

Adventitious rooting in response to long-term cold: a possible mechanism of clonal growth in alpine perennials

Priyanka Mishra¹, Alice Vayssieres¹, Adrian Roggen¹, Karin Ljung², and Maria Albani¹

¹University of Cologne

²Swedish University Of Agricultural Sciences

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Abstract

Arctic alpine species experience extended periods of cold and unpredictable conditions during flowering. Thus, often, alpine plants use both sexual and asexual means of reproduction to maximise fitness and ensure reproductive success. We used the arctic alpine perennial *Arabis alpina* to explore the role of prolonged cold exposure on adventitious rooting. We exposed plants to 4°C for different durations and scored the presence of adventitious roots on the main stem and axillary branches. Our physiological studies demonstrated that the presence of adventitious roots positively correlates with increased duration of exposure to cold treatment, with 21 weeks at 4 °C saturating the effect of cold on adventitious rooting. On the main stem adventitious roots developed in specific internodes. Transcriptomic and histological studies indicated that adventitious roots in *A. alpina* stems are initiated during cold exposure and emerge after plants experience growth promoting conditions. The emergence of the adventitious root primordia correlates with an increase in auxin response and free endogenous auxin in the stems. Our results highlight the role of low temperature during clonal growth in alpine plants and provide insights on the molecular mechanisms involved at different stages of adventitious rooting.

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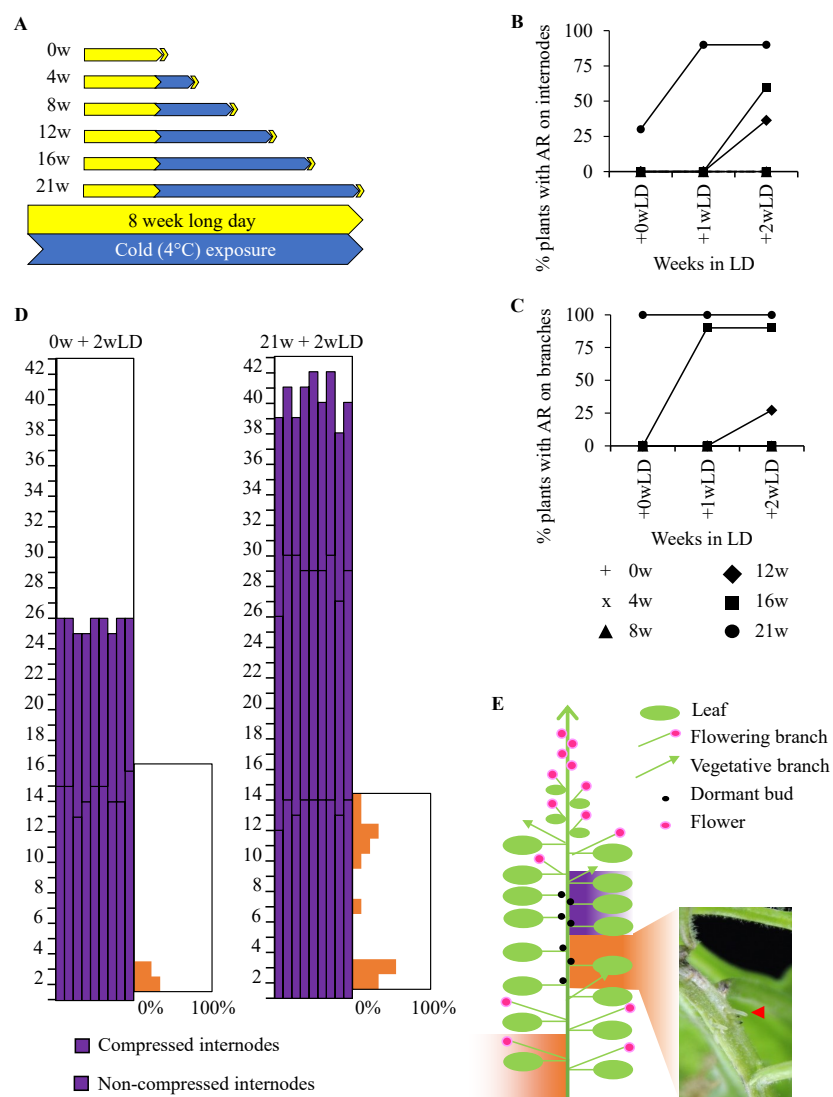


Figure 1.

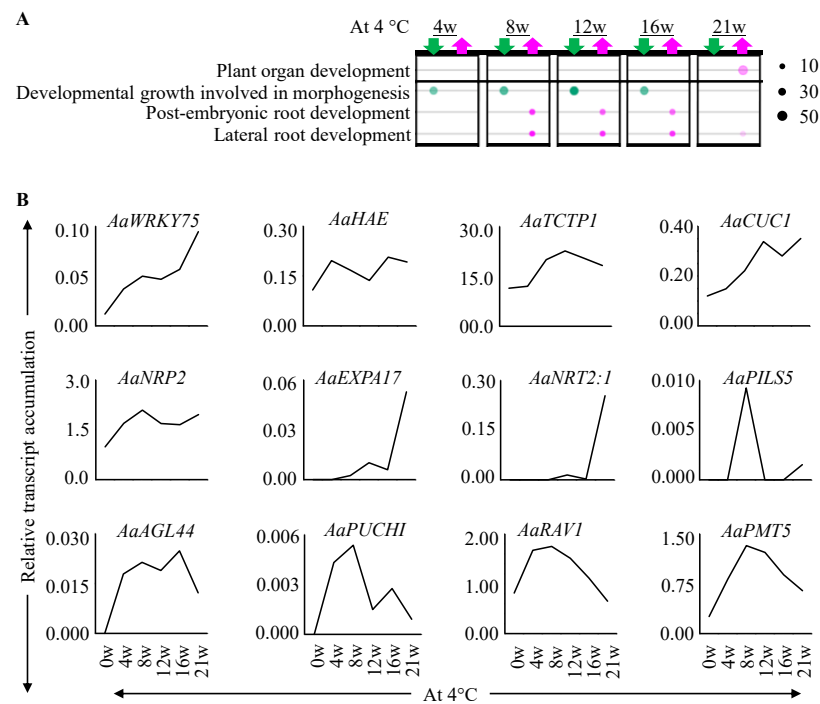


Figure 2.

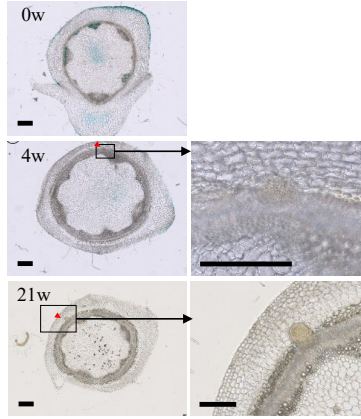


Figure 3.

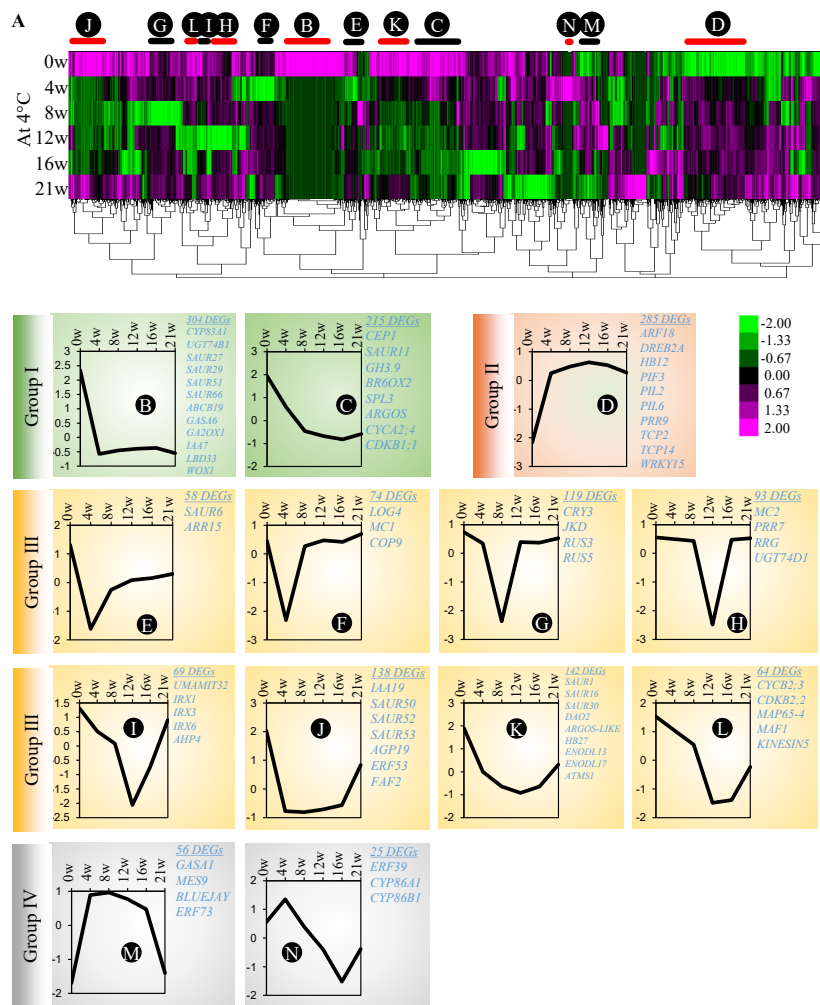


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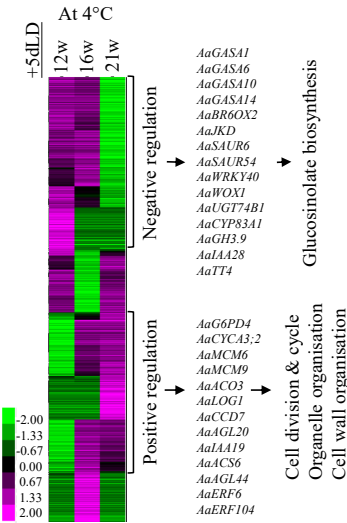


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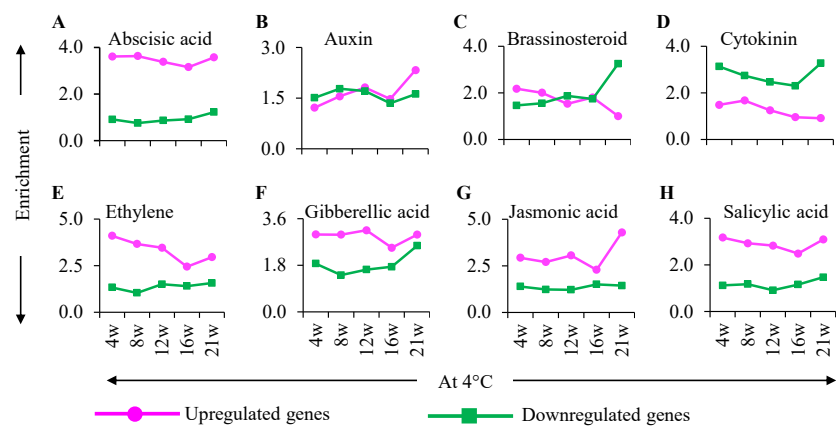


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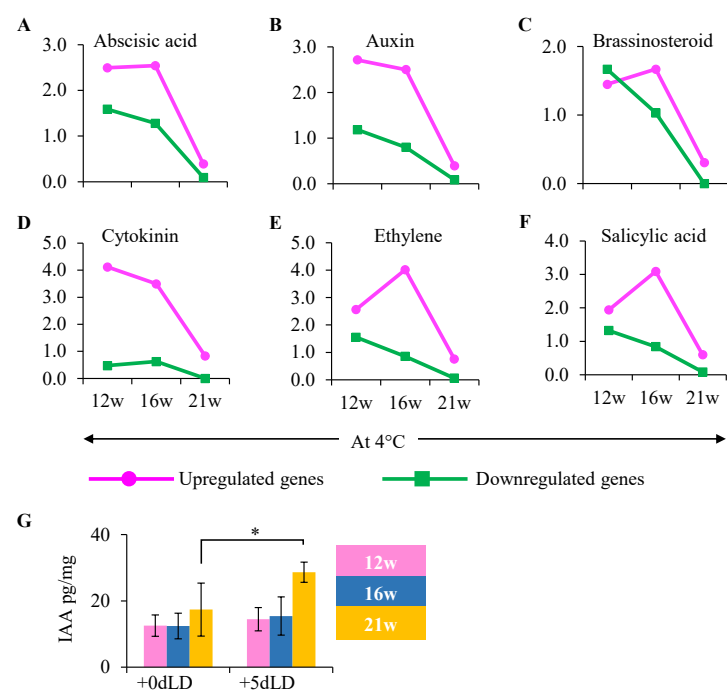


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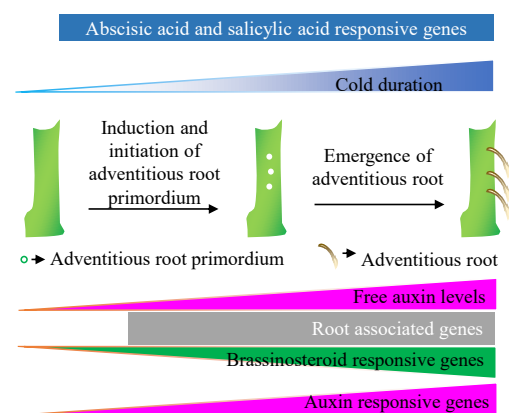


Figure 8.