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EPIGENETIC SIGNATURES REGULATE FLOWER BUD ENDODORMANCY IN PEACH (PRUNUS PERSICA)

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Perennial deciduous fruit trees have evolved adaptive mechanisms, such as bud dormancy, to survive the critical environmental conditions. Tree buds enter in a dormant state during which visible growth is limited mainly by environmental and genetic factors. After the exposure to low temperature and fulfillment of bud chilling requirements, mild temperatures promotes the release from bud dormancy and growth reactivation. In peach flower buds, an insufficient chilling exposure may lead to the abortion of the reproductive whorls, to low bud burst and non-uniform blooming, with negative impact on fruit set and quality. Indeed, the selection of cultivars with low chilling requirements is a breeding priority, mainly for milder regions where peach floral buds on trees do not always satisfy their chilling requirement to complete their development. During the chilling period, the reproductive whorls differentiate very slowly in the dormant flower bud, but the major developmental events, including the female gametophyte differentiation in the carpel and the microsporogenesis and pollen maturation in the anthers, occur at the end of the chilling period which is necessary for flowering.

In this work we focused our attention on flower bud development during winter in peach. To understand how bud development progression is regulated

during winter we integrate the methylome and chromatin genome wide data with transcriptional outputs to obtain a complete picture of the main regulatory pathways involved in flower bud dormancy. Until now, a group of six tandemly repeated transcription factors of the MADS-box gene family, named DORMANCY ASSOCIATED MADS-box genes (DAM 1-6) were identified in peach genome as the major regulators of the dormancy progression. However, we observed that the DAM genes are expressed in all the whorls of flower bud and their transcriptional regulation at chromatin level is not consistent with a major role in dormancy progression. Indeed, our results highlight the importance of chromatin signature in the regulation of the hormonal balance and chilling adaptation on both reproductive whorls differentiation and gamete formation, which proceed slowly during winter. Moreover, our results brought to light existing differences as well as intriguing homologies between the dormancy progression in flower bud compared to vegetative buds.