UNIVERSITÀ DEGLI STUDI DI PADOVA
DAFNAE
Department of Agronomy Food Natural resources Animals and Environment

STERILITYTARGET

Identification and functional characterization of new target genes involved in plant male sterility

In Angiosperms, sexual reproduction is the main route for recombining maternal and paternal genes in the offspring. Male sterility, being one of the leading sexual barriers thatprevents selfing and supports outcrossing, represents an effective strategy to harness hybrid vigor (or heterosis), the phenomenon in which the progeny outperforms its parents in terms of vigorousness, uniformity and yield. This aspect makes heterosis of particular relevance for achieving the Sustainable Development Goal 2 “End hunger”, within the2030 Agenda adopted by the United Nations in 2015. “Producing more with less” is also in full compliance with the “Do No Significant Harm” (DNSH) principle, within the environmentally sustainable activities indicated in Article 17 of Regulation (EU) 2020/852. Despite the enormous benefits deriving from the exploitation of male sterility, the genetic mechanism underlying this barrier in several crop species is far from being understood. In this frame, this project aims to advance our knowledge on the genetics of plant reproductive systems through the combined use of omics technologies, data integration among species and genome editing. Two young scientists with different backgrounds, supported by as many specifically recruited research fellows, will combine their experience to unravel the complex tangle underlying the viable pollen production within the Angiospermae clade. Recent genetic studies in both dicotyledonous (i.e. chicory and Arabidopsis) and monocotyledonous (i.e. rice) species have postulated the conserved and key role of the transcription factor MYB80 in male fertility. Knockout mutations affecting the aforementioned gene always determine complete (i.e. with full penetrance) male sterilephenotypes. The project, organized in three Work Packages (WP), will be initially oriented towards increasing the knowledge of MYB80 in chicory and endive through omics methodologies (DAP-seq, RNA-seq, smallRNA-seq and BS-seq) and through the editing of MYB80 in endive, for which there are no efficient male sterility systems. The resulting data will be integrated with those already available for rice and Arabidopsis, to identify common High Confidence Targets (HCT) of MYB80. These will be functionally characterized and validated in rice through genome editing approaches. The final goal is the identification of new possible MYB80 targets potentially editable to induce male sterility in a wide range of crop species. A conspicuous section of the project is dedicated to coordination and

dissemination, which will be guaranteed respectively by regular meetings, high impact publications, and participation in scientific congresses and events addressed to a broader audience. The participating groups, besides being strongly committed to the cause, they would benefit from increased cooperation, laying the foundations for a research network.

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