Self- and Graft- incompatibility on a F1 apricot progeny

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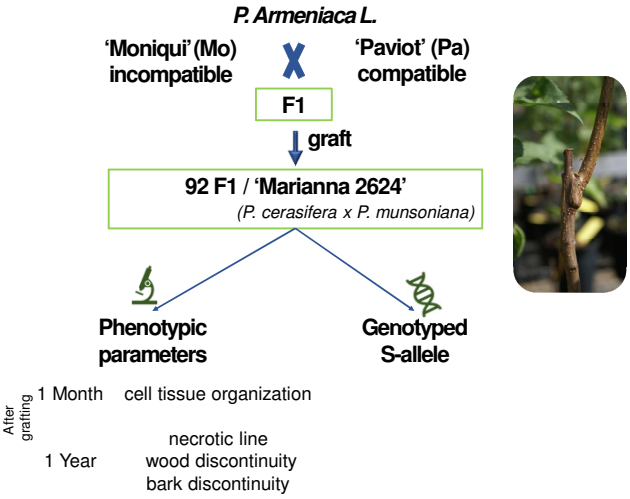
Introduction

Self- and graft- incompatibility are important agronomic traits for apricot production. Graft incompatibility can occur months to years after grafting wasting time and resources, and causing major economic losses to growers and nurseries. Self-incompatibility is also a not desirable trait for apricot cultivation since it limits productivity and breeding efficiency because of low fruit set. The genotypes of both, rootstock and scion, play an important role in rootstock-scion interaction affecting the success of graft union formation and the quality of vascular connections at the graft union [1, 2]. Likewise, floral self-incompatibility (SI) is another trait affecting yield in apricot. Many fruit species in the Rosaceae (apricot, apple, pear, plum, sweet cherry, Japanese plum, and almond) exhibit typical gametophytic self-incompatibility (SI) controlled by multi-allelic S-locus [3, 4].However, whether the two traits (self- and graft-incompatibility) are genetically dependent or not is still unknown.

Material and Methods



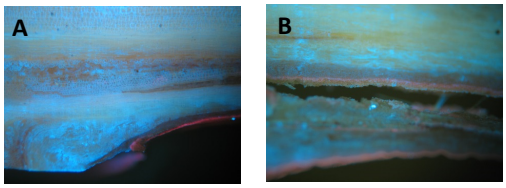


Figure 1. Cell tissue organization at one month after grafting. (A) Compatible combination. (B) Incompatible combination

Figure 2. Internal characterization at one year after grafting. The evaluation was performed as followed: necrotic line, woody and bark discontinuity.

Results and Discussion

In this study, we established an early anatomical and cytomorphological phenotyping test and determined graft compatibility between different F1 apricot seedlings from a cross between self- and graft- incompatible 'Moniqui (Mo)' and self- and graft-compatible 'Paviot (Pa)' cultivars. Both phenotypically contrast cultivars were pollinated to generate a cross potentially segregating for compatibility when grafted on Marianna 2624 rootstock. We observed continuous variation of the morphocytological characters (Figure 1 and 2) linked to formation of graft union among F1 progeny that most likely reflects a polygenic inheritance of the trait [5]. Hybrid individuals were also genotyped for establishing self-incompatibility status (Figure 3). Based on the PCR genotyping test, 53.6% of the descendants were self-compatible and 46.4% self-incompatible. Thus, the segregation ratio was 1:1 (X^2 = 1.043 at $p<0.01$) in agreement with findings by previous researchers [6,7].

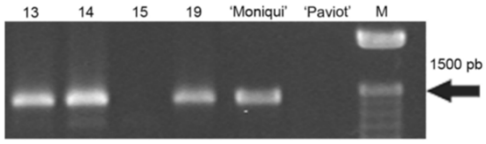


Figure 3. PCR analysis of the self-incompatibility. Amplified fragments were obtained by PCR from genomic DNA using AS1 and Pru-C4R [35] primers. Results from 4 individuals of the 'Moniqui' x 'Paviot' progeny (13, 14, 15 and 19) and their parents 'Moniqui' and 'Paviot'. Band size was determined by comparison with 100-bp molecular weight marker (M) on the right.

Finally, we estimated correlation between graft incompatibility and self-incompatibility, using the Pearson's metrics. To our knowledge, this is the first study in which the transmission of both agronomical traits have been examined in the same genetic background Strong and significant correlations were detected between anatomical (necrotic line, wood and bark discontinuity) and cytomorphological traits (cell arrangement, cell shape and cell proliferation) that may reduce the number of characters for screening genotypes or progenies for graft compatibility in segregating crosses. However, correlations between self-incompatibility trait and phenotypic parameters linked to graft incompatibility were negative suggesting that no correlation exist between these traits. Thus, screening large number of progenies independently is required for pyramiding these traits in breeding.

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