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POSTER - A cost-effective strategy for marker assisted selection (MAS) in apple (*M. pumila* Mill.): the experience from the Fondazione Edmund Mach programme for resistance and quality traits

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Abstract: Marker assisted selection (MAS) permits the selection of plants carrying genes that control interesting agronomic traits through the screening of associated markers. In practice, it is possible to select the phenotype of plants at the seedling stage based on their genotype, in order to allow the breeders to retain only germplasm conferring desirable traits from an early stage.

In this work the development of a pipeline at the Fondazione Edmund Mach (FEM) to enable the implementation of a time and cost effective MAS programme for apple (*Malus pumila* Mill.) is reported, for both disease resistance and fruit quality.

Usually MAS involves the screening of hundreds or thousands of seedlings. Common high-throughput extraction methods, such as columns, are too expensive since DNA is only screened a small number of times. Thus, the main challenge faces is developing a pipeline that starts with a "lab friendly" and unambiguous seedling disposition in greenhouse, allows the rapid collection of samples avoiding cross contamination, implements a fast, cost-effective, high-throughput method of DNA extraction to be used for a small number of PCRs, and utilizes robust, reliable, and easy to interpret molecular markers. In 2013 ~6,500 seedlings from 24 apple crosses were screened in order to select seedlings conferring resistance traits, fruit quality traits or both. Lab work was performed by the KAPA 3G Plant PCR kit, with optimization both during the "quick'n'dirty" extraction and PCR amplification. The main problems encountered were associated with dirty extractions; however, following optimization less than 10% of the seedlings had to be re-sampled.

For resistance the major difficulties were represented by the implementation of SCAR (sequence characterized region) markers for scab resistance that gave low signals and intense smear. Better results were instead obtained with an SSR (simple sequence repeat) marker designed for the same trait.

Based on our experience this year, we are confident that MAS for apple fruit quality and disease resistance at FEM will be reliable and time and cost effective.

Keywords: Apple, Scab, fruit quality, resistance gene, marker assisted selection

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