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Unraveling graft compatibility of scion/rootstock interactions in pepper

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Grafting has been used for millennia to increase uniformity, vigour and resistance to biotic and abiotic stresses. Currently, although the use of grafted plants is rapidly increasing, this practice remains limited in some cases due to inconsistent grafting success. Considering the variation of graft compatibility between even closely related species, it seems necessary to evaluate the graft compatibility before considering the use of a rootstock for a specific scion genotype. The main goal of this work was to compare Chlorophyll Fluorescence Imaging (CFI) parameters with histological studies at the graft interface in several combinations scion/rootstock with different levels of compatibility in order to demonstrate whether CFI can be useful for a rapid determination of the compatibility in pepper combinations. For this purpose, we evaluated the compatibility between the commercial pepper cultivar 'Adige' (A) and different *Capsicum* spp. accessions selected as tolerant to salinity and water stresses (A5, B14, C12 and A25 codes) 30 day after grafting. In addition, we used different graft combinations with known graft compatibility as controls: eggplant grafted on *S. torvum* and pepper homografts (A/A, high compatibility), pepper grafted on *S. torvum* (incompatibility) and pepper grafted on tomato (high incompatibility). Callus formation, new cambium and vascular connections, and the chlorophyll fluorescence parameters Fv/Fm, Φ_{PSII}, NPQ and q_P were evaluated in those graft combinations. A stronger level of graft incompatibility was observed when 'Adige' was grafted onto *S. torvum* and 'Beaufort' (tomato), and in a lesser grade in A5. In these cases, histological examination provided clear evidences of discontinuous xylem elements in the graft union as well as large areas of unbroken necrotic lines along the wounded edges of the rootstock and the scion. These observations were correlated with lower Fv/Fm, Φ_{PSII}, NPQ and q_P. By contrast, anatomical observations provided clear evidences that the graft combinations A/A and A/A25 showed the highest vascular regeneration across the graft interface, and in a lesser extent were the accessions B14 and C12. In these cases, CFI values were lower than in the less compatible combinations, thus confirming that Chlorophyll Fluorescence Imaging can be an useful non-destructive technique for the diagnosis of graft compatibility in pepper grafted plants.