



HAL
open science

Analysis and integration of heterogeneous data from response to low temperature condition of two *Arabidopsis thaliana* ecotypes

Harold Duruflé, Vincent Hervé, Philippe Ranocha, Cécile Albenne, Sébastien Déjean, Josiane Chourré, Vincent Burlat, Thierry Balliau, Michel Zivy, Elisabeth Jamet, et al.

► To cite this version:

Harold Duruflé, Vincent Hervé, Philippe Ranocha, Cécile Albenne, Sébastien Déjean, et al.. Analysis and integration of heterogeneous data from response to low temperature condition of two *Arabidopsis thaliana* ecotypes. Day of the Doctoral School SEVAB, Mar 2016, Toulouse, France. hal-03511731

HAL Id: hal-03511731

<https://hal.inrae.fr/hal-03511731v1>

Submitted on 5 Jan 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Analysis and integration of heterogeneous data from response to low temperature condition of two *Arabidopsis thaliana* ecotypes

Harold Duruflé^a, Vincent Hervé^a, Philippe Ranocha^a, Cécile Albenne^a, Sébastien Déjean^c, Josiane Chourré^a, Vincent Burlat^a, Thierry Balliau^b, Michel Zivy^b, Elisabeth Jamet^a, Philippe Besse^c, Christophe Dunand^a

^a Laboratoire de Recherche en Sciences Végétales, UMR 5546; ^b Plateforme d'Analyse Protéomique de Paris Sud-Ouest; ^c Institut de Mathématique de Toulouse (IMT), UMR 5219; Email addresses: harold.duruflé@lrsv.ups-tlse.fr

Context

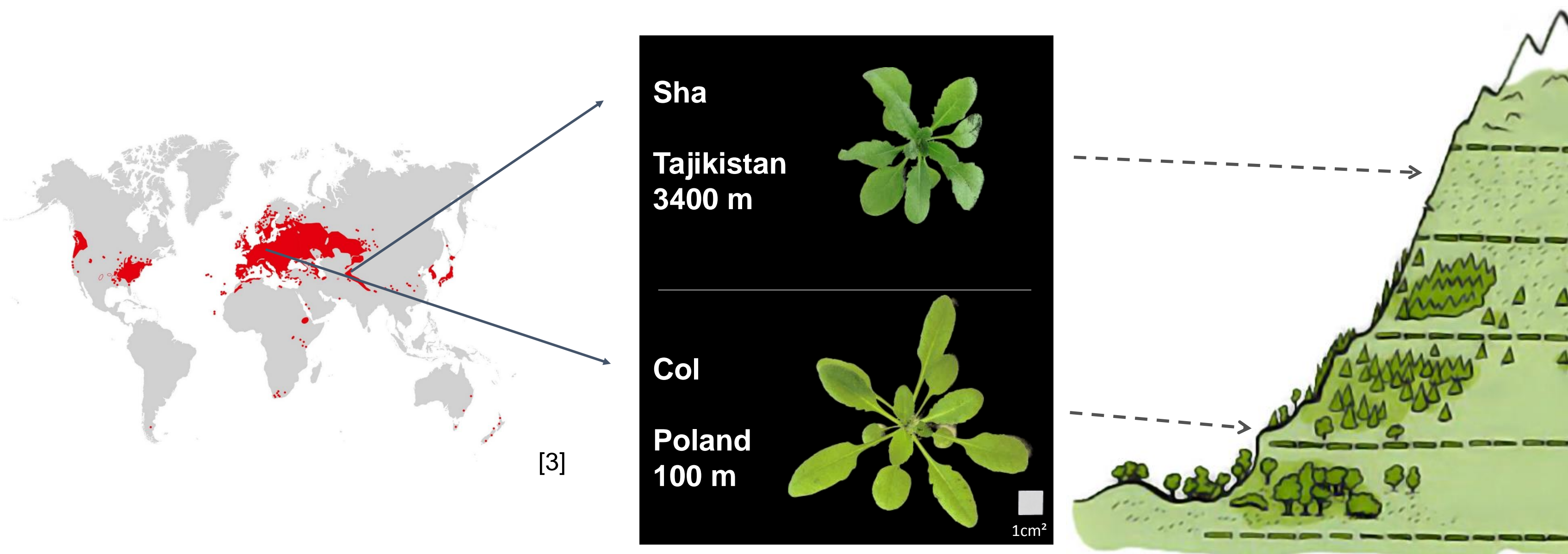
The plant cell wall represents an **external physical barrier** crucial to perceive and limit the effect of environmental changes on plant physiology. This compartment in contact with the environment can **change its structure and composition**¹ to maximize plant acclimatization. In previous studies, it has been shown that cell wall proteins are important players in these processes². By providing, combining and **integrating heterogeneous omics data**, this study aims at identifying relevant profiles possibly related to modulation of **cell wall plasticity** in response to temperature variations.

Strategies & Objectives

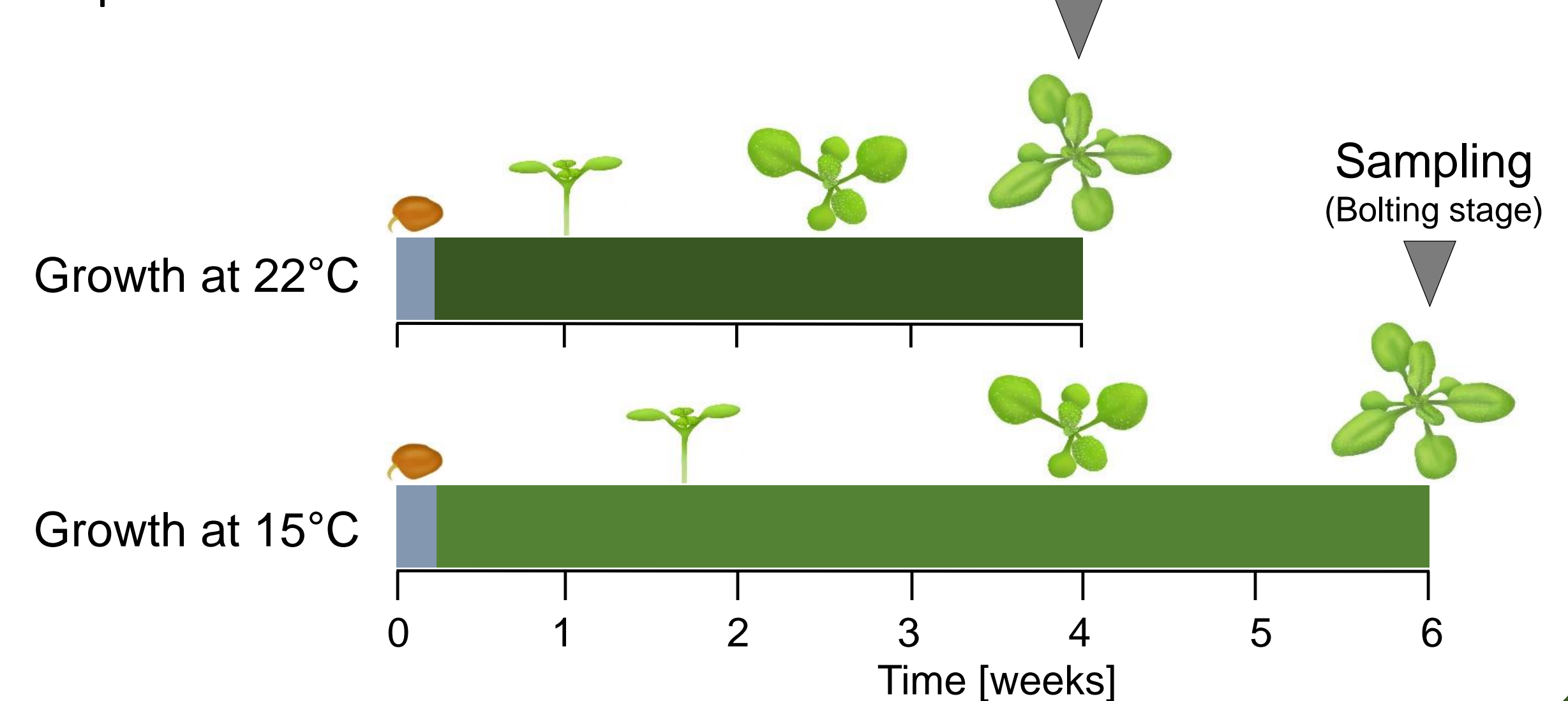


Experimental Protocol

Considering its large ecological distribution and its multiple natural and contrasted ecotypes, the model plant *A. thaliana* has been chosen to study the influence of temperature on cell wall plasticity.

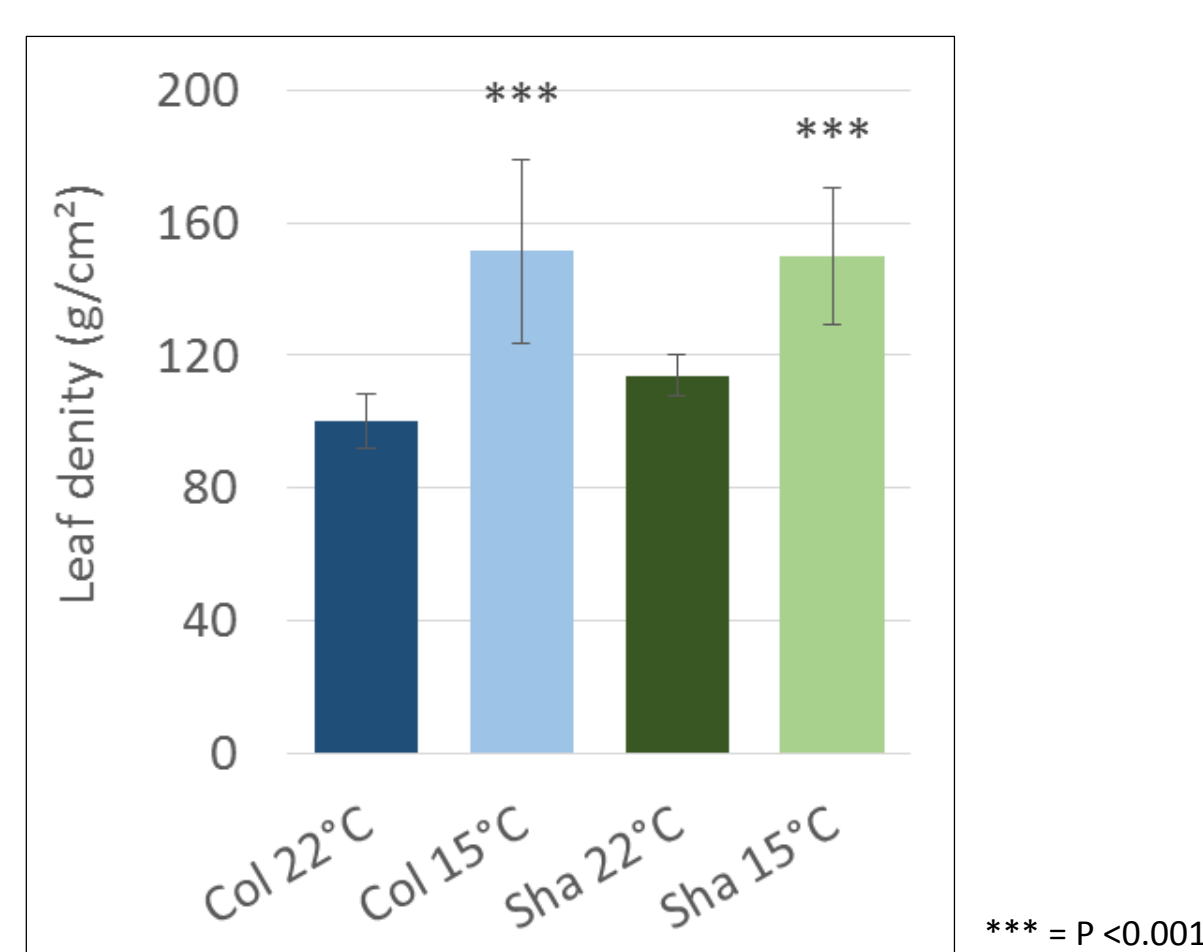
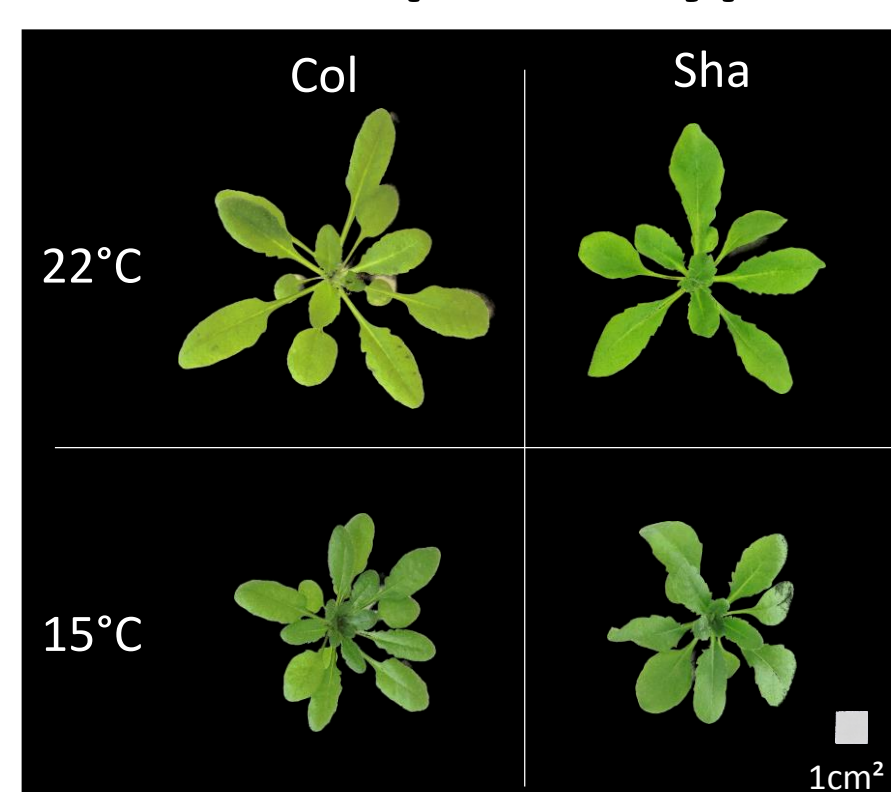


Col, a temperate ecotype (altitude 100 m), and Sha, growing in the high valley "Shakh dara" in Tajikistan (altitude 3400 m) have been cultivated at two different temperatures to highlight their contrasted responses of acclimatization.

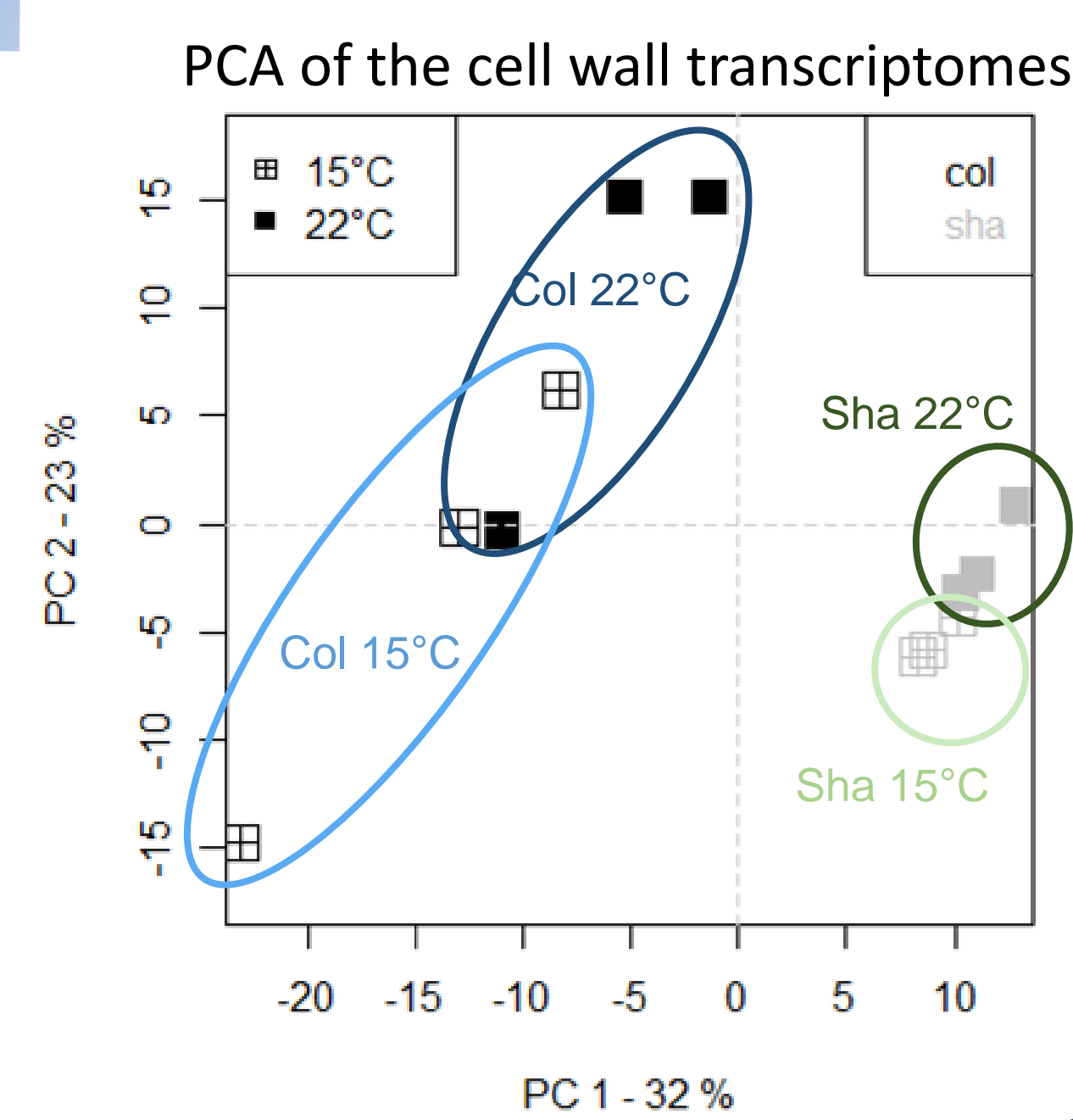
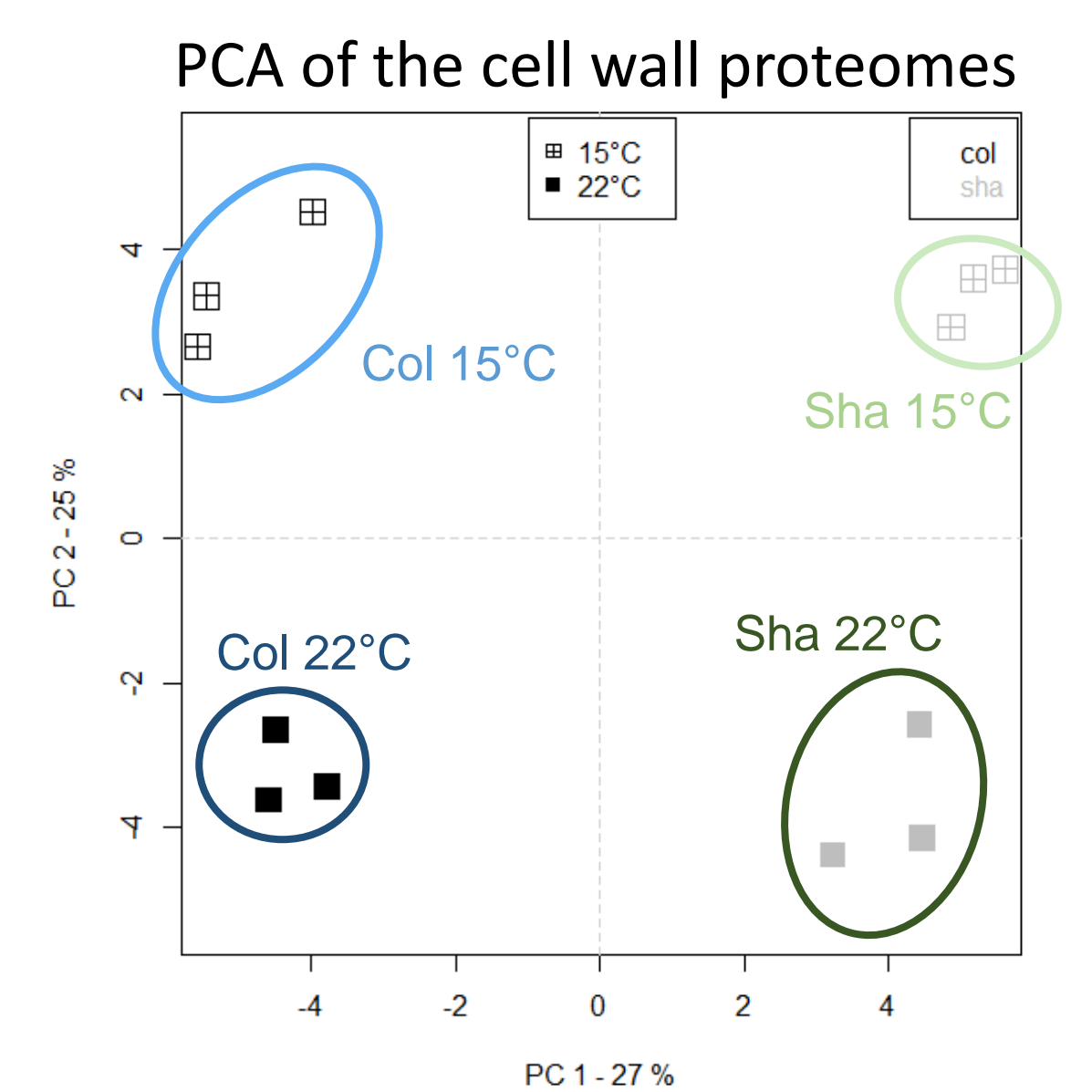


Results

1) The contrasted phenotype ...

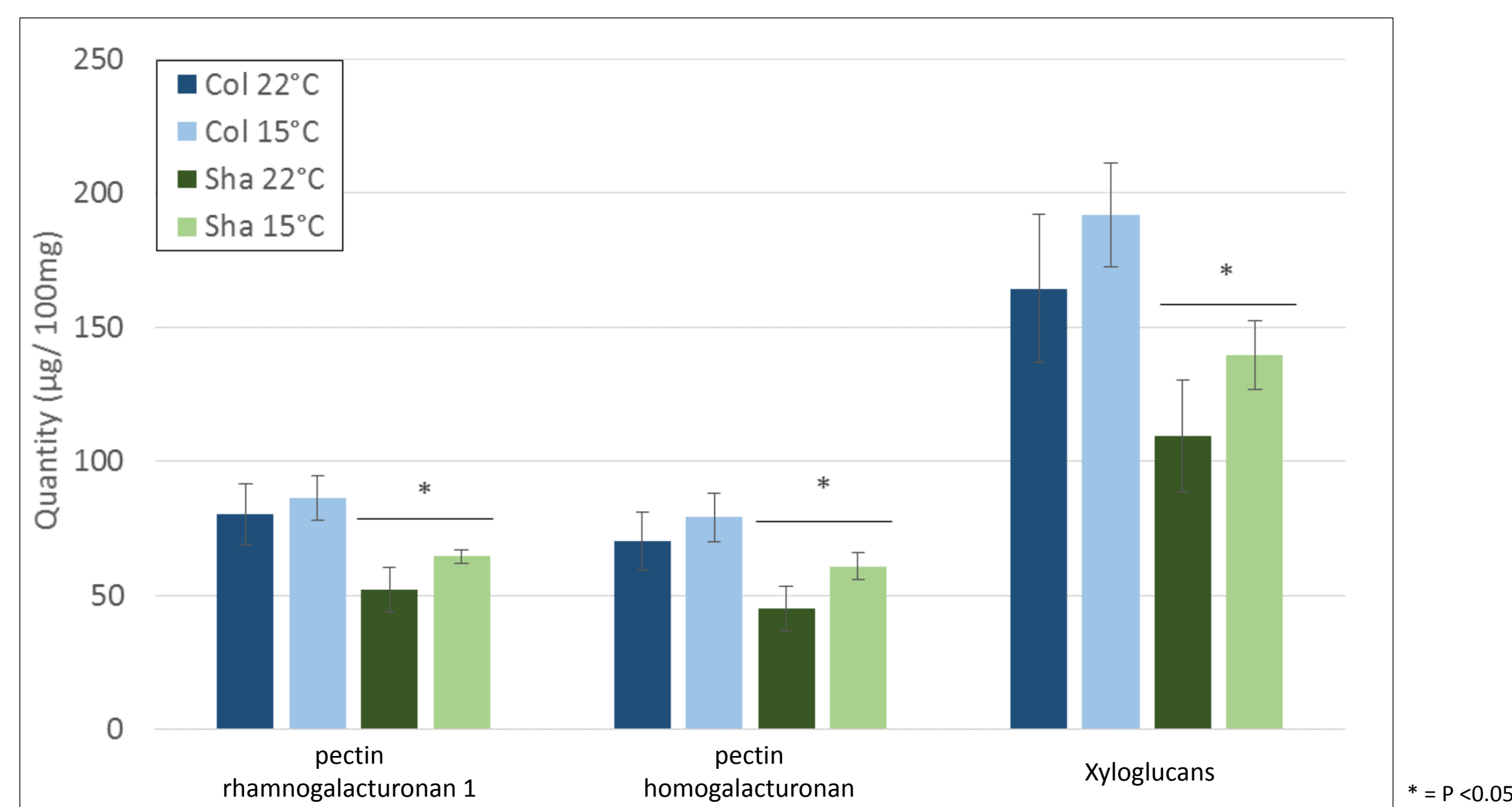


3) and the proteome and transcriptome profiles.



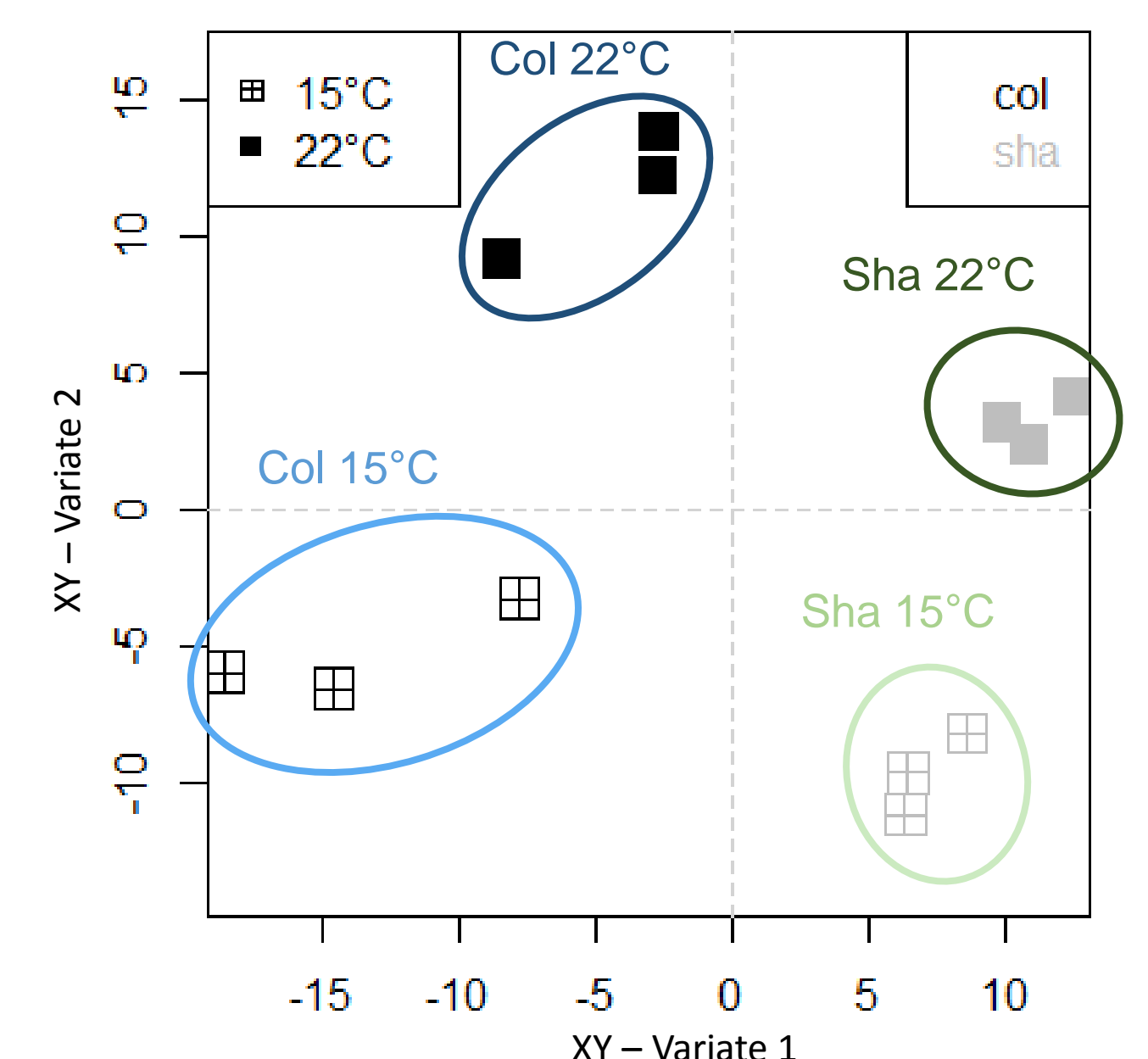
2) may be explained by modification of the cell wall polysaccharides...

Cell wall polysaccharides reconstructed from monosaccharide analysis by HPAEC



Integrative study

The integrative study between cell wall proteomes and transcriptomes using PLS (Partial Least Squares regression) analysis allow us to show these heterogeneous data in a unique statistical space...



and give us interesting candidates:

Example:

α -xylosidase 2 cleaves xyloglucans

	Col 22°C	Col 15°C	Sha 22°C	Sha 15°C
Proteins	0	0	+	+
Transcripts	0	0	+	+
Xyloglucans	+	+	-	-

one element that could explain the phenotype

Conclusion & Perspectives

In conclusion, we have demonstrated that *A. thaliana* has a specific response to the low temperature condition and we have observed specific responses depending on the ecotypes and on the temperature conditions with good repeatability. Furthermore, the integrative study is helpful to provide interesting candidates to explain these effects and to understand the relationships between different heterogeneous omics data sets.

In perspective, we will characterize the most interesting candidates and study their roles in the cell wall and we will try to explain the phenotype variability by the integration of more than 2 heterogeneous data.

References: [1] Franková & Fry, J Exp Bot. 2013; 64:3519-3550; [2] Albenne et al., Front Plant Sci. 2013; 4:111; [3] Krämer, eLife. 2015; 4:e06100