IMPLANTEUS
SUSTAINABLE MEDITERRANEAN AGRICULTURE FOR HEALTH | GRADUATE SCHOOL

MAFEN MASTER **Academic Year 2026 - 2027**

Proposal of M1 tutored project

PROJECT TITLE AND SUMMARY:

Applications of CRISPR and AI for improving stress tolerance in crops and cross-kingdom species

In this tutored project, you will prepare a mini-literature review focusing on how CRISPR-based genome and epigenome editing, combined with artificial intelligence (AI) and machine-learning approaches, can be used to enhance stress tolerance in crops and other biological systems across kingdoms. The objective is to explore how modern gene-editing tools —such as CRISPR-Cas9, CRISPR-Cas12a, base editors, and epigenetic editors—enable precise modification of stress-responsive genes, regulatory elements, and chromatin marks, while AI models accelerate target discovery, predict editing outcomes, and optimize multi-gene engineering strategies. You are expected to search for and critically analyze recent peer-reviewed publications, identify well-characterized examples of CRISPR applications for drought, heat, salinity, pathogen resistance, or multi-stress tolerance, and describe how AI contributes to guide RNA design, off-target prediction, regulatory network inference, and phenotype forecasting. As starting points, you may examine CRISPR editing of DREB, NAC, and WRKY transcription factors, modification of ABA signaling components, engineering of heat-stress memory genes such as HSFA2, or AI-assisted identification of multi-omics stress-tolerance hubs. The mini-review should include a clear introduction to the topic, a structured synthesis of selected studies, a critical discussion comparing different methodological approaches, and a short section outlining future perspectives for CRISPR–AI synergy in agriculture and cross-kingdom biology.

HOST UNIT: ERIT – PSII (Plant Sciences Interactions and Innovation), IAgES, Avignon University

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INRAE