Deacclimation Significantly Reduced Cold Hardiness of Densa and Shamrock Inkberry

Youping Sun*, Donglin Zhang

Department of Plant, Soil, and Environmental Sciences

University of Maine, Orono, ME 04469

**Youping.sun@umit.maine.edu*

Introduction

Ilex glabra (L.) A. Gray is a native evergreen shrub with fine textured foliage and black fruits (Fig. 1). It is an ideal woody ornamental plant for northern landscape. A total of 27 cultivars are reported in the literature, but most cultivars are not in the horticultural market. That may result from the vulnerability to low-temperature injury.

Fig.1. Foliage (A) and fruit (B) of Inkberry.

Plant' s ability to survive the stress of a winter environment without injury depends on the timing of acclimation, maximum cold hardiness capacity, and ability to resist rapid deacclimation or ability to reacclimate rapidly after unseasonable warm periods in late winter. Northern US states have usually experienced unexpected warm temperature during winter season. However, influence of the deacclimation on the cold hardiness of Inkberry is unknown.

Objective

To determine the significance of deacclimation on the cold hardiness of 'Densa' and 'Shamrock' Inkberry.

Materials and Methods

- Fully cold acclimated potted plants (Fig.1A) of 'Densa' and 'Shamrock' Inkberry were moved into a greenhouse (20.8±1.9 C) for deacclimation every other day from 18 to 27 Jan. 2008.
- Leaf discs (30.7 mm2) were sampled to be frozen from -4 to -48C with intervals of 4 C in a programmable freezer (Fig. 1B,C).
- Electronic leakage conductance were measured after leaf samples were completely thawed in a cooler and stored at room temperature for 24 hr with 10 ml of dd water.
- LT50 (lethal temperature for 50% cold damaged) were calculated by using the Boatman's model.

Fig.2. Acclimated inkberry (A), leaf discs (B), freezer (C) for cold hardiness measurement.

Results and Discussion

Cold hardiness of 'Densa' significantly reduced by 3.9 C from zero to three days of deacclimation (DOD), then gradually dropped only by 1.1 C till seven DOD, and followed by another dramatically decreasing of 5.5 C at nine DOD. While that of 'Shamrock' gradually decreased only by 5.4 C from zero to nine DOD. Their cold hardiness had a strong, negative linear correlation as DOD increased (r2 = 0.78 for 'Densa' and 0.88 for 'Shamrock'). 'Densa' lost its cold hardiness faster than 'Shamrock' did. A total of 33.5% and 17.2% of cold hardiness reduction were observed for 'Densa' and 'Shamrock' Inkberry, respectively (Fig.3).

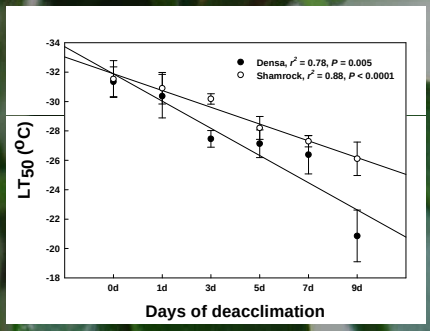

Fig. 3. Function of LT50 value (n=3) as days of deacclimation.

Conclusion

Deacclimation significantly reduced cold hardiness of Inkberry and its effect varied with cultivars. Cold hardiness of 'Densa' decreased by 10.5C after 9 DOD, while only 5.4C for 'Shamrock'.

References

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