



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

## Loss of freezing tolerance of *Hydrangea* under natural and experimental temperature changes

Pagter, Majken; Renaut, Jenny; Hausman, Jean-Francois; Lefèvre, Isabelle; Sergeant, Kjell; Arora, Rajeev

*Publication date:*  
2012

*Document Version*  
Early version, also known as pre-print

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*  
Pagter, M., Renaut, J., Hausman, J-F., Lefèvre, I., Sergeant, K., & Arora, R. (2012). *Loss of freezing tolerance of Hydrangea under natural and experimental temperature changes*. Abstract from Hydrangea 2012, Angers, France.

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.

## Loss of freezing tolerance of *Hydrangea* under natural and experimental temperature changes

Majken Pagter<sup>1</sup>, Jenny Renaut<sup>2</sup>, Jean-Francois Hausman<sup>2</sup>, Isabelle Lefèvre<sup>2</sup>, Kjell Sergeant<sup>2</sup>, Rajeev Arora<sup>3</sup>

<sup>1</sup>Department of Food Science, Aarhus University, DK-5792 Aarslev, Denmark

<sup>2</sup>Centre de Recherche Public – Gabriel Lippmann, Department EVA, 4422 Belvaux, Luxembourg

<sup>3</sup>Department of Horticulture, Iowa State University, Ames, IA 50011, USA

Temperate winters are becoming progressively milder due to global warming, and temperature patterns are becoming increasingly irregular with risk of warm spells. Warm spells may cause premature cold deacclimation, thereby increasing the risk of subsequent freezing injury. This research investigated the timing and rate of deacclimation in stems of non-endodormant *Hydrangea macrophylla* ssp. *macrophylla* (Thunb.) Ser. 'Alma' and *Hydrangea paniculata* Sieb. 'Vanille Fraise' under both natural conditions and in response to a simulated warm spell (22°C/17°C day/night).

In both *H. paniculata*, the mid-winter hardier genotype, and *H. macrophylla* small fluctuations in air temperature during late winter and spring had a direct effect on cold hardiness of stems, whereas the long-term effect of increased temperatures caused a sigmoid deacclimation pattern. Under natural conditions the two species started to deacclimate at approximately the same time, but *H. paniculata* deacclimated faster than *H. macrophylla*. Similarly, under a simulated warm treatment, *H. paniculata* deacclimated to a greater extent than *H. macrophylla*. This implies that greater risk of frost injuries in *H. macrophylla* than in *H. paniculata* is not due to earlier or faster deacclimation in the former than the latter species, but is merely a result of the relative lower absolute cold hardiness of *H. macrophylla* during mid-winter and spring.

Temperature alterations drive or, at least, are closely related to carbohydrate catabolism, which is an important component of deacclimation physiology in *Hydrangea*. Significant differences in accumulation patterns of specific soluble carbohydrates between *H. macrophylla* and *H. paniculata* indicated contrasting species-specific responses; including the possible involvement of 1-kestose, heretofore not implicated in freezing tolerance of woody perennials.

A recent, more detailed study of *H. paniculata* revealed that, in addition to changes in carbohydrate metabolism, loss of freezing tolerance is also associated with significant changes in the bark proteome. Using two-dimensional difference gel electrophoresis (DIGE) ca. 100 spots were identified differing significantly in abundance in the bark of *H. paniculata* during deacclimation and showing a clear seasonal separation.

This research was supported by the Danish Research Council for Technology and Production Sciences (Grant No. 274-08-0331)