	1.00	10.00	258.00	283.74	1929.60	35.62	7.37	3.55
489	HH255_03L04	AA255	F	NT	HH	472.61	143.69	175.05	1.00	2.00	51.00	208.06	373.71	42.90	7.17	4.41
490	HH255_03L0B	AA255	F	NT	HH	612.10	150.95		1.00	3.00	72.00	318.03	511.86	46.00	8.93	3.89
491	HH255_04L05	AA255	F	NT	HH	276.48	372.85	115.54	1.00	8.00	196.00	358.39	1818.65	42.39	8.85	4.10
492	HH255_06L07	AA255	F	NT	HH	263.78	400.18	83.07	1.00	6.00	142.00	434.21	1856.69	37.71	8.09	4.08
493	HH255_12L0B	AA255	F	NT	HH	260.52	366.78		1.00	10.00	229.00	337.99	1823.99	41.29	6.78	4.00
494	HH255_12L10	AA255	F	NT	HH	102.25	492.99	77.70	1.00	6.00	209.00	376.57	3456.02	32.33	7.38	4.84
495	HL255_02L01	AA255	F	NT	HL	119.45	369.12	49.35	1.00	5.00	198.00	406.54	2504.59	67.11	7.04	3.45
496	HL255_02L02	AA255	F	NT	HL	98.31	314.21	46.81	1.00	8.00	166.00	451.94	2540.35	63.10	7.37	3.46
497	HL255_02L0B	AA255	F	NT	HL	122.60	304.84	40.06	1.00	11.00	213.00	379.90	3129.85	58.25	8.25	3.69
498	HL255_03L03	AA255	F	NT	HL	141.08	255.33	40.41	1.00	4.00	137.00	545.01	1679.50	54.53	7.82	3.63
499	HL255_03L04	AA255	F	NT	HL	144.47	311.06	91.73	1.00	5.00	188.00	327.59	2622.85	72.88	8.14	3.86
500	HL255_04L05	AA255	F	NT	HL	134.09	348.75	46.70	1.00	6.00	178.00	354.13	2371.34	52.93	7.80	3.97
501	HL255_04L06	AA255	F	NT	HL	122.67	280.18	49.64	1.00	7.00	168.00	380.93	1801.93	48.60	8.75	4.36
502	HL255_04L0B	AA255	F	NT	HL	322.19	128.70	41.73	1.00	3.00	55.00	292.09	948.21	52.42	7.91	3.73
503	HL255_06L07	AA255	F	NT	HL	96.33	217.56	49.38	1.00	5.00	111.00	386.67	1509.63	51.49	8.97	4.03
504	HL255_06L08	AA255	F	NT	HL	120.43	174.05	30.32	1.00	3.00	92.00	321.58	1022.78	49.23	6.14	3.96
505	HL255_12L09	AA255	F	NT	HL	102.54	166.49	52.90	1.00	6.00	84.00	321.82	1129.03	41.66	7.47	3.06
506	HL255_12L0B	AA255	F	NT	HL	102.34	85.33	20.48	1.00	1.00	37.00	201.29	366.77	47.18	5.32	2.51
507	HL255_12L10	AA255	F	NT	HL	115.24	222.83	38.44	1.00	6.00	127.00	383.02	1029.23	57.26	7.35	3.76
508	LH255_02L01	AA255	F	NT	LH	158.85	193.25	107.75	1.00	8.00	69.00	125.68	634.90	38.60	8.10	3.82
509	LH255_03L03	AA255	F	NT	LH	134.89	240.05	83.07	1.00	9.00	84.00	152.98	834.34	40.40	7.92	4.01
510	LH255_03L0B	AA255	F	NT	LH	94.41	144.60	81.11	1.00	8.00	53.00	102.84	505.47	52.60	7.34	3.59
511	LH255_04L06	AA255	F	NT	LH	91.64	206.31	82.21	1.00	5.00	77.00	130.85	781.85	40.40	8.34	4.53
512	LH255_12L09	AA255	F	NT	LH	54.98	140.59		1.00	7.00	56.00	98.31	355.16	26.90	6.95	3.82
513	LH255_12L10	AA255	F	NT	LH	189.67	0.00	127.79	0.00	0.00	0.00	0.00	0.00	39.20		
514	LL255_02L01	AA255	F	NT	LL	136.94	261.02	50.10	1.00	5.00	51.00	196.40	1137.85	67.19	9.58	4.37
515	LL255_02L02	AA255	F	NT	LL	189.47	144.46	51.73	1.00	3.00	35.00	214.37	485.37	62.88	9.15	3.64
516	LL255_02L13	AA255	F	NT	LL	147.67	103.53	40.60	1.00	6.00	27.00	163.85	395.80	50.57	8.79	4.64
517	LL255_03L03	AA255	F	NT	LL	125.22	146.49	32.64	1.00	6.00	29.00	222.87	580.65	66.44	8.25	4.00
518	LL255_03L04	AA255	F	NT	LL	93.88	107.02	48.62	1.00	2.00	33.00	248.54	454.61	55.46	8.42	4.34
519	LL255_04L05	AA255	F	NT	LL	110.55	54.08	46.92	1.00	1.00	13.00	170.44	170.44	49.46	8.90	4.66
520	LL255_04L06	AA255	F	NT	LL	122.94	38.10	35.52	1.00	1.00	11.00	126.43	126.43	58.46	8.71	3.97
521	LL255_06L07	AA255	F	NT	LL	128.12	95.60	54.40	1.00	4.00	20.00	191.49	191.49	56.20	9.34	3.96
522	LL255_06L08	AA255	F	NT	LL	174.72	29.37	63.89	0.00	2.00	0.00	44.39	46.80	69.65		
523	LL255_06L11	AA255	F	NT	LL	154.49	56.78	43.29	1.00	2.00	17.00	144.16	149.25	48.80	8.98	4.95
524	LL255_12L10	AA255	F	NT	LL	110.35	60.81	54.35	1.00	2.00	15.00	110.75	107.28	61.64	8.87	4.70

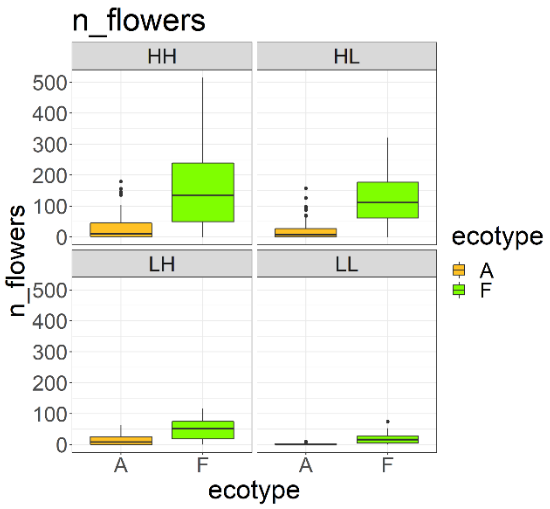
	ID	RLL	RLW	RNLP	n_rosette_buds	root_diam	biomass_tot	biomassR_root_shoot	biomassR_gen_veg	biomass_rosette_log	biomass_flow_log	biomass_root_log	biomass_tot_log	height_log	stems_length_log	SLA
488	HH255_02L02	12.59	5.10	8.00	1.00	3.22	587.46	0.07	2.45	4.88	6.03	3.66	6.38	5.65	7.57	7.60
489	HH255_03L04	16.35	4.61	5.00	0.00		791.35	0.28	0.22	6.16	4.97	5.17	6.67	5.34	5.92	3.06
490	HH255_03L0B	23.07	6.23	5.00	1.00	5.42				6.42	5.02			5.76	6.24	2.71
491	HH255_04L05	16.00	4.49	7.00	1.00	3.39	764.87	0.18	0.95	5.62	5.92	4.75	6.64	5.88	7.51	5.10
492	HH255_06L07	17.08	6.65	4.00	0.00	4.06	747.03	0.13	1.15	5.58	5.99	4.42	6.62	6.07	7.53	4.23
493	HH255_12L0B	15.57	2.99	3.00	2.00	3.73				5.56	5.90			5.82	7.51	5.14
494	HH255_12L10	18.55	5.17	8.00	0.00	3.14	672.94	0.13	2.74	4.63	6.20	4.35	6.51	5.93	8.15	8.03
495	HL255_02L01	19.76	7.76	6.00	1.00	2.70	537.92	0.10	2.19	4.78	5.91	3.90	6.29	6.01	7.83	29.62
496	HL255_02L02	32.44	8.45	2.00	0.00	2.17	459.33	0.11	2.17	4.59	5.75	3.85	6.13	6.11	7.84	31.81
497	HL255_02L0B	29.51	8.28	3.00	0.00	2.71	467.50	0.09	1.87	4.81	5.72	3.69	6.15	5.94	8.05	21.73
498	HL255_03L03	29.32	8.37	6.00	0.00	2.71	436.82	0.10	1.41	4.95	5.54	3.70	6.08	6.30	7.43	16.55
499	HL255_03L04	41.55	10.40	8.00	0.00	2.79	547.26	0.20	1.32	4.97	5.74	4.52	6.30	5.79	7.87	28.87
500	HL255_04L05	21.49	7.09	4.00	0.00	3.02	529.54	0.10	1.93	4.90	5.85	3.84	6.27	5.87	7.77	16.41
501	HL255_04L06	24.42	11.47	6.00	0.00	2.78	452.49	0.12	1.63	4.81	5.64	3.90	6.11	5.94	7.50	15.12
502	HL255_04L0B	28.60	8.48	4.00	0.00	2.84	492.62	0.09	0.35	5.78	4.86	3.73	6.20	5.68	6.85	6.70
503	HL255_06L07	27.99	10.55	3.00	0.00	2.09	363.27	0.16	1.49	4.57	5.38	3.90	5.90	5.96	7.32	21.62
504	HL255_06L08	24.46	7.17	8.00	0.00	2.17	324.80	0.10	1.15	4.79	5.16	3.41	5.78	5.77	6.93	15.80
505	HL255_12L09	20.53	6.57	3.00	0.00	2.55	321.93	0.20	1.07	4.63	5.11	3.97	5.77	5.77	7.03	13.29
506	HL255_12L0B	28.05	6.53	3.00	0.00	1.60	208.15	0.11	0.69	4.63	4.45	3.02	5.34	5.30	5.90	17.08
507	HL255_12L10	24.52	7.53	2.00	0.00	2.51	376.51	0.11	1.45	4.75	5.41	3.65	5.93	5.95	6.94	22.35
508	LH255_02L01	16.72	4.54	5.00	2.00	3.46	459.85	0.31	0.72	5.07	5.26	4.68	6.13	4.83	6.45	7.37
509	LH255_03L03	19.49	5.33	7.00	0.00	3.90	458.01	0.22	1.10	4.90	5.48	4.42	6.13	5.03	6.73	9.50
510	LH255_03L0B	21.78	6.35	7.00	3.00	4.12	320.12	0.34	0.82	4.55	4.97	4.40	5.77	4.63	6.23	23.02
511	LH255_04L06	19.40	4.11	7.00	3.00	3.18	380.16	0.28	1.19	4.52	5.33	4.41	5.94	4.87	6.66	13.99
512	LH255_12L09	10.89	4.66	3.00	1.00	4.04				4.01	4.95			4.59	5.87	10.34
513	LH255_12L10	13.95	5.35	3.00	1.00	3.66	317.46	0.67		5.25		4.85	5.76			6.36
514	LL255_02L01	29.53	7.39	4.00	2.00	3.11	448.06	0.13	1.40	4.92	5.56	3.91	6.10	5.28	7.04	25.89
515	LL255_02L02	30.06	8.80	7.00	3.00	2.86	385.66	0.15	0.60	5.24	4.97	3.95	5.95	5.37	6.18	16.39
516	LL255_02L13	28.30	10.53	1.00	1.00	2.55	291.80	0.16	0.55	4.99	4.64	3.70	5.68	5.10	5.98	13.60
517	LL255_03L03	35.20	10.93	4.00	1.00	2.54	304.35	0.12	0.93	4.83	4.99	3.49	5.72	5.41	6.36	27.68
518	LL255_03L04	28.64	7.07	4.00	5.00	2.55	249.52	0.24	0.75	4.54	4.67	3.88	5.52	5.52	6.12	25.73
519	LL255_04L05	26.71	10.17	3.00	3.00	2.66	211.55	0.29	0.34	4.71	3.99	3.85	5.35	5.14	5.14	17.38
520	LL255_04L06	34.97	15.23	2.00	2.00	2.55	196.56	0.22	0.24	4.81	3.64	3.57	5.28	4.84	4.84	21.84
521	LL255_06L07	39.02	11.47	3.00	2.00	2.80	278.12	0.24	0.52	4.85	4.56	4.00	5.63	5.25	5.25	19.36
522	LL255_06L08	31.89	13.21	2.00	4.00	3.59	267.98	0.31	0.12	5.16	3.38	4.16	5.59	3.79	3.85	21.80
523	LL255_06L11	28.29	10.21	1.00	2.00	2.36	254.56	0.20	0.29	5.04	4.04	3.77	5.54	4.97	5.01	12.11
524	LL255_12L10	27.33	7.82	6.00	3.00	2.97	225.51	0.32	0.37	4.70	4.11	4.00	5.42	4.71	4.68	27.04

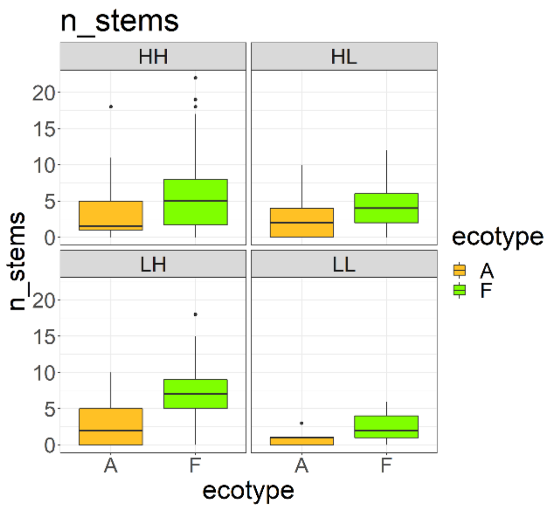
Supplement 3 Comparison of alpine and foothill plants in each treatment.

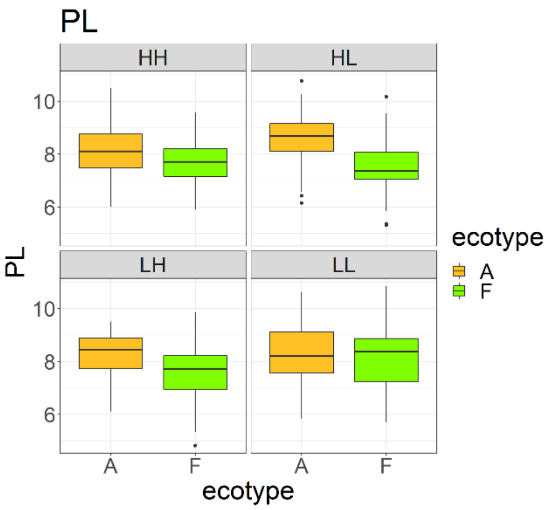


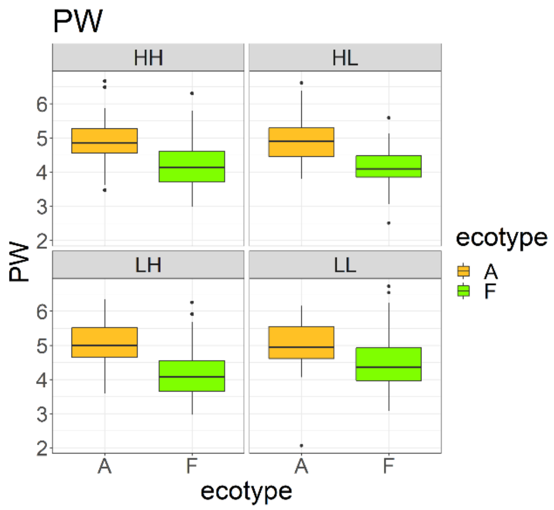

stems_length
HH
HL
LH
LL
stems_length
6000
4000
2000
0
A
F
ecotype
ecotype
A
F

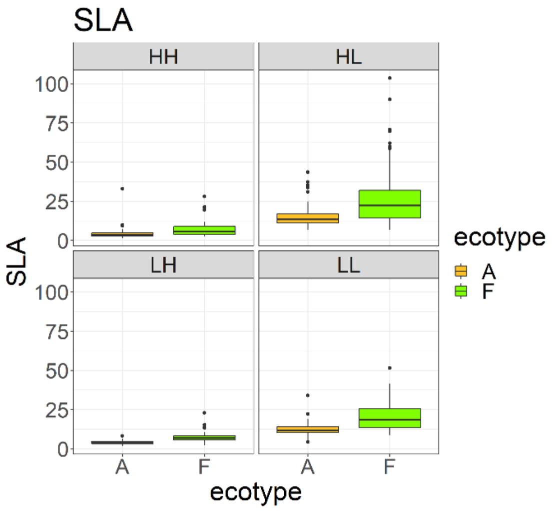

height
HH
HL
LH
LL
height
600
400
200
0
A
F
ecotype
ecotype
A
F

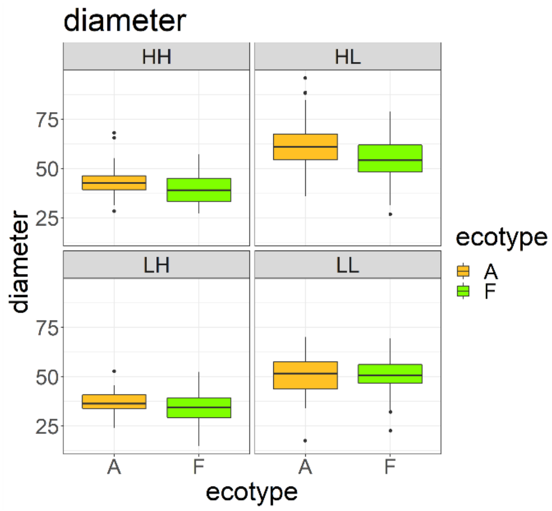

n_flowers
HH
HL
LH
LL
n_flowers
500
400
300
200
100
0
A
F
ecotype
ecotype
A
F

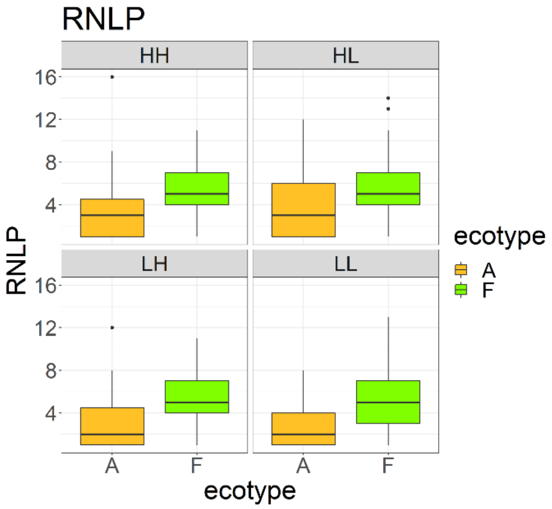

n_stems
HH
HL
LH
LL
n_stems
20
15
10
5
0
A
F
ecotype
ecotype
A
F

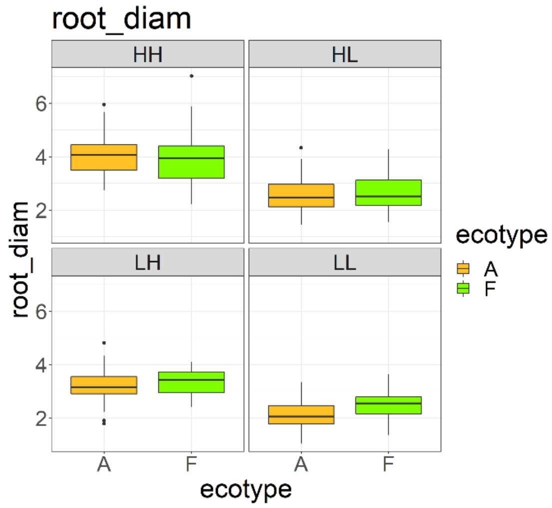

PL
HH
HL
LH
LL
PL
10
8
6
A
F
ecotype
ecotype
A
F

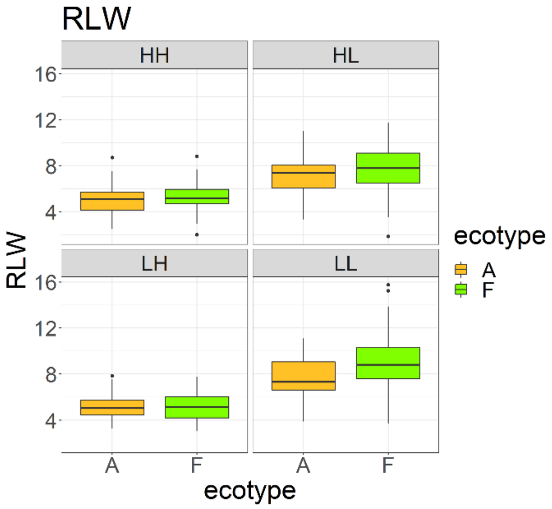

PW
HH
HL
LH
LL
PW
6
5
4
3
2
A
F
ecotype
ecotype
A
F

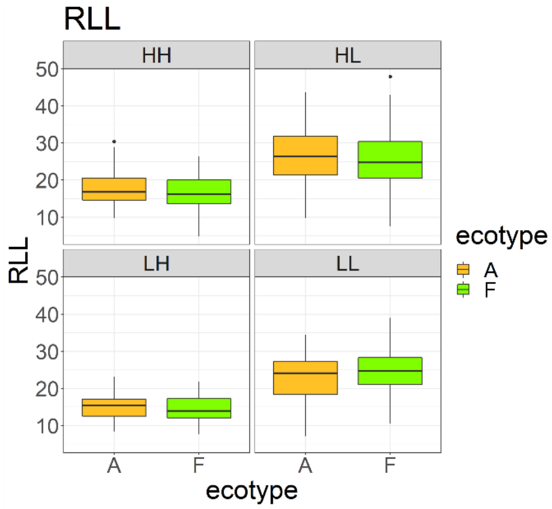

SLA
HH
HL
LH
LL
100
75
50
25
0
SLA
ecotype
A
F
A
F
A
F
ecotype

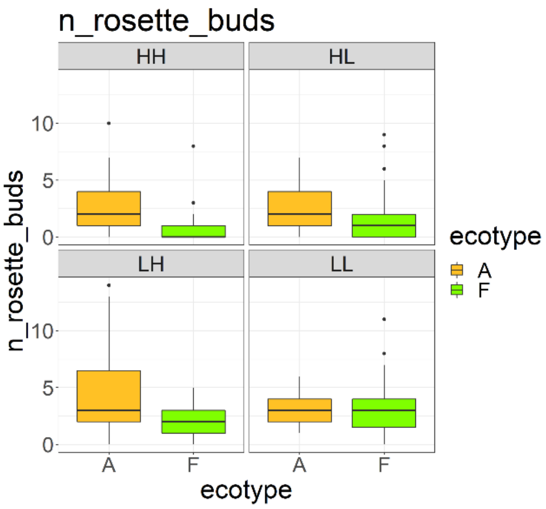

diameter
HH
HL
LH
LL
75
50
25
diameter
ecotype
A
F
A
F
A
F
ecotype


RNLP
HH
HL
LH
LL
16
12
8
4
RNLP
ecotype
A
F
A
F
A
F
ecotype

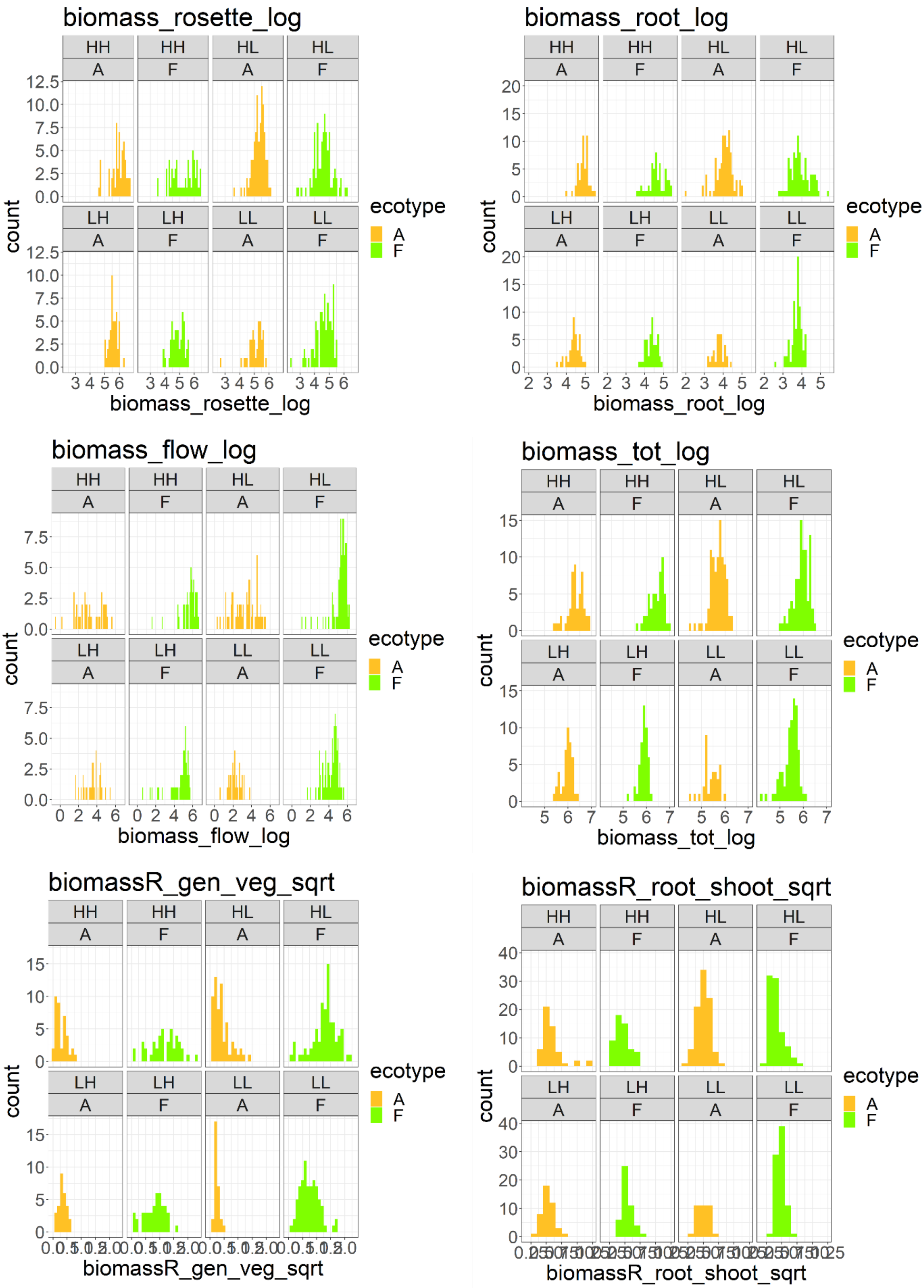

root_diam
HH
HL
LH
LL
6
4
2
root_diam
ecotype
A
F
A
F
A
F
ecotype

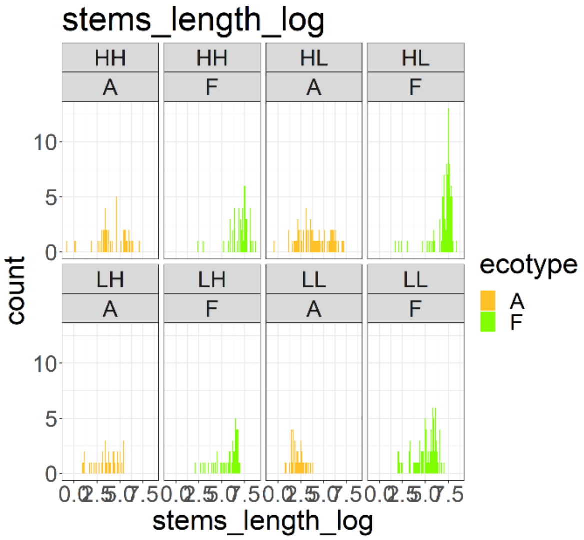

RLW
HH
HL
LH
LL
16
12
8
4
RLW
ecotype
A
F
A
F
A
F
ecotype

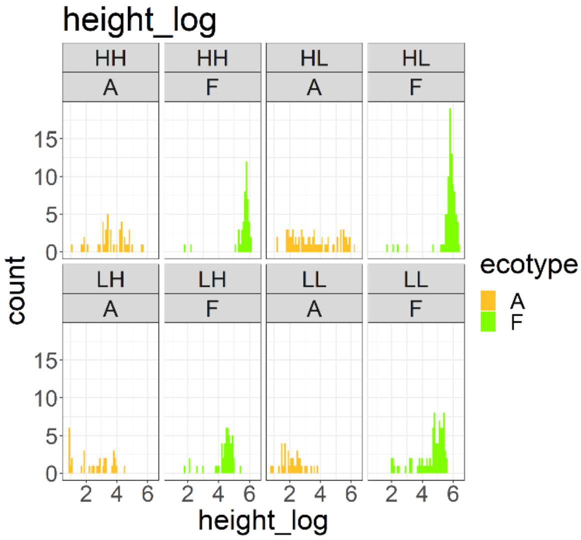

RLL
HH
HL
LH
LL
50
40
30
20
10
RLL
ecotype
A
F
A
F
A
F
ecotype

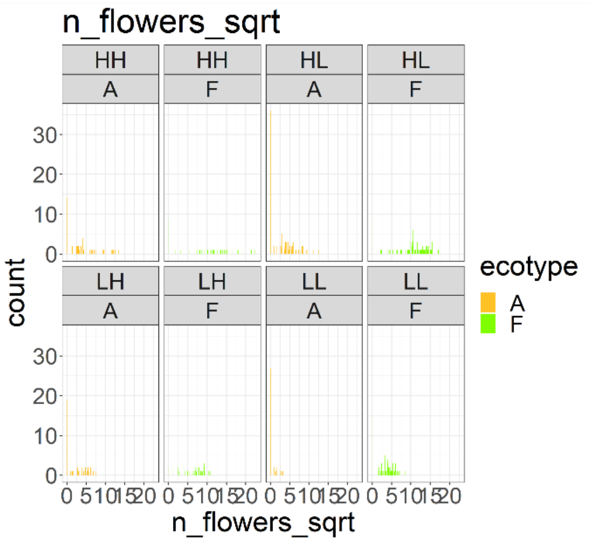

n_rosette_buds
HH
HL
LH
LL
10
5
0
10
5
0
n_rosette_buds
A
F
A
F
ecotype
ecotype
A
F

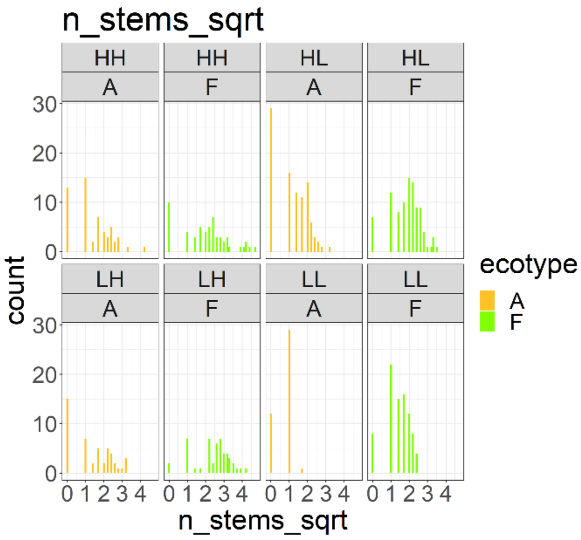
Supplement 4 Distributions of continuous variables from the dataset.

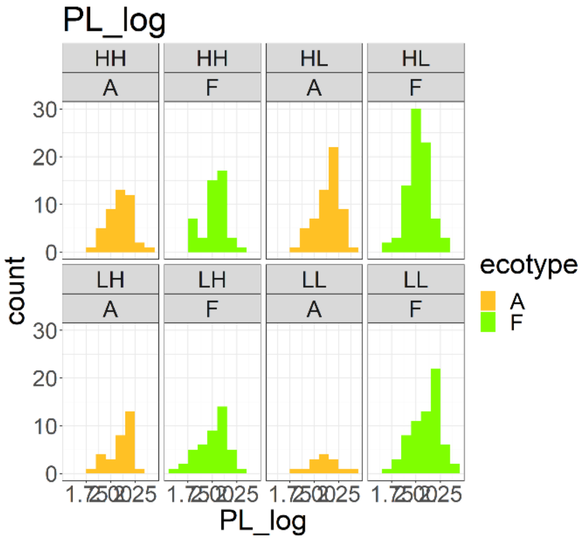


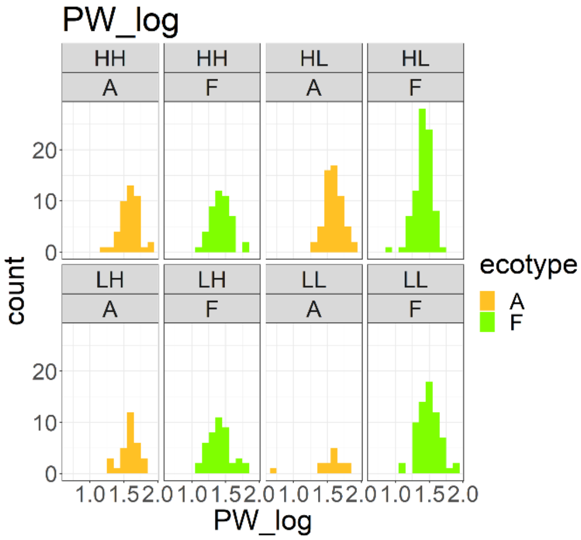

stems_length_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
10
5
0
0.02.55.07.5
stems_length_log
ecotype
A
F

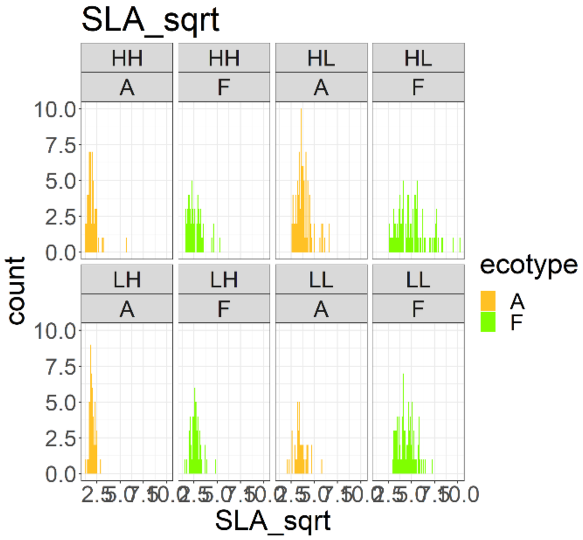

height_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
15
10
5
0
2 4 6
height_log
ecotype
A
F

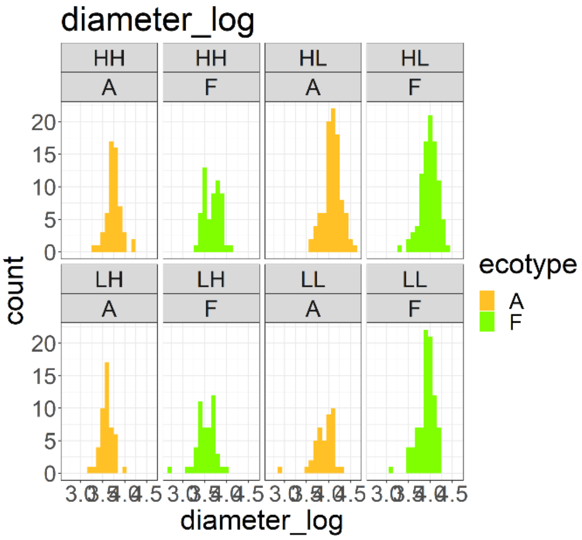

n_flowers_sqrt
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
30
20
10
0
0 5 10 15 20
n_flowers_sqrt
ecotype
A
F

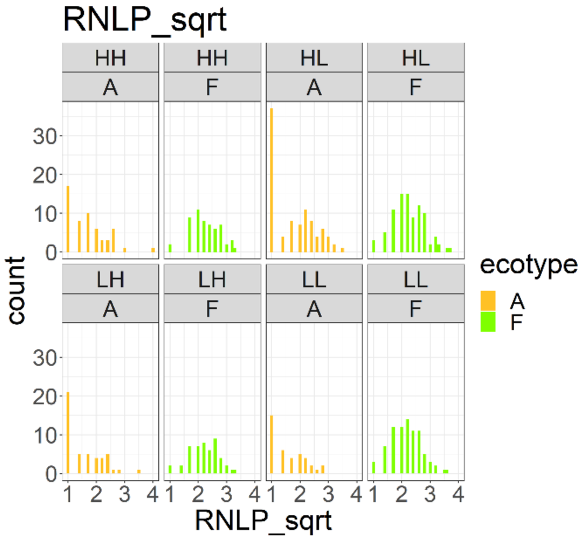

n_stems_sqrt
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
30
20
10
0
0 1 2 3 4
n_stems_sqrt
ecotype
A
F

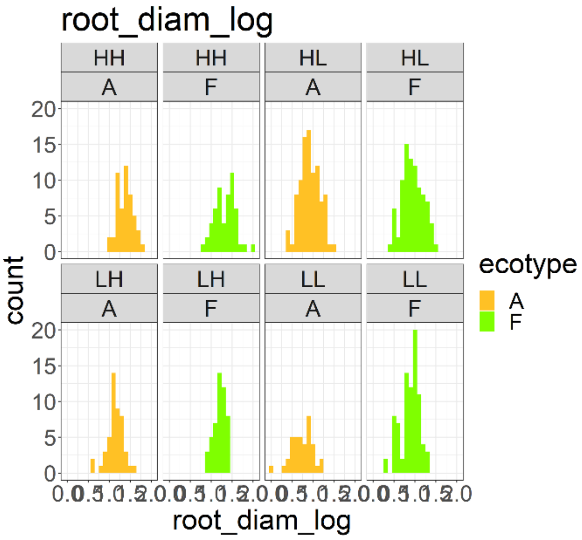

PL_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
30
20
10
0
1.752.002.25
PL_log
ecotype
A
F

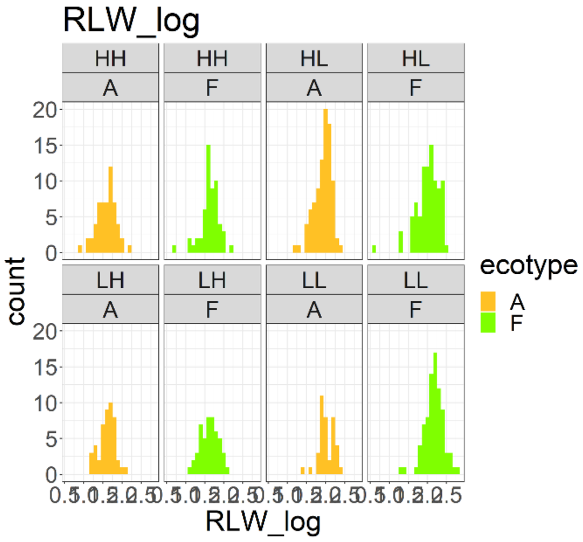

PW_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
20
10
0
1.0 1.5 2.0
PW_log
ecotype
A
F

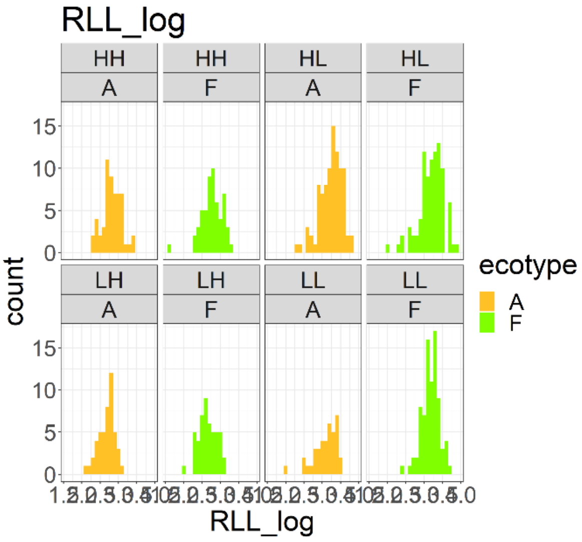

SLA_sqrt
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0.0
2.5
5.0
7.5
10.0
SLA_sqrt
2.5 5.0 7.5 10.0
ecotype
A
F

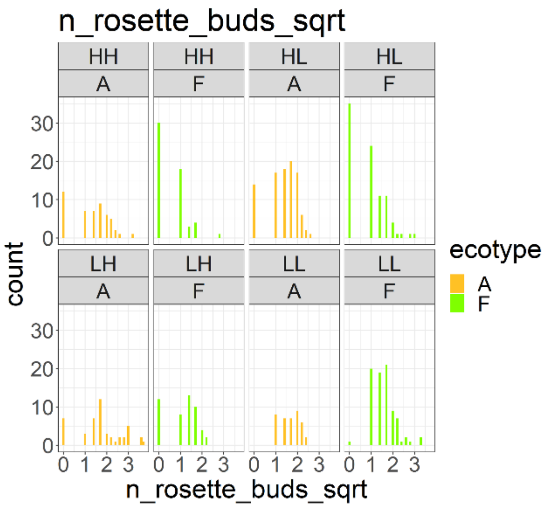

diameter_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
5
10
15
20
diameter_log
3.0 3.5 4.0 4.5
ecotype
A
F


RNLP_sqrt
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
10
20
30
RNLP_sqrt
1 2 3 4
ecotype
A
F


root_diam_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
5
10
15
20
root_diam_log
0.0 0.5 1.0 1.5 2.0
ecotype
A
F


RLW_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
5
10
15
20
RLW_log
0.5 1.0 1.5 2.0 2.5
ecotype
A
F


RLL_log
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
5
10
15
RLL_log
1.5 2.0 2.5 3.0 3.5 4.0
ecotype
A
F


n_rosette_buds_sqrt
HH A
HH F
HL A
HL F
LH A
LH F
LL A
LL F
count
0
10
20
30
0 1 2 3
n_rosette_buds_sqrt
ecotype
A
F

Supplement 5 Stan model.

```
data {

  // level-1
  int<lower=1> Ni;
  // the number of observations - plants

  // not used level
  // int<lower=1> Nj;
  // the number of groups - populations

  // level-2
  int<lower=1> Nk;
  // the number of groups - regions

  // level-3
  int<lower=1> Ne;
  // number of ecotypes

  // population code for individuals
  int<lower=1> pop_i[Ni];

  // region code for individuals
  int<lower=1> reg_i[Ni];

  // ecotype code for individuals
  int<lower=1> ecotype_i[Ni];

  // not used region code for populations
  // int<lower=1> reg_pop[Nj];
  // not used ecotype codes for populations
  // int<lower=1> ecotype_pop[Nj];

  // outcome - trait values
  real Y[Ni];

  // predictor - treatment
  int<lower=1> X[Ni];

  // maximal trait value
  real<lower=0> Ymax;

  // nuber of treatments
  int<lower=1> Nt;

}
```

```
parameters {

  // intercept of regression line = beta_0,
  // slope of regression line = beta_1
  // separate for alpine (A) and foothill (F) ecotypes
  real <lower=-Ymax, upper =3*Ymax> beta_0e [Ne];
  real beta_1e [Ne];

  // standard deviation of the individual observations - level 1 errors
  real<lower=0> sigma_i;

  // deviation from intercept at different levels

  // not used deviation between the populations within a region
  // real dev_j0[Nj];
  // real dev_j1[Nj];

  //deviation between the regions
  real dev_k0[Nk, Ne];
  real dev_k1[Nk, Ne];

  // the standard deviation for the deviations

  // not used deviation for populations
  // real<lower=0> sigma_j;

  // deviation for regions
  real<lower=0> sigma_k;

}
```

```
transformed parameters {

  // matrices - parameter for each region, separate for ecotypes
  real beta_0k [Nk, Ne];
  real beta_1k [Nk, Ne];

  // not used vectors - parameter for each population
  // real beta_0j [Nj];
  // real beta_1j [Nj];

  // individual mean
  real mu[Ni];

  // caculating the varying intercept and slope at the region level
  // divided by ecotype

    for(k in 1:Nk){
      beta_0k[k, 1] = beta_0e [1] + dev_k0[k, 1];
      beta_0k[k, 2] = beta_0e [2] + dev_k0[k, 2];

      beta_1k[k, 1] = beta_1e [1] + dev_k1[k, 1];
      beta_1k[k, 2] = beta_1e [2] + dev_k1[k, 2];
    }

  // not used varying intercept at the population within region level
  // for(j in 1:Nj){
    // beta_0j[j] = beta_0k[reg_pop[j], ecotype_pop[j]] + dev_j0[j];
    // beta_1j[j] = beta_1k[reg_pop[j], ecotype_pop[j]] + dev_j1[j];
    // }

  // formula for getting ndividual mean based on region x ecotype

    for(i in 1:Ni){

      mu[i] = beta_0k[reg_i[i], ecotype_i[i]] + beta_1k[reg_i[i], ecotype_i[i]
]*X[i];

    }

  // not used formula for getting ndividual mean based on population identity
    // for(i in 1:Ni){
    // mu[i] = beta_0j[pop_i[i]] + beta_1j[pop_i[i]]*X[i];
    // }

}
```

```
model {

  // non used deviation for beta_0 populations
  // dev_j0 ~ normal(0, sigma_j0);

  //deviation for beta_0 regions x ecotype
  dev_k0[1] ~ normal(0, sigma_k);
  dev_k0[2] ~ normal(0, sigma_k);

  // non used deviation for beta_1  populations
  // dev_j1 ~ normal(0, sigma_j1);

  //deviation for beta_1 regions x ecotype
  dev_k1[1] ~ normal(0, sigma_k);
  dev_k1[2] ~ normal(0, sigma_k);

  // outcome model

    for (i in 1:Ni) {
    Y[i] ~ gamma((mu[i]^2)/(sigma_i), (mu[i])/(sigma_i));
    }

}
```

```
generated quantities {

  // 1. difference between alpine and foothill plants
  real delta_0e;
  real delta_1e;

  // 2. difference between alpine and foothill plants within each region
  real delta_0k [Nk];
  real delta_1k [Nk];

  // 3. generated trait value for apine and foothill plants
  // [1] - first treatment
  // [2] - second treatment
  real trait_value_A [Ne];
  real trait_value_F [Ne];

  real trait_value_Ak [Nk, Nt];
  real trait_value_Fk [Nk, Nt];

  // 1.
  delta_0e = beta_0e [1] - beta_0e [2];
  delta_1e = beta_1e [1] - beta_1e [2];

  // 2.
    for(k in 1:Nk){
     delta_0k[k] = beta_0k[k, 1] -  beta_0k[k, 2];
     delta_1k[k] = beta_1k[k, 1] -  beta_1k[k, 2];
  }

  // 3.
  trait_value_A [1] = beta_0e[1] +  beta_1e[1]*1;
  trait_value_A [2] = beta_0e[1] +  beta_1e[1]*2;

  trait_value_F [1] = beta_0e[2] +  beta_1e[2]*1;
  trait_value_F [2] = beta_0e[2] +  beta_1e[2]*2;

  for(k in 1:Nk){
     trait_value_Ak[k, 1] =  beta_0k[k, 1] +  beta_1k[k, 1]*1;
     trait_value_Ak[k, 2] =  beta_0k[k, 1] +  beta_1k[k, 1]*2;

     trait_value_Fk[k, 1] =  beta_0k[k, 2] +  beta_1k[k, 2]*1;
     trait_value_Fk[k, 2] =  beta_0k[k, 2] +  beta_1k[k, 2]*2;
  }


}
```

Supplement 6 Data pre-processing for stan model.

```
###### load data ##############################################################

APtableFinal <- read.csv("adapt_plast_table_21jul.csv")

APtableFinal <- APtable %>%
  mutate(across(
    c(
      ID,
      pop,
      ecotype,
      mountain_range,
      ploidy,
      region,
      region_ecotype,
      locality,
      lineage,
      treatment,
      temp,
      irr,
      flowering01
    ),
    ~ as.factor(.)
  )
  )

###### overall list of tables - grouped for analysis #########################

levels_treatment <- levels(APtableFinal$treatment) %>%
  combn(., 2) %>%
  t() %>%
  as.data.frame() %>%
  rename(trt1 = V1,
         trt2 = V2) %>%
  mutate(combT = c(5, 3, 2, 1, 4, 6)) %>%
  arrange(combT)

listTablesStan00 <-
  map2(
    levels_treatment$trt1,
    levels_treatment$trt2,
    ~ filter(APtableFinal,
             treatment == .x | treatment == .y)
  )

# names
```

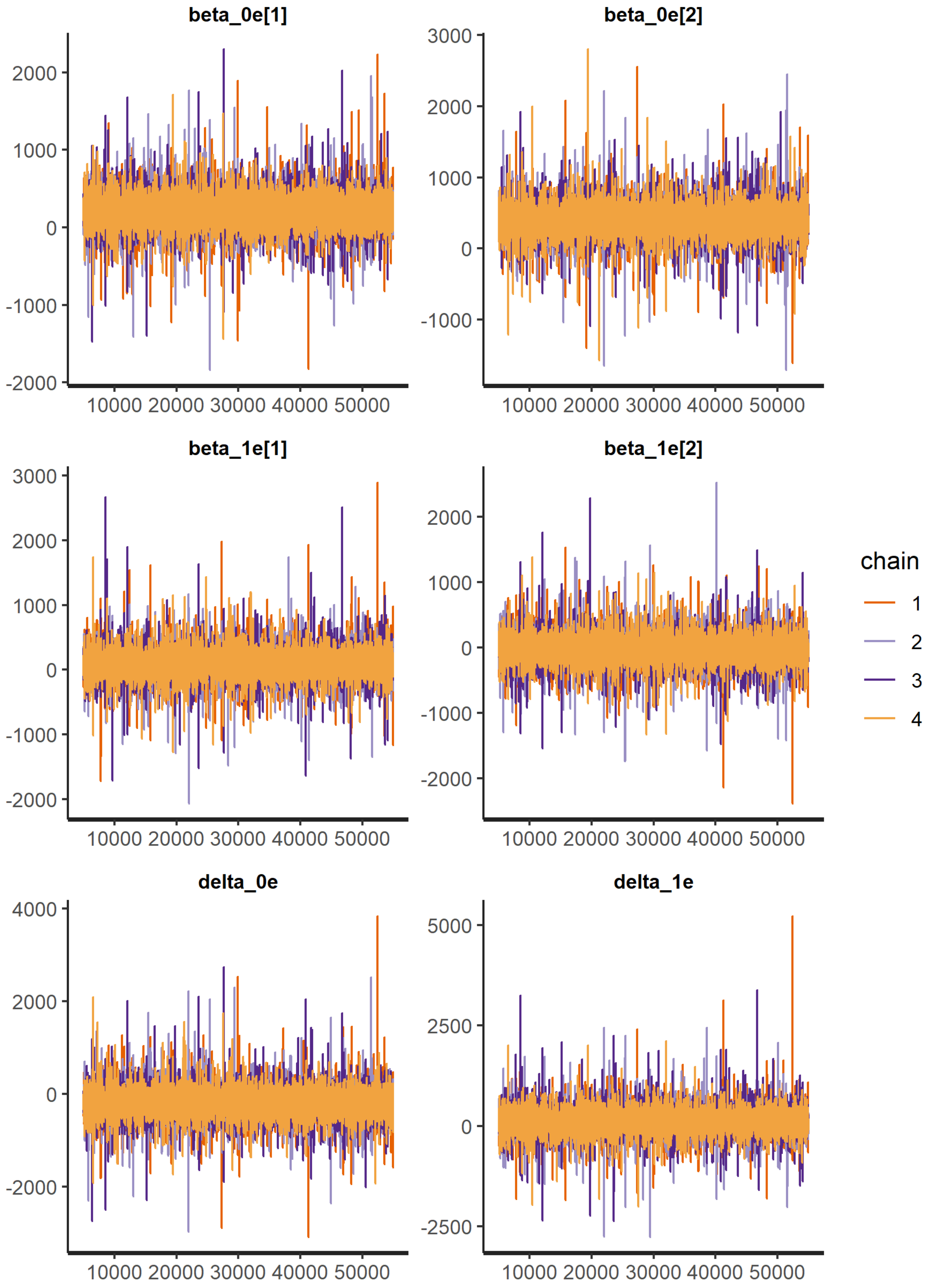
```
names_listTableStan00 <-
  map2(levels_treatment$trt1,
       levels_treatment$trt2,
       ~ paste(.x, .y, "tableStan00", sep = "_"))

names(listTablesStan00) <- names_listTableStan00

map(listTablesStan00, summary)

###### choosing the response variable and preparing list for STAN ############

Y_variable <- "biomass_tot"

# removing NAs and creating numeric representtions of grouping var. for model

listTablesStan0 <- map(listTablesStan00,
                       ~ filter(.x,
                              !is.na(eval(
                                parse(text = Y_variable)
                                )
                                )
                              ) %>%
                         droplevels() %>%
                         mutate(across(
                           c(
                             pop,
                             ecotype,
                             region,
                             region,
                             treatment
                             ),
                           ~ as.numeric(.),
                           .names = paste("S_{.col}"))) %>%
                         mutate(S_ID = ID)
)
```

```
### selecting

listTablesStan <- map(listTablesStan0,
                      ~ select(.x,
                               ends_with(Y_variable),
                               starts_with("S_"))
)



map(listTablesStan,
    ~ select(.x,
             !starts_with("S_")) %>%
      pull() %>%
      descdist(., discrete = FALSE))


### turning to lists of lists

listListsStan <- map(listTablesStan,
                     ~ list(
                       Ni = length(.x$S_ID),
                       Nj = length(unique(.x$S_pop)),
                       Nk = length(unique(.x$S_region)),
                       Ne = length(unique(.x$S_ecotype)),

                       pop_i = .x$S_pop,
                       reg_i = .x$S_region,
                       ecotype_i = .x$S_ecotype,

                       X = .x$S_treatment,

                       Y = pull(select(.x, ends_with(Y_variable)))

                       Ymax = max(pull(select(.x, ends_with(Y_variable))))

                       Nt = length(unique(.x$S_treatment))


                     )
                     )
```

Supplement 7 Parameters used for stan model in R program interface.

```
###### using the STAN model ##################################################

listFits1 <- map(listListsStan,
                 ~ stan(
                   # Stan program
                   file = "adapt_plasticity_regploidy_pop_level_06.stan",
                   # named list of data
                   data = .x,
                   # number of Markov chains
                   chains = 4,
                   # number of warmup iterations per chain
                   warmup = 5000,
                   # total number of iterations per chain
                   iter = 55000,
                   # number of cores (can use one per chain)
                   cores = 4,
                   # progress shown or not
                   refresh = T,
                   # tree depth
                   control = list(max_treedepth = 15),
                   # seed
                   seed = 420
                 ))
```

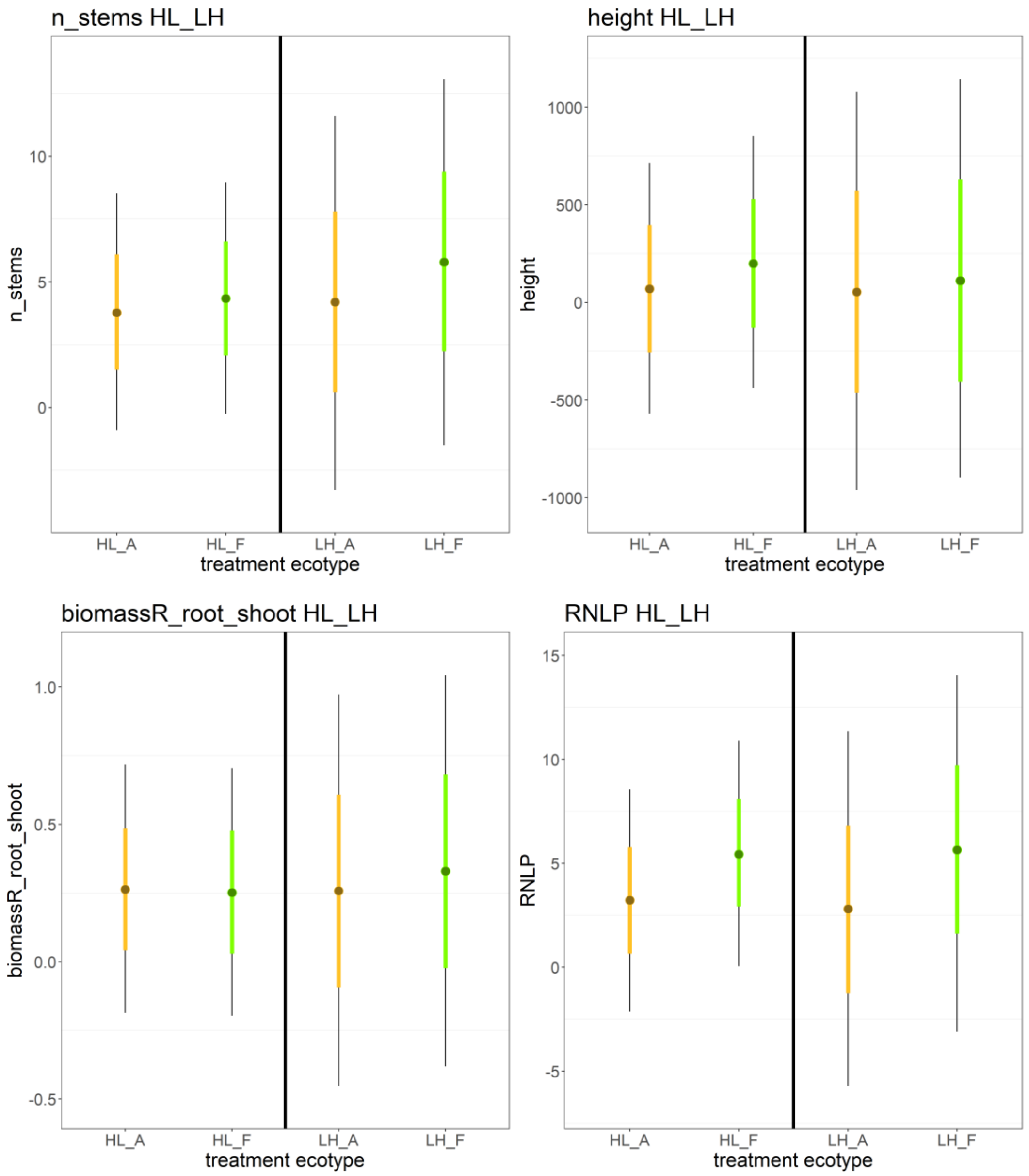
Supplement 8 Trace plot showing convergence of chains during run of the model (example for complete biomass (biomass_tot)).



Supplement 9 Code for plotting estimated trait values in two treatment comparison.

```r
#### modeled values ###########################################################

ggplot_trait_values <- map2(listFits1, namesCombinations,
    ~ stan_plot(.x,
                pars=c("trait_value_F[2]",
                        "trait_value_A[2]",
                        "trait_value_F[1]",
                        "trait_value_A[1]"),
                point_est = "mean",
                show_density = F,
                ci_level = 0.8,
                outer_level = 0.95,
                fill_color = c("chartreuse1", "goldenrod1",
                                "chartreuse1", "goldenrod1"),
                outline_color = "black",
                est_color = c("chartreuse4", "goldenrod4",
                                "chartreuse4", "goldenrod4")) +
        geom_hline(yintercept = 2.5,
                    linetype='solid',
                    color=c('black'),
                    size = 1.5) +
        coord_flip() +
        scale_y_discrete(limits = c(paste(substr(.y, 1,2), "_A"),
                                    paste(substr(.y, 1,2), "_F"),
                                    paste(substr(.y, 4,5), "_A"),
                                    paste(substr(.y, 4,5), "_F"))
        ) +
        theme_bw() +
        theme(panel.grid.major = element_blank(),
            panel.grid.minor = element_blank(),
            text = element_text(size = 20)) +
        #xlim(0, 100) +
        xlab(Y_variable) +
        ylab("treatment ecotype") +
        ggtitle(paste(Y_variable, substr(.y, 1, 5))
    )
)
```

Supplement 10 Plotted expected values of traits, with 95% ci (black line) and 80 % ci (colored line). Yellow for alpine ecotype, green for foothill.



1

Supplement 11 Function for plotting regression lines for ecotypes, with parameters got by random sampling parameters distributions.

```r
### lines plot ecotype ######################################################

lines_plot_ecotype <- function (fits, data){
  samplesA <- as.data.frame(rstan::extract(fits,
                                           pars = c("beta_0e[1]", "beta_1e[1]"
))) %>%
    sample_n(size = 1000)

  samplesF <- as.data.frame(rstan::extract(fits,
                                           pars = c("beta_0e[2]", "beta_1e[2]"
))) %>%
    sample_n(size = 1000)

  measuredValues_plot <- ggplot(data,
                                aes(x = treatment,
                                    y = eval(parse(text = Y_variable)),
                                    col = as.factor(ecotype)
                                    # fill = as.factor(ecotype)
                                    )) +
    # geom_boxplot() +
    # scale_fill_manual(values = ecotype_colours) +
    # labs(fill = "ecotype") +
    geom_point(size = 3,
               position = position_jitter(width = 0.2,
                                          height = 0.001)) +
    scale_colour_manual(values = ecotype_colours) +
    labs(col = "ecotype") +
    ylab(Y_variable) +
    theme_bw() +
    #ylim(0, 1200) +
    theme(legend.position = "bottom",
          text = element_text(size = 20)) +
    guides(colour = guide_legend(override.aes = list(size=6)))

  lines_plot <- measuredValues_plot +

    geom_abline(data = samplesF, aes(intercept = beta_0e.2.,
                                     slope = beta_1e.2.),
                color = "chartreuse1", size = 0.4, alpha = 0.05) +

    geom_abline(data = samplesA, aes(intercept = beta_0e.1.,
                                     slope = beta_1e.1.),
                color = "goldenrod1", size = 0.4, alpha = 0.05) +
```

```

    geom_abline(data = samplesF, aes(intercept = mean(beta_0e.2.),
                                     slope = mean(beta_1e.2.)),
                color = "chartreuse4", size = 2) +

    geom_abline(data = samplesA, aes(intercept = mean(beta_0e.1.),
                                     slope = mean(beta_1e.1.)),
                color = "goldenrod4", size = 2)

  treatments <- unique(data$treatment)
  treatments <- paste(treatments[1], "_", treatments[2])

  ggsave(filename = paste("lines_plot", Y_variable, treatments, ".png"),
          plot = lines_plot)

  return(lines_plot)
}
```

Supplement 12 Set of functions for plotting highest density interval (HDI).

```r
### HDI ####################################################

# function for one HDI

singleHDIfunction <- function(prametersSampleDF, parameters,
                              lowerQuantile, upperQuantile) {
  # this function takes
  #   1) prametersSampleDF - data frame with values sampled from model
  #   2) parameters - which parameters will be used in calculation of HDI
  #      which beta0 and beta1

  seq(1, 2, length.out = 100) %>%
    #sequence between 1 and 2 = X
map_dfr( ~ data.frame(y = #simulated Y value, Y = beta_0 + beta_1 * X
        pull(
            select(prametersSampleDF, starts_with(parameters[1]))
            # beta_0
        )
        +
        .x * pull(
            select(prametersSampleDF, starts_with(parameters[2]))
            # beta_1
        ),

        x = .x)
# numbers from previously introduced sequence <1,2>
) %>%

    group_by(x) %>%

    summarise(
      mu = mean(y),
      lower = quantile(y, probs = lowerQuantile),
      upper = quantile(y, probs = upperQuantile)
    ) %>%

    ungroup()
}

# function for multiple HDIs

HDIsFunction <- function(stanFitObject, parameters,
                         lowerQuantile, upperQuantile) {
  # groups in data - columns - alpine and foothill
  Groups <- as.data.frame(rstan::extract(stanFitObject)) %>%
```

```
    select(starts_with(parameters)) %>%
    colnames() %>%
    str_sub(.,-3,-1) %>%
    unique()


  # table with all parameters in columns
  SelectedParametersSamples <-
    as.data.frame(rstan::extract(stanFitObject)) %>%
    select(starts_with(parameters))

  # list with each element as table with both parameters for the group
  listOfParameters <- map(Groups,
                          ~ SelectedParametersSamples %>%
                            select(ends_with(.x)))

  names(listOfParameters) <- Groups


  # calculation of HDIs for each group in data
  # using both parameters - beta0 and beta1
  # result - list of tables with HDIs for each group one element

  # 1 # function to create HDI margins

  HDIsList <- map(listOfParameters,
                  ~singleHDIfunction(.x, parameters = parameters,
                                  lowerQuantile = lowerQuantile,
                                  upperQuantile = upperQuantile))
  #1.1 is Alpine, 1.2 is foothill, for each ecotype there is one element of li
st
  #because beta0 and beta1 are included in the value of HDI
  return(HDIsList)

}

# final function

HDIsPlotFunction <- function(ListOfDataTables, ListStanFitObjects, parameters,
                             lowerQuantile, upperQuantile){

  HDIsPerTreatments <- map(ListStanFitObjects,
                           ~HDIsFunction(.x, parameters = parameters,
                                         lowerQuantile = lowerQuantile,
                                         upperQuantile = upperQuantile))

  plots <- map2(
    ListOfDataTables,
```

```
    HDIsPerTreatments,

    ~ ggplot() +

      geom_boxplot(
        data = .x,
        aes_string(
          x = "treatment",
          y = Y_variable,
          fill = "ecotype",
          alpha = 0.2
        ),
        width = 0.2
      ) +
      scale_fill_manual(values = ecotype_colours) +
      #ylim(0, 1080) +


      #   geom_count(
      #     data = .x,
      #     aes_string(x = "treatment",
      #                y = Y_variable,
      #                colour = "ecotype")
      #   ) +#,
      # #size = 2,
      # #position = position_jitter(height = 0.05, width = 0.1)) +
    # scale_colour_manual(values = ecotype_colours) +
    theme_bw() +


      map2(
        .y,
        ecotype_colours,
        ~ geom_ribbon(
          data = .x,
          aes(x = x, ymin = lower, ymax = upper),
          fill = .y,
          alpha = 0.50
        )
      ) +

      map2(
        .y,
        ecotype_colours2,
        ~ geom_line(
          data = .x,
          aes(x = x, y = mu),
          color = .y,
```

```
          size = 2
        )
      )

  )

  namesPlots <- names(plots)

  imap(plots,
       ~ ggsave(path = "FIGS",
                filename = paste(Y_variable,
                                 "plot",
                                 .y ,
                                 "_",
                                 lowerQuantile,
                                 "-",
                                 upperQuantile,
                                 ".png"),
                plot = .x))
}
```

Supplement 13 Function for plotting regression lines for ecotypes in regions, with parameters got by random sampling parameters distributions.

```r
### lines plot reg_ploidy ####################################################
##

lines_plot_regploidy <- function (fits, data){

  samplesA <- as.data.frame(rstan::extract(fits,
                                           pars = c(
                                             #alpine
                                             "beta_0k[1,1]",
                                             "beta_0k[2,1]",
                                             "beta_0k[3,1]",
                                             "beta_0k[4,1]",

                                             "beta_1k[1,1]",
                                             "beta_1k[2,1]",
                                             "beta_1k[3,1]",
                                             "beta_1k[4,1]")))%>%
    sample_n(size = 1000)


  samplesF <- as.data.frame(rstan::extract(fits,
                                           pars = c(

                                             #foothill

                                             "beta_0k[1,2]",
                                             "beta_0k[2,2]",
                                             "beta_0k[3,2]",
                                             "beta_0k[4,2]",

                                             "beta_1k[1,2]",
                                             "beta_1k[2,2]",
                                             "beta_1k[3,2]",
                                             "beta_1k[4,2]"))) %>%
    sample_n(size = 1000)

  ###
  measuredValues_plot <- ggplot(data,
                                aes(x = treatment,
                                    y = eval(parse(text = Y_variable)),
                                    col = as.factor(region_ecotype))) +
    geom_point(size = 3,
               position = position_jitter(width = 0.2,
```

```
                                          height = 0.001)) +
    scale_colour_manual(values = reg_ecotype_colours) +
    labs(col = "region
and ecotype") +
    ylab(Y_variable) +
    #ylim(0, 1200) +
    theme_bw() +
    theme(legend.position = "bottom",
          text = element_text(size = 20)) +
    guides(colour = guide_legend(override.aes = list(size=6)))
  ###

  lines_plot <- measuredValues_plot +
    ### foothill
    ###
    geom_abline(data = samplesF, aes(intercept = beta_0k.1.2.,
                                     slope = beta_1k.1.2.),
                color = "chartreuse", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesF, aes(intercept = beta_0k.2.2.,
                                     slope = beta_1k.2.2.),
                color = "chartreuse3", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesF, aes(intercept = beta_0k.3.2.,
                                     slope = beta_1k.3.2.),
                color = "chartreuse4", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesF, aes(intercept = beta_0k.4.2.,
                                     slope = beta_1k.4.2.),
                color = "seagreen", size = 0.2, alpha = 0.02) +
    ### alpine
    ###
    geom_abline(data = samplesA, aes(intercept = beta_0k.1.1.,
                                     slope = beta_1k.1.1.),
                color = "gold", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesA, aes(intercept = beta_0k.2.1.,
                                     slope = beta_1k.2.1.),
                color = "goldenrod1", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesA, aes(intercept = beta_0k.3.1.,
                                     slope = beta_1k.3.1.),
                color = "darkorange", size = 0.2, alpha = 0.02) +

    geom_abline(data = samplesA, aes(intercept = beta_0k.4.1.,
                                     slope = beta_1k.4.1.),
                color = "darkgoldenrod3", size = 0.2, alpha = 0.02) +

```

```
    ### means A ###
    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.1.1.),
                                     slope = mean(beta_1k.1.1.)),
                color = "gold", size = 2) +

    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.1.1.),
                                     slope = mean(beta_1k.1.1.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.2.1.),
                                     slope = mean(beta_1k.2.1.)),
                color = "goldenrod1", size = 2) +

    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.2.1.),
                                     slope = mean(beta_1k.2.1.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.3.1.),
                                     slope = mean(beta_1k.3.1.)),
                color = "darkorange", size = 2) +

    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.3.1.),
                                     slope = mean(beta_1k.3.1.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.4.1.),
                                     slope = mean(beta_1k.4.1.)),
                color = "darkgoldenrod3", size = 2) +

    geom_abline(data = samplesA, aes(intercept = mean(beta_0k.4.1.),
                                     slope = mean(beta_1k.4.1.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ### means F ###
    ###
    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.1.2.),
                                     slope = mean(beta_1k.1.2.)),
                color = "chartreuse", size = 2) +

    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.1.2.),
                                     slope = mean(beta_1k.1.2.)),
```

```
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.2.2.),
                                     slope = mean(beta_1k.2.2.)),
                color = "chartreuse3", size = 2) +

    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.2.2.),
                                     slope = mean(beta_1k.2.2.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.3.2.),
                                     slope = mean(beta_1k.3.2.)),
                color = "chartreuse4", size = 2) +

    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.3.2.),
                                     slope = mean(beta_1k.3.2.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
) +

    ###
    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.4.2.),
                                     slope = mean(beta_1k.4.2.)),
                color = "seagreen", size = 2) +

    geom_abline(data = samplesF, aes(intercept = mean(beta_0k.4.2.),
                                     slope = mean(beta_1k.4.2.)),
                color = "black", size = 0.3, linetype = "dotdash", alpha = 0.5
)


  treatments <- unique(data$treatment)
  treatments <- paste(treatments[1], "_", treatments[2])

  ggsave(filename = paste("lines_plot_regploidy", Y_variable, treatments, ".pn
g"),
      plot = lines_plot)

  return(lines_plot)
}

```

Supplement 14 Parameters of posterior probability distribution for estimated values.

biomass_flow	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	17.99	0.31	99.37	-121.49	-76.49	112.43	155.85	102907
beta_1e[2]	-22.6	0.32	98.1	-163.68	-118.31	70.88	113.72	96938.5
delta_1e	40.59	0.43	138.76	-152.67	-92.08	175.63	237.82	102626.4
beta_1k[1,1]	29.21	0.04	17.31	1.13	7.1	51.49	58.04	221534
beta_1k[2,1]	7.24	0.04	20.67	-26.82	-19.2	33.72	41.08	217423.1
beta_1k[3,1]	1.93	0.03	15.59	-23.51	-18	22.01	27.74	231832.9
beta_1k[4,1]	-4.54	0.04	18.06	-33.94	-27.57	18.74	25.4	236921.6
beta_1k[1,2]	-7.12	0.05	18	-36.91	-30.27	15.89	22.29	138191.1
beta_1k[2,2]	-37.6	0.08	27.7	-83.56	-73.32	-2.18	7.71	114811.4
beta_1k[3,2]	-84.08	0.05	25.21	-125.4	-116.25	-51.79	-42.66	230450.4
beta_1k[4,2]	-82.64	0.06	28.06	-128.88	-118.61	-46.78	-36.67	221804.2
delta_1k[1]	36.33	0.06	24.62	-3.92	4.9	67.92	76.91	195934.8
delta_1k[2]	44.84	0.08	33.66	-9.87	1.88	88.39	100.76	165439.3
delta_1k[3]	86.01	0.06	29.66	37.36	47.96	123.95	134.67	230853.1
delta_1k[4]	78.1	0.07	33.36	23.59	35.48	120.83	133.01	225628.5
trait_value_F[2]	133.92	0.69	216.9	-174.24	-73.64	340.62	437.42	99123.41
trait_value_A[2]	87.26	0.69	221.35	-221.14	-120.7	295.26	394.98	101735.2
trait_value_F[1]	156.52	0.43	137.51	-38.6	25.51	288.86	350.36	102376.5
trait_value_A[1]	69.27	0.45	139.5	-124.72	-62.04	200.9	264.46	97943.85
biomass_root								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	19.35	0.18	52.69	-44.23	-24.33	62.95	82.85	86503.19
beta_1e[2]	12.95	0.25	68.28	-50.58	-30.56	56.6	76.67	76853.29
delta_1e	6.41	0.29	81.2	-83.99	-55.59	68.68	97.09	80868.69
beta_1k[1,1]	24.49	0.02	8.17	10.94	14	34.88	37.76	216309.9
beta_1k[2,1]	14.61	0.02	8.34	0.78	3.92	25.2	28.15	218864.3
beta_1k[3,1]	37.2	0.02	8.06	23.79	26.82	47.45	50.27	240142
beta_1k[4,1]	9.52	0.02	8.93	-5.27	-1.95	20.85	24.03	245383.4
beta_1k[1,2]	-6.38	0.03	9.46	-21.71	-18.33	5.74	9.35	106556.4
beta_1k[2,2]	32.24	0.02	8.51	17.96	21.25	43.04	45.93	136099.8
beta_1k[3,2]	26.53	0.02	7.43	14.18	16.94	35.98	38.59	239550.6
beta_1k[4,2]	29.9	0.02	8.23	16.24	19.34	40.35	43.23	245810.4
delta_1k[1]	30.87	0.04	12.84	9.44	14.37	47.13	51.71	117750.8
delta_1k[2]	-17.63	0.03	12.18	-37.48	-33.18	-2.01	2.52	144064.5
delta_1k[3]	10.67	0.02	10.96	-7.34	-3.35	24.68	28.63	240335.8
delta_1k[4]	-20.38	0.02	12.17	-40.35	-35.97	-4.79	-0.34	245649.9
trait_value_F[2]	86.47	0.53	146.06	-55.4	-9.35	182.72	227.4	75520.02
trait_value_A[2]	80.82	0.35	116.21	-60.1	-14.94	177.11	221.49	108474.1
trait_value_F[1]	73.52	0.31	86.03	-15.34	13.15	134.78	163.14	79175.82
trait_value_A[1]	61.47	0.22	76.81	-27.48	1.02	122.22	150.69	121045

biomass_rosette								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	71.64	0.2	56.33	-1.94	20.52	122.58	144.56	81508.4
beta_1e[2]	6.89	0.24	57.47	-66.5	-43.57	56.75	79.26	55309.94
delta_1e	64.75	0.3	81.59	-39.66	-6.87	136.46	168.27	75841.13
beta_1k[1,1]	75.75	0.06	21.49	40.78	48.37	103.49	111.48	128091.2
beta_1k[2,1]	67.25	0.07	22.25	29.46	38.45	95.17	102.64	113018
beta_1k[3,1]	67.36	0.05	22.23	30.61	38.8	95.65	103.69	243034.7
beta_1k[4,1]	39.7	0.05	25.61	-2.82	6.84	72.24	81.3	224101.2
beta_1k[1,2]	20.44	0.05	20.55	-13.75	-5.83	46.46	53.75	185561.3
beta_1k[2,2]	-7.58	0.04	17	-35.54	-29.32	14.14	20.23	209505.2
beta_1k[3,2]	62.33	0.04	18.61	31.36	38.41	86.06	92.64	253708.9
beta_1k[4,2]	18.09	0.04	19.06	-13.41	-6.37	42.36	49.21	248451.8
delta_1k[1]	55.31	0.08	30.14	6.79	17.28	94.19	105.87	134003.5
delta_1k[2]	74.83	0.08	28.16	27.6	38.49	110.31	120.08	132025
delta_1k[3]	5.03	0.06	29.02	-42.63	-32.19	42.16	52.7	248990
delta_1k[4]	21.6	0.07	31.95	-30.97	-19.42	62.32	74.01	231997.6
trait_value_F[2]	172.75	0.65	131.29	17.14	68.78	276.28	328.57	40811.15
trait_value_A[2]	290.18	0.4	118.51	134.93	186.02	393.88	445.83	88347.61
trait_value_F[1]	165.86	0.43	85.38	67.47	100.02	232.25	265.31	38536.2
trait_value_A[1]	218.54	0.25	74.88	120.33	152.67	284.22	317.24	92829.36
biomass_tot								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	98.91	0.42	119.95	-63.62	-11.74	209.44	262.73	80539.34
beta_1e[2]	-22.38	0.41	118.24	-184.74	-133.01	88.61	140.78	81737.96
delta_1e	121.29	0.6	170.6	-109.24	-35.71	277.77	353.11	80889.76
beta_1k[1,1]	137.83	0.12	34.56	80.13	92.91	181.8	193.81	83392.75
beta_1k[2,1]	58.75	0.12	34.36	1.96	14.65	102.83	115.39	76958.11
beta_1k[3,1]	69.9	0.06	30.6	19.16	30.67	108.81	119.81	250270
beta_1k[4,1]	38.22	0.07	34.1	-18.48	-5.54	81.66	93.93	251266.7
beta_1k[1,2]	-18.11	0.06	30.17	-67.51	-56.57	20.37	31.63	217978.4
beta_1k[2,2]	-27.45	0.06	29.51	-76.61	-65.4	9.96	20.45	227178
beta_1k[3,2]	29.52	0.06	30.71	-21.37	-9.85	68.7	79.62	245340.1
beta_1k[4,2]	-10.7	0.06	32.37	-64.19	-52.14	30.65	42.06	249464.9
delta_1k[1]	155.94	0.12	44.97	82.31	98.49	213.72	230.34	134794.7
delta_1k[2]	86.2	0.13	44.51	12.53	28.97	143.22	159.01	120901.8
delta_1k[3]	40.38	0.09	43.23	-30.68	-14.83	95.57	111.66	247225.9
delta_1k[4]	48.92	0.09	47.04	-28.75	-11.47	109.04	126.22	250932
trait_value_F[2]	359.04	0.91	261.12	4.95	119.69	597.23	715.77	82649.78
trait_value_A[2]	412.42	0.92	265.73	59.59	174.88	653.66	771.7	83759.59
trait_value_F[1]	381.43	0.57	165.8	155.98	229.76	531.98	606.97	84589.43
trait_value_A[1]	313.52	0.56	169.49	90.91	163.8	465.95	541.84	92453.13

biomassR_gen_veg								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	0.04	0	0.58	-0.79	-0.53	0.6	0.86	97640.64
beta_1e[2]	-0.21	0	0.58	-1.06	-0.78	0.35	0.61	99286.8
delta_1e	0.24	0	0.82	-0.91	-0.55	1.05	1.43	96863.46
beta_1k[1,1]	0.09	0	0.13	-0.11	-0.07	0.26	0.31	216565.5
beta_1k[2,1]	-0.03	0	0.14	-0.26	-0.21	0.15	0.2	216486.5
beta_1k[3,1]	-0.02	0	0.11	-0.19	-0.16	0.12	0.16	235746.3
beta_1k[4,1]	-0.04	0	0.13	-0.25	-0.2	0.12	0.16	245132
beta_1k[1,2]	-0.13	0	0.13	-0.35	-0.3	0.05	0.09	124249.5
beta_1k[2,2]	-0.28	0	0.22	-0.64	-0.56	0	0.07	88067.23
beta_1k[3,2]	-1.17	0	0.2	-1.5	-1.42	-0.91	-0.83	223037
beta_1k[4,2]	-0.57	0	0.23	-0.95	-0.87	-0.28	-0.19	215575.7
delta_1k[1]	0.22	0	0.18	-0.08	-0.01	0.45	0.52	182886
delta_1k[2]	0.25	0	0.25	-0.15	-0.07	0.57	0.67	129612.2
delta_1k[3]	1.15	0	0.23	0.77	0.86	1.44	1.52	224310.2
delta_1k[4]	0.53	0	0.26	0.1	0.19	0.87	0.96	223062.5
trait_value_F[2]	0.9	0	1.27	-0.94	-0.33	2.1	2.69	104341.9
trait_value_A[2]	0.56	0	1.28	-1.24	-0.67	1.79	2.4	98080.63
trait_value_F[1]	1.1	0	0.81	-0.05	0.32	1.88	2.26	106571.2
trait_value_A[1]	0.53	0	0.82	-0.62	-0.25	1.3	1.68	98331.75
biomassR_root_shoot								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-0.01	0	0.17	-0.24	-0.17	0.15	0.23	92132.44
beta_1e[2]	0.08	0	0.17	-0.16	-0.08	0.24	0.31	79117.43
delta_1e	-0.08	0	0.24	-0.41	-0.31	0.14	0.25	82770.36
beta_1k[1,1]	-0.02	0	0.03	-0.07	-0.06	0.02	0.03	211969.8
beta_1k[2,1]	0.01	0	0.03	-0.04	-0.03	0.05	0.06	228832.6
beta_1k[3,1]	0.1	0	0.03	0.05	0.06	0.14	0.15	236511.3
beta_1k[4,1]	0.02	0	0.03	-0.04	-0.03	0.06	0.07	233664
beta_1k[1,2]	0.01	0	0.04	-0.05	-0.04	0.05	0.07	97298.88
beta_1k[2,2]	0.15	0	0.03	0.09	0.11	0.19	0.2	130133.1
beta_1k[3,2]	0.1	0	0.03	0.05	0.07	0.13	0.14	235842.4
beta_1k[4,2]	0.11	0	0.03	0.06	0.07	0.14	0.15	232081.6
delta_1k[1]	-0.03	0	0.05	-0.1	-0.08	0.03	0.05	142202.6
delta_1k[2]	-0.14	0	0.04	-0.21	-0.2	-0.09	-0.07	182297.8
delta_1k[3]	0	0	0.04	-0.06	-0.05	0.05	0.07	236707.2
delta_1k[4]	-0.09	0	0.05	-0.16	-0.14	-0.03	-0.01	236513.9
trait_value_F[2]	0.33	0	0.39	-0.19	-0.02	0.68	0.85	78055.29
trait_value_A[2]	0.26	0	0.38	-0.26	-0.09	0.61	0.77	94741.26
trait_value_F[1]	0.25	0	0.24	-0.07	0.03	0.48	0.58	81990.59
trait_value_A[1]	0.26	0	0.24	-0.06	0.04	0.48	0.59	96376.88

diameter								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-19.44	0.02	5.74	-27.49	-25.08	-13.83	-11.5	81835.12
beta_1e[2]	-16.41	0.02	5.92	-24.5	-22.11	-10.76	-8.43	81884.95
delta_1e	-3.03	0.03	8.29	-14.35	-11.03	4.96	8.33	80691.75
beta_1k[1,1]	-20.06	0.01	2.63	-24.33	-23.39	-16.69	-15.69	141668.9
beta_1k[2,1]	-18.85	0.01	2.68	-23.37	-22.31	-15.48	-14.57	128130.8
beta_1k[3,1]	-21.93	0.01	2.89	-26.73	-25.65	-18.26	-17.22	237096.5
beta_1k[4,1]	-30.29	0.01	3.34	-35.82	-34.56	-26.03	-24.83	223841.8
beta_1k[1,2]	-15.88	0.01	2.67	-20.33	-19.31	-12.5	-11.56	165101.9
beta_1k[2,2]	-16.91	0.01	2.62	-21.22	-20.25	-13.58	-12.61	183062.9
beta_1k[3,2]	-19.95	0.01	2.93	-24.83	-23.73	-16.21	-15.18	240875.9
beta_1k[4,2]	-21.6	0.01	2.97	-26.53	-25.42	-17.81	-16.77	234851.8
delta_1k[1]	-4.18	0.01	3.81	-10.31	-8.99	0.71	2.18	129811.9
delta_1k[2]	-1.93	0.01	3.79	-8.28	-6.82	2.86	4.17	136034.6
delta_1k[3]	-1.98	0.01	4.12	-8.77	-7.25	3.27	4.78	238592.4
delta_1k[4]	-8.69	0.01	4.47	-16.04	-14.42	-2.96	-1.33	229624.9
trait_value_F[2]	38.13	0.04	12.31	21.64	27.11	49.08	54.46	84609.54
trait_value_A[2]	38.33	0.04	12.09	21.79	27.28	49.37	54.84	77439.69
trait_value_F[1]	54.54	0.03	7.81	44.04	47.48	61.6	64.99	85962.05
trait_value_A[1]	57.77	0.03	7.69	47.26	50.79	64.82	68.36	75227.75
height								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-15.53	0.81	253.09	-350.22	-248.02	217.67	321.59	98455.61
beta_1e[2]	-87.27	0.79	251.97	-423.37	-320.81	144.61	248.69	102322.6
delta_1e	71.74	1.08	349.2	-404.52	-257.84	401.74	544.72	103617.1
beta_1k[1,1]	-11.01	0.02	10.89	-28.86	-24.91	3	6.99	209442.4
beta_1k[2,1]	-20.21	0.04	19.22	-52.31	-45.03	4.24	10.9	205846.5
beta_1k[3,1]	-20.39	0.03	13.42	-42.46	-37.59	-3.12	1.76	213202.4
beta_1k[4,1]	-4.12	0.03	15.41	-29.34	-23.83	15.7	21.3	210506.3
beta_1k[1,2]	7.79	0.04	18.22	-23.02	-15.9	30.81	36.81	188196.4
beta_1k[2,2]	-184.05	0.05	23.12	-221.88	-213.45	-154.43	-145.82	192412.6
beta_1k[3,2]	-243.08	0.05	21.93	-279.02	-271.05	-214.96	-206.91	212675.5
beta_1k[4,2]	-258.36	0.05	21.79	-294.03	-286.24	-230.47	-222.32	212342
delta_1k[1]	-18.79	0.05	21.14	-52.83	-45.62	8.64	16.72	196447.6
delta_1k[2]	163.84	0.07	30.17	113.72	125.13	202.19	212.94	199208.4
delta_1k[3]	222.69	0.06	25.74	180.13	189.71	255.62	264.75	211660.8
delta_1k[4]	254.24	0.06	26.73	210.07	220.01	288.32	297.84	210834.8
trait_value_F[2]	112.13	1.71	559.15	-634.94	-407.82	631.66	865.28	106574.4
trait_value_A[2]	53.94	1.64	558.62	-689.58	-461.78	571.86	803.81	115326.2
trait_value_F[1]	199.41	1.07	353.4	-273.44	-129.03	528.42	680.39	108087.9
trait_value_A[1]	69.47	1.09	359.38	-398.39	-256.65	396.85	541.58	107768

n_flowers								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-0.27	0.16	45.29	-59.51	-40.22	38.87	57.87	85337.79
beta_1e[2]	-26.74	0.14	43.48	-85.69	-66.36	12.84	31.69	97596.73
delta_1e	26.47	0.21	63.34	-56.53	-29.58	81.91	109.57	88394.46
beta_1k[1,1]	3.19	0.02	10.35	-13.63	-9.94	16.56	20.45	198613.2
beta_1k[2,1]	-3.53	0.04	14.93	-28.52	-22.85	15.35	20.59	150511.1
beta_1k[3,1]	0.48	0.02	10.93	-17.39	-13.52	14.55	18.56	251980.9
beta_1k[4,1]	-4.13	0.02	10.45	-21.12	-17.44	9.31	13.19	248635.8
beta_1k[1,2]	-22.08	0.05	12.92	-43.06	-38.58	-5.33	-0.54	76001.95
beta_1k[2,2]	-30.98	0.05	15.29	-56.78	-50.9	-11.58	-6.49	84992.03
beta_1k[3,2]	-75.85	0.03	14.19	-99.04	-93.97	-57.57	-52.35	228575.7
beta_1k[4,2]	-42.29	0.03	14.26	-65.61	-60.5	-23.96	-18.73	239537.5
delta_1k[1]	25.27	0.05	16.11	-1.35	4.5	45.83	51.62	125342
delta_1k[2]	27.45	0.05	20.4	-5.45	1.75	53.74	61.7	171335
delta_1k[3]	76.33	0.04	17.96	46.7	53.3	99.27	105.86	242346.9
delta_1k[4]	38.16	0.04	17.7	9.11	15.54	60.82	67.34	240895
trait_value_F[2]	68.15	0.3	95.93	-59.75	-16.62	151.85	194.67	104326.1
trait_value_A[2]	52.66	0.34	99.02	-74.92	-31.31	137.07	180.54	85046.69
trait_value_F[1]	94.89	0.19	61.7	12.7	40.48	148.65	176.32	108752.6
trait_value_A[1]	52.93	0.21	63.19	-27.45	-0.31	107.02	135.12	86569.85
n_rosette_buds								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	1.2	0.01	1.82	-1.33	-0.54	2.99	3.81	80128.23
beta_1e[2]	0.23	0.01	1.82	-2.33	-1.52	1.97	2.77	94665.23
delta_1e	0.97	0.01	2.59	-2.6	-1.49	3.49	4.63	93191.15
beta_1k[1,1]	-0.13	0	0.32	-0.65	-0.54	0.28	0.4	138450
beta_1k[2,1]	2.53	0	0.5	1.68	1.9	3.15	3.31	87185.46
beta_1k[3,1]	0.36	0	0.41	-0.33	-0.17	0.88	1.02	239865.4
beta_1k[4,1]	0.15	0	0.44	-0.59	-0.42	0.71	0.86	238659.4
beta_1k[1,2]	0.13	0	0.3	-0.37	-0.25	0.52	0.63	232761.3
beta_1k[2,2]	0.33	0	0.3	-0.17	-0.06	0.72	0.83	230435.8
beta_1k[3,2]	0.51	0	0.33	-0.04	0.09	0.93	1.05	240961.2
beta_1k[4,2]	0.06	0	0.3	-0.44	-0.33	0.45	0.56	239801
delta_1k[1]	-0.26	0	0.44	-0.98	-0.82	0.3	0.46	186046.5
delta_1k[2]	2.2	0	0.58	1.23	1.46	2.93	3.12	109897
delta_1k[3]	-0.15	0	0.53	-1.03	-0.83	0.52	0.7	240750.1
delta_1k[4]	0.09	0	0.54	-0.81	-0.6	0.77	0.96	239790.4
trait_value_F[2]	2.27	0.01	4.04	-3.35	-1.57	6.09	7.87	85392.43
trait_value_A[2]	3.58	0.01	3.99	-2.06	-0.26	7.46	9.3	84722.98
trait_value_F[1]	2.04	0.01	2.56	-1.5	-0.39	4.48	5.6	84210.58
trait_value_A[1]	2.38	0.01	2.51	-1.2	-0.06	4.82	5.95	90893.82

n_stems								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	0.42	0.01	1.87	-2.19	-1.39	2.22	2.95	91027.21
beta_1e[2]	1.45	0.01	1.86	-1.03	-0.28	3.19	3.95	90255.83
delta_1e	-1.03	0.01	2.6	-4.67	-3.55	1.47	2.52	81994.84
beta_1k[1,1]	0.86	0	0.79	-0.42	-0.14	1.87	2.16	152201.3
beta_1k[2,1]	-0.01	0	0.86	-1.47	-1.13	1.07	1.36	113213
beta_1k[3,1]	0.98	0	0.76	-0.28	0	1.95	2.21	247195.5
beta_1k[4,1]	0.05	0	0.73	-1.15	-0.88	0.98	1.25	253349.3
beta_1k[1,2]	0.63	0	0.6	-0.35	-0.13	1.39	1.61	211870.1
beta_1k[2,2]	2.27	0	0.75	1.02	1.31	3.23	3.5	203653.6
beta_1k[3,2]	0.68	0	0.88	-0.8	-0.46	1.8	2.11	241146.4
beta_1k[4,2]	4.78	0	0.83	3.4	3.72	5.83	6.12	240495.7
delta_1k[1]	0.24	0	0.98	-1.38	-1.02	1.5	1.86	175170
delta_1k[2]	-2.28	0	1.15	-4.21	-3.77	-0.83	-0.42	137807.6
delta_1k[3]	0.3	0	1.16	-1.61	-1.19	1.79	2.21	242871.1
delta_1k[4]	-4.73	0	1.1	-6.53	-6.14	-3.31	-2.9	246337.3
trait_value_F[2]	5.79	0.01	3.97	0.53	2.23	9.38	11.07	90805.77
trait_value_A[2]	4.2	0.01	3.98	-1.15	0.61	7.8	9.54	96586.85
trait_value_F[1]	4.34	0.01	2.5	1	2.07	6.61	7.68	90060.89
trait_value_A[1]	3.77	0.01	2.52	0.41	1.5	6.09	7.19	99348.41
PL								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	0.04	0	0.64	-0.82	-0.58	0.66	0.92	87007.32
beta_1e[2]	0.17	0	0.6	-0.7	-0.42	0.75	0.97	80039.71
delta_1e	-0.13	0	0.88	-1.3	-0.97	0.74	1.12	82671.75
beta_1k[1,1]	-0.03	0	0.32	-0.55	-0.44	0.38	0.49	151234.3
beta_1k[2,1]	0.11	0	0.4	-0.54	-0.39	0.61	0.76	142850.2
beta_1k[3,1]	-0.8	0	0.34	-1.35	-1.23	-0.37	-0.25	218492.5
beta_1k[4,1]	-0.09	0	0.49	-0.9	-0.72	0.53	0.71	178540.4
beta_1k[1,2]	0.21	0	0.35	-0.4	-0.24	0.64	0.75	64721.39
beta_1k[2,2]	0.14	0	0.3	-0.35	-0.24	0.52	0.63	135086.1
beta_1k[3,2]	-0.69	0	0.32	-1.23	-1.11	-0.28	-0.16	217954.8
beta_1k[4,2]	-0.28	0	0.33	-0.83	-0.71	0.14	0.26	218350.7
delta_1k[1]	-0.24	0	0.47	-0.99	-0.83	0.36	0.55	96069.06
delta_1k[2]	-0.03	0	0.49	-0.84	-0.66	0.6	0.78	144749.3
delta_1k[3]	-0.1	0	0.47	-0.87	-0.7	0.49	0.66	220927
delta_1k[4]	0.19	0	0.59	-0.78	-0.57	0.95	1.16	191572.8
trait_value_F[2]	7.9	0	1.23	6.27	6.87	8.94	9.53	87716.39
trait_value_A[2]	8.2	0	1.26	6.59	7.16	9.27	9.85	92034.77
trait_value_F[1]	7.73	0	0.79	6.73	7.08	8.43	8.83	90127.01
trait_value_A[1]	8.16	0	0.8	7.13	7.49	8.84	9.2	98874.59

PW								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	0.29	0	0.33	-0.15	-0.04	0.62	0.75	89337
beta_1e[2]	0.19	0	0.32	-0.23	-0.11	0.48	0.58	77966.55
delta_1e	0.1	0	0.46	-0.49	-0.34	0.55	0.73	78707.86
beta_1k[1,1]	0.21	0	0.21	-0.13	-0.05	0.48	0.55	91101.48
beta_1k[2,1]	0.36	0	0.26	-0.04	0.05	0.69	0.8	47452.87
beta_1k[3,1]	-0.14	0	0.22	-0.5	-0.42	0.15	0.23	172037
beta_1k[4,1]	-0.24	0	0.32	-0.77	-0.65	0.17	0.29	137115.6
beta_1k[1,2]	0.17	0	0.2	-0.18	-0.09	0.41	0.48	59730.92
beta_1k[2,2]	0.21	0	0.19	-0.1	-0.03	0.45	0.52	107887.3
beta_1k[3,2]	-0.3	0	0.21	-0.65	-0.57	-0.03	0.05	178052.5
beta_1k[4,2]	-0.16	0	0.22	-0.52	-0.44	0.12	0.2	174978.1
delta_1k[1]	0.05	0	0.28	-0.41	-0.31	0.41	0.51	107393.8
delta_1k[2]	0.15	0	0.31	-0.35	-0.24	0.55	0.67	74270
delta_1k[3]	0.16	0	0.31	-0.35	-0.23	0.56	0.67	168050.1
delta_1k[4]	-0.08	0	0.39	-0.72	-0.58	0.42	0.56	136230
trait_value_F[2]	4.2	0	0.61	3.52	3.79	4.61	4.87	81474.47
trait_value_A[2]	5.1	0	0.6	4.44	4.67	5.55	5.83	103083.1
trait_value_F[1]	4.01	0	0.39	3.59	3.74	4.3	4.47	91719.69
trait_value_A[1]	4.81	0	0.38	4.37	4.52	5.1	5.26	112001.6
RLL								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-9	0.02	4.41	-14.9	-13	-5.06	-3.29	74115.1
beta_1e[2]	-7.02	0.02	4.38	-12.88	-11.02	-3	-1.16	78766.63
delta_1e	-1.98	0.02	6.12	-10.35	-7.68	3.6	6.2	81786.86
beta_1k[1,1]	-8.76	0.01	1.72	-11.52	-10.93	-6.52	-5.86	93420.11
beta_1k[2,1]	-9.21	0.01	1.86	-12.39	-11.64	-6.89	-6.28	79391.33
beta_1k[3,1]	-8.58	0	1.89	-11.71	-11.01	-6.17	-5.47	240194.4
beta_1k[4,1]	-13.38	0	2.15	-16.94	-16.14	-10.63	-9.85	226933.7
beta_1k[1,2]	-6.48	0	1.75	-9.33	-8.7	-4.25	-3.59	176367.8
beta_1k[2,2]	-7.55	0	1.69	-10.36	-9.71	-5.41	-4.81	184368.8
beta_1k[3,2]	-7.73	0	1.85	-10.8	-10.11	-5.37	-4.7	237427.3
beta_1k[4,2]	-13.56	0	1.94	-16.78	-16.05	-11.1	-10.39	239700.8
delta_1k[1]	-2.27	0.01	2.41	-6.19	-5.33	0.83	1.75	160519.8
delta_1k[2]	-1.66	0.01	2.46	-5.8	-4.84	1.45	2.3	131698.7
delta_1k[3]	-0.85	0.01	2.65	-5.2	-4.23	2.55	3.53	241992.6
delta_1k[4]	0.19	0.01	2.89	-4.57	-3.53	3.9	4.94	231821.3
trait_value_F[2]	17.45	0.04	9.31	5.12	9.43	25.53	29.73	70214.74
trait_value_A[2]	15.83	0.03	9.25	3.45	7.77	23.84	28.01	78241.13
trait_value_F[1]	24.47	0.02	5.95	16.58	19.34	29.64	32.27	69068.9
trait_value_A[1]	24.83	0.02	5.84	17	19.74	29.98	32.69	86233.09

RLW								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-1.39	0	1.06	-2.85	-2.37	-0.42	0.03	86763.57
beta_1e[2]	-1.97	0	1.07	-3.41	-2.95	-0.97	-0.5	88923.04
delta_1e	0.57	0.01	1.5	-1.5	-0.82	1.95	2.58	85449.33
beta_1k[1,1]	-1.47	0	0.44	-2.19	-2.03	-0.91	-0.75	157441.9
beta_1k[2,1]	-1.31	0	0.46	-2.08	-1.89	-0.73	-0.58	138687.7
beta_1k[3,1]	-2.2	0	0.51	-3.03	-2.84	-1.55	-1.37	228720.3
beta_1k[4,1]	-2.27	0	0.57	-3.22	-3	-1.54	-1.33	216812.4
beta_1k[1,2]	-1.58	0	0.52	-2.4	-2.23	-0.9	-0.69	62767.34
beta_1k[2,2]	-2.35	0	0.49	-3.18	-2.98	-1.74	-1.58	70549.34
beta_1k[3,2]	-1.84	0	0.51	-2.68	-2.49	-1.19	-1.01	234664.9
beta_1k[4,2]	-2.62	0	0.53	-3.49	-3.29	-1.95	-1.76	225921.7
delta_1k[1]	0.11	0	0.66	-1	-0.74	0.93	1.16	118656.9
delta_1k[2]	1.05	0	0.64	0.02	0.24	1.87	2.11	159824.1
delta_1k[3]	-0.36	0	0.72	-1.54	-1.28	0.56	0.82	230574.9
delta_1k[4]	0.35	0	0.78	-0.93	-0.65	1.35	1.63	224311
trait_value_F[2]	5.91	0.01	2.26	2.86	3.97	7.84	8.94	87826.88
trait_value_A[2]	5.33	0.01	2.24	2.3	3.4	7.25	8.35	92332.85
trait_value_F[1]	7.87	0	1.43	5.91	6.62	9.1	9.79	87159.88
trait_value_A[1]	6.72	0	1.44	4.81	5.5	7.95	8.64	94759.59
RNLP								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-0.42	0.01	2.25	-3.2	-2.29	1.44	2.35	84787.09
beta_1e[2]	0.2	0.01	2.33	-2.71	-1.75	2.08	2.95	67913.95
delta_1e	-0.62	0.01	3.26	-4.5	-3.26	2.08	3.42	62711.97
beta_1k[1,1]	-0.32	0	0.46	-1.07	-0.9	0.27	0.44	224557.3
beta_1k[2,1]	-0.53	0	0.5	-1.36	-1.17	0.1	0.28	214728.6
beta_1k[3,1]	0.16	0	0.43	-0.55	-0.39	0.71	0.86	242228.2
beta_1k[4,1]	-1.67	0	0.76	-2.92	-2.64	-0.7	-0.43	225212.8
beta_1k[1,2]	-0.07	0	0.8	-1.42	-1.12	0.94	1.2	62471.8
beta_1k[2,2]	0.49	0	0.63	-0.54	-0.32	1.3	1.52	110213.8
beta_1k[3,2]	-0.72	0	0.67	-1.83	-1.58	0.13	0.37	242136.2
beta_1k[4,2]	-1.51	0	0.71	-2.68	-2.41	-0.61	-0.36	239604.7
delta_1k[1]	-0.25	0	0.94	-1.76	-1.44	0.98	1.33	70522.85
delta_1k[2]	-1.02	0	0.82	-2.38	-2.07	0.02	0.31	118793.8
delta_1k[3]	0.88	0	0.79	-0.42	-0.13	1.9	2.19	241075.6
delta_1k[4]	-0.16	0	1.03	-1.86	-1.48	1.16	1.54	231802.2
trait_value_F[2]	5.64	0.02	5.16	-0.52	1.62	9.72	11.72	66682.4
trait_value_A[2]	2.81	0.02	4.89	-3.26	-1.23	6.81	8.86	80051.39
trait_value_F[1]	5.44	0.01	3.29	1.62	2.92	8.09	9.36	70317.5
trait_value_A[1]	3.22	0.01	3.1	-0.64	0.65	5.77	7.06	81550.33

root_diam								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	0.42	0	1.02	-0.9	-0.48	1.33	1.74	84696.51
beta_1e[2]	0.64	0	1.03	-0.69	-0.27	1.54	1.95	91703.15
delta_1e	-0.23	0	1.46	-2.08	-1.49	1.06	1.66	94384.22
beta_1k[1,1]	0.29	0	0.18	-0.01	0.06	0.51	0.57	229495.9
beta_1k[2,1]	0.54	0	0.18	0.25	0.31	0.77	0.84	226897.7
beta_1k[3,1]	1	0	0.18	0.7	0.77	1.23	1.29	242663.5
beta_1k[4,1]	0.56	0	0.21	0.22	0.3	0.82	0.9	243837.6
beta_1k[1,2]	0.25	0	0.21	-0.09	-0.01	0.52	0.6	101637.8
beta_1k[2,2]	1.02	0	0.19	0.7	0.77	1.27	1.34	122200.8
beta_1k[3,2]	0.73	0	0.18	0.43	0.5	0.97	1.04	242954.5
beta_1k[4,2]	0.71	0	0.19	0.39	0.46	0.95	1.01	240486.2
delta_1k[1]	0.04	0	0.27	-0.41	-0.31	0.38	0.48	145858.4
delta_1k[2]	-0.48	0	0.26	-0.91	-0.81	-0.15	-0.05	174858.5
delta_1k[3]	0.26	0	0.26	-0.16	-0.06	0.59	0.68	240710.8
delta_1k[4]	-0.14	0	0.28	-0.6	-0.5	0.21	0.31	240308.9
trait_value_F[2]	3.65	0.01	2.26	0.73	1.67	5.63	6.59	74625.77
trait_value_A[2]	3.13	0.01	2.24	0.22	1.16	5.13	6.09	86772.93
trait_value_F[1]	3.01	0.01	1.43	1.16	1.76	4.27	4.88	68259.56
trait_value_A[1]	2.71	0	1.41	0.86	1.46	3.98	4.59	86755.05
SLA								
	mean	se_mean	sd	5%	10%	90%	95%	n_eff
beta_1e[1]	-7.34	0.01	2.69	-10.75	-9.81	-4.84	-3.88	81119.64
beta_1e[2]	-6.45	0.01	2.83	-10.22	-9.27	-3.6	-2.57	94967.16
delta_1e	-0.88	0.01	3.91	-6.03	-4.66	2.89	4.22	84034.61
beta_1k[1,1]	-7.54	0	1.54	-10.07	-9.5	-5.56	-5	112079.7
beta_1k[2,1]	-7.13	0	1.58	-9.68	-9.13	-5.1	-4.51	106520.5
beta_1k[3,1]	-7.95	0	2.01	-11.23	-10.51	-5.37	-4.62	171649.8
beta_1k[4,1]	-11.11	0.01	2.52	-15.25	-14.34	-7.87	-6.94	85677.09
beta_1k[1,2]	-6.68	0.01	1.86	-9.68	-9.02	-4.3	-3.58	97616.27
beta_1k[2,2]	-6.24	0.01	1.93	-9.42	-8.69	-3.78	-3.07	104663.4
beta_1k[3,2]	-20.52	0.01	2.58	-24.71	-23.8	-17.22	-16.25	141721.8
beta_1k[4,2]	-12.69	0.01	2.77	-17.2	-16.22	-9.12	-8.09	160499.5
delta_1k[1]	-0.85	0.01	2.43	-4.9	-3.96	2.21	3.07	96965.45
delta_1k[2]	-0.89	0.01	2.5	-4.97	-4.06	2.3	3.26	105474.7
delta_1k[3]	12.57	0.01	3.27	7.18	8.39	16.76	17.94	139188.9
delta_1k[4]	1.58	0.01	3.74	-4.56	-3.22	6.37	7.73	156294.7
trait_value_F[2]	12.96	0.02	5.13	7.11	9.24	16.78	18.93	107728.4
trait_value_A[2]	9.64	0.02	5.15	3.83	6.03	13.27	15.42	84338.5
trait_value_F[1]	19.41	0.01	3.39	15.3	16.62	22.2	23.47	119574.1
trait_value_A[1]	16.97	0.01	3.36	13.06	14.38	19.59	20.88	95773.48