PLANT & ANIMAL GENOME

PO0675

Preliminary study on genes involved in vigor and development in *Prunus* rootstock-scion interactions

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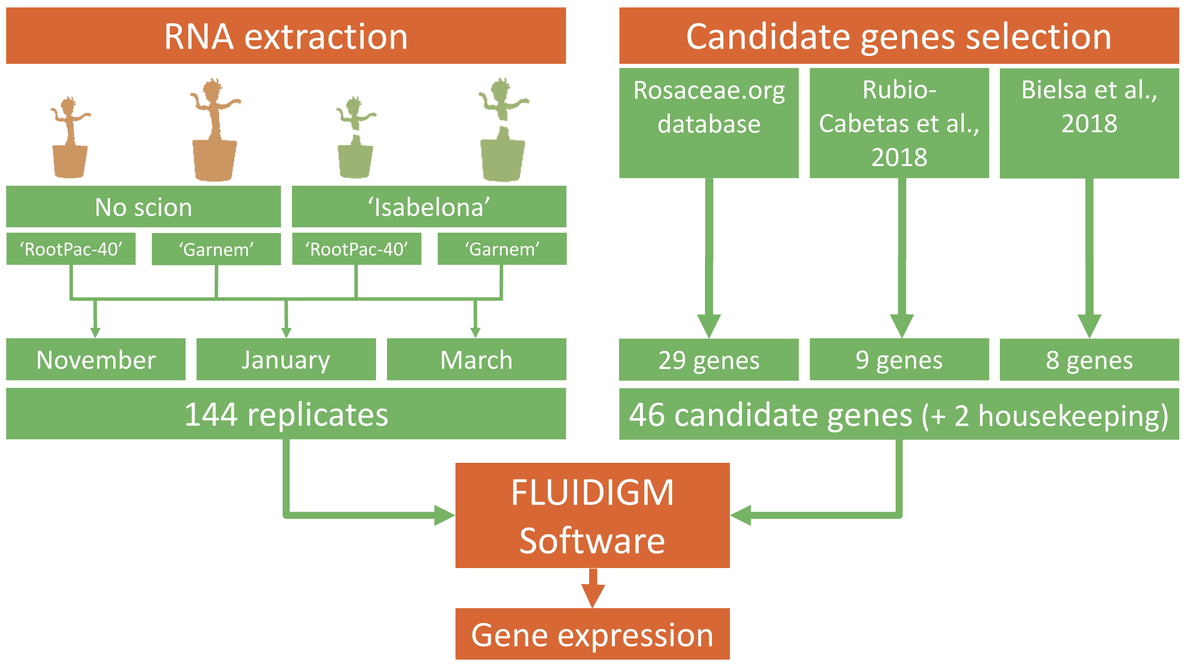
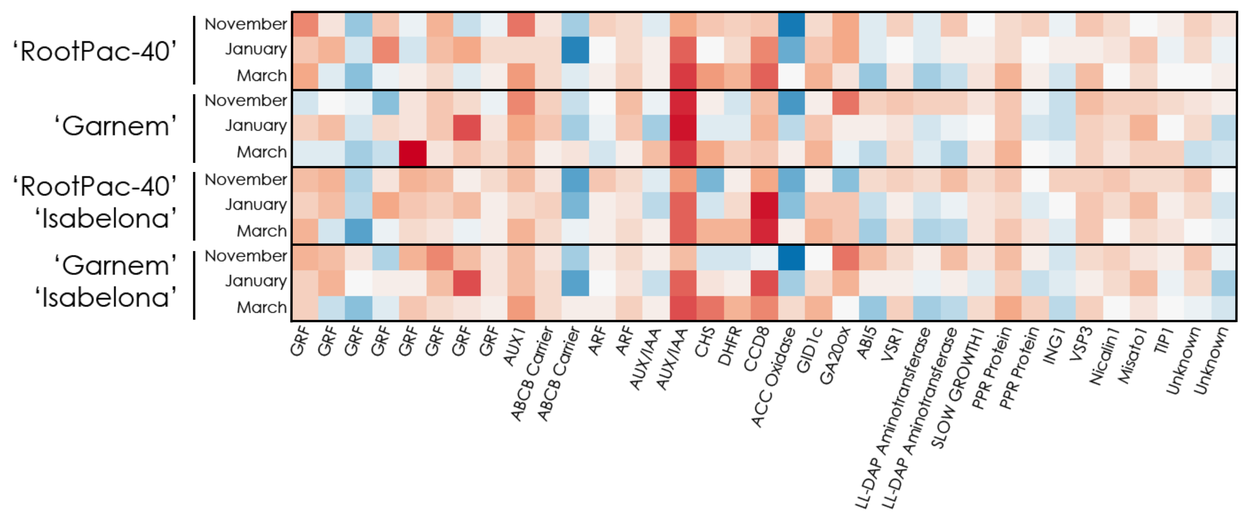
Introduction

Semi-high and super-high density orchards are an important trend in new almond planting. Setting up these orchards require low vigor-conferring scion/rootstock combinations. This represents two important challenges for breeders: to obtain cultivars with both low vigor rootstocks and manageable tree architecture. In order to accomplish this goal, we need to understand how the interaction of rootstock vigor and branch architecture affects development and adaption in almond. Previous research in angiosperms have shown genes related both to floral transition and to vigor (Foster et al., 2013). In our study, we have analyzed the genetic expression in phloem tissue through dormancy to floral transition. The experiment was carried out in two hybrid rootstocks representing low and high vigor, with and without a scion.

Materials and Methods

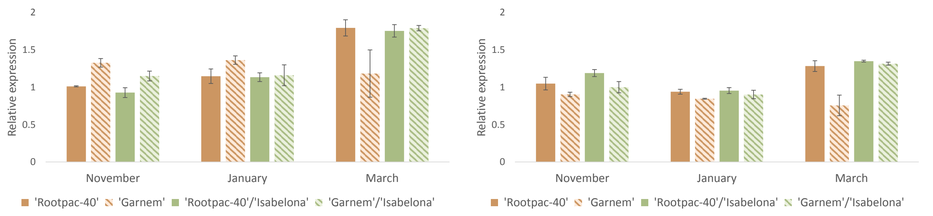


Heatmap

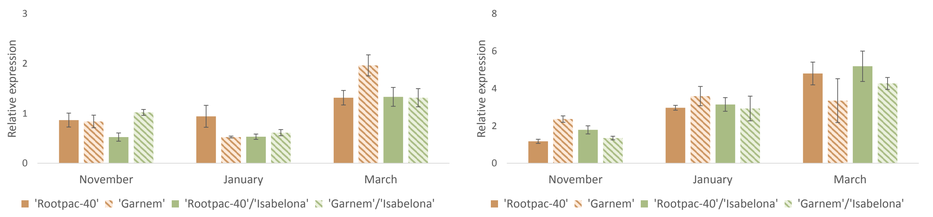


Auxin

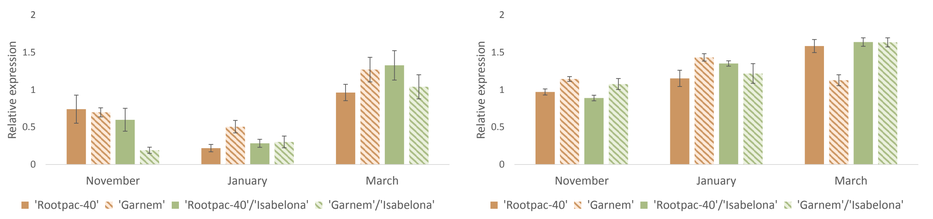
Auxin Response Factors



AUX/IAA

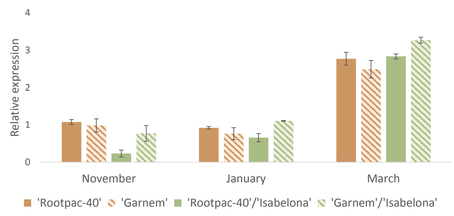


ABCB Carriers

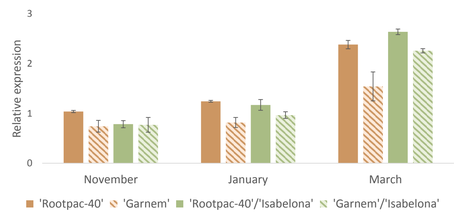


Strigolactone

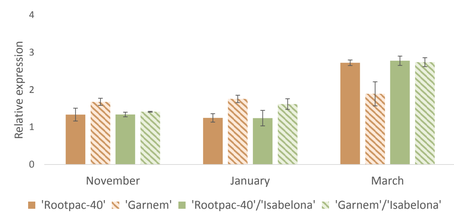
Chalcone Synthase



Dehydrofolate Reductase

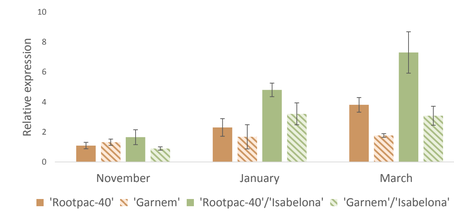


Auxin Permease 1

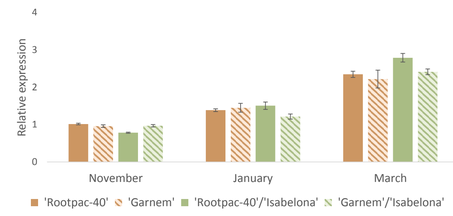


Gibberelic Acid

CCD8

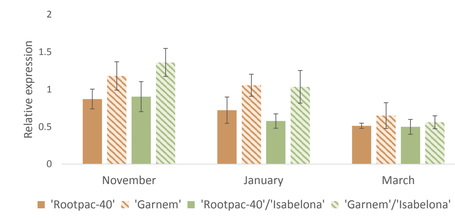


GIDc Receptor



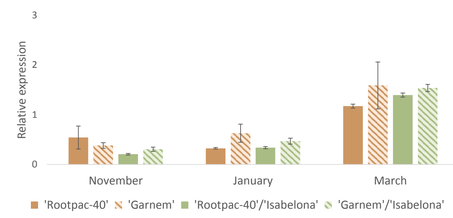
Abscisic Acid

Abscisic Acid Insensitive 5



Ethylene

ACC Oxidase



Conclusions

In this study, genes implicated in the synthesis and response of hormones involved in growth promotion showed an overexpression profile in March, while genes inhibiting vegetative development were repressed. The role of auxin in growth is known since a long time (Delker et al., 2008). Besides being upregulated in March, expression of some auxin-response genes differed between rootstocks. While 'RootPac-40' showed similar expression levels with and without the scion, 'Garnem' levels in March were lower compared to other time points, but only in ungrafted plants. Auxin is synthetized in aerial parts of the plant and then is transported to the roots (Delker et al., 2008), which might explain why expression levels in grafted 'Garnem' are similar to those in grafted 'RootPac-40'. Strigolactones (SL) are a crucial part of branching regulation, but are also positively correlated with vigor (de Saint Germain et al., 2013). An SL synthesis homolog gene *CCD8* (Waldie et al., 2014) was overexpressed in 'RootPac-40' vs 'Garnem'. Although once grafted, the expression levels increased in both rootstocks, the difference between rootstocks was maintained. This might indicate that a signal from the scion affects SL synthesis, combined with the rootstock influence. These results lead us to suggest that the expression of auxin response and SL biosynthesis genes is activated early in the dwarfing rootstock 'RootPac-40'. No difference was observed between rootstocks for genes involved in other hormonal responses, such as ethylene, gibberellins and abscisic acid. Further research is needed to understand how the interaction of the rootstock and scion hormonal responses affects plant vigor.

References

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Acknowledgements

This work was supported by RTA-2014-0062 and by FPI-INIA2016 CPD2016-0056.