

SYSTEM GENETICS APPROACH DISCLOSED THE GENETIC ARCHITECTURE OF THE CHILLING INJURY DISORDER SUPERFICIAL SCALD IN APPLE

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To promote fruit quality and security, fruit, after harvest, are stored at low temperature to slow down the general metabolism towards the prevention of over-ripening processes and fruit decay. The lowering down of temperature can, however, also stimulate the onset of chilling injury phenomenon, such as the superficial scald, which can severely compromise the entire fruit marketability, especially in apple. To this end, the Euregio project “ScaldCold” aimed to comprehensively dissect the superficial scald physiology in apple, initially through a transcriptome-metabolite investigation that shed light on the role of the polyphenol oxidase and its interaction with the chlorogenic acid, as primary mechanism involved in the control of superficial scald. The genetic control of this disorder was further investigated employing a System Genetic approach, understanding the flow of biological information underlying this disorder and providing a global overview of the molecular architecture of the superficial scald control. In this regard, a bi-parental segregating population was employed to perturbate the system of this postharvest physiological disorder, integrating the genetic variome with different intermediate physiological and metabolic phenotypes, representing the superficial scald based QTLome, together with a wide-transcription

profiling in a genetical-genomic investigation. The results obtained by this holistic approach revisited past concepts and disclosed the role of new mechanisms, such as the protecting role played by specific categories of fatty acids. This information can be now exploited to improve the final quality of stored fruit or to design novel molecular markers to support the breeding in the selection of new varieties distinguished by a superior quality and storability.