Job offer

PhD: Genomic analyzes to optimize the quality of the grapevines of the future

L'INRAE, l'Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement

The French National Research Institute for Agriculture, Food, and Environment (INRAE) is a major player in research and innovation. It is a community of 12,000 people with 272 research, experimental research, and support units located in 18 regional centres throughout France. Internationally, INRAE is among the top research organisations in the agricultural and food sciences, plant and animal sciences, as well as in ecology and environmental science. It is the world's leading research organisation specialising in agriculture, food and the environment. INRAE's goal is to be a key player in the transitions necessary to address major global challenges. Faced with a growing world population, climate change, resource scarcity, and declining biodiversity, the Institute has a major role to play in building solutions and supporting the necessary acceleration of agricultural, food and environmental transitions.

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VOTRE MISSION ET VOS ACTIVITÉS

- You will be welcomed within the UMR "Vine Health and Wine Quality" (SVQV) whose mission is to develop research and experiments to respond to the challenges of qualitative viticulture, with low inputs and resilient to global warming. To address these challenges, INRAE launched a program in 2000 to create grapevine varieties resistant to its main fungal pathogens based on crosses of individuals from different *Vitis* species. This proof of concept, led by the UMR SVQV (INRAE Grand Est Colmar), has resulted since 2018 in the creation of nine new grapevine varieties that are both qualitative and carry two resistance genes against downy mildew and two resistance genes against powdery mildew, making it possible to reduce the number of fungicide treatments from an average of a dozen per year to only one or two. This innovation was followed by numerous requests from the various French wine-growing regions that want to develop varieties that have the typicality associated with their terroir and are genetically resistant. This new challenge is considerable since it involves combining several loci for resistance to downy and powdery mildew in grapevine, as well as loci involved in resistance to blackrot, adaptation to climate change, quality and typicality.

To meet such a challenge, the strategy implemented is the use of crosses between two parents with a variable portion of wild genome, specifically carrying traits of interest that we wish to combine into a single genotype. The success of this approach depends entirely on the ability of the mixing of parental genomes to produce at least one individual grouping together all the desired traits that is based on genetic recombination. The overall objective of the project is thus to better understand meiotic recombination in vines, more particularly the probability of transmission of a genomic region of wild origin carrying a trait of interest or on the contrary undesirable. The exploration of possible compromises between resistance and quality traits will make it possible to optimize the creation of the grapevines of the future. The originality of this project is based both on its study model, the grapevine, a perennial, heterozygous and vegetatively propagated species, for which recombination has not been studied in depth until now, but also on the integrative biology approach implemented from omics data of various nature and on the objective applied to varietal creation.

- The PhD student will have to answer the following research question: What are the genomic factors influencing the location of crossing-overs and the segregation of genetic determinants of quality in different interspecific contexts of the *Vitis* genus?

To answer this question, different approaches are envisaged:

- Establish QTLs of interest (in particular metabolic and organoleptic) on the populations of interest.
- Test the colocalization of these genomic regions with wild haplotypes present in hybrid grapevines by chromosome painting, in order to better understand the potential impact of these regions on quality traits.
- Perform phased diploid assembly of the population parents to analyze the level of divergence between wild and cultivated haplotypes.
- Establish recombination profiles from dense genetic maps and compare the frequency and location of crossing-overs with haplotypic divergence in order to predict the segregation of traits of interest in future generations of grapevines.

LE PROFIL QUE NOUS RECHERCHONS

- Recommended training: Master 2 or Ingénieur Agronome in genetics, genomics and/or plant biotechnology.
- Knowledge required: Knowledge in genetics and genomics. Basis knowledge in R programming.
- Appreciated experience: Experience in bioinformatics analyses on a dedicated Linux server.
- Skills sought: Rigor, organization, teamwork, curiosity, communication, autonomy, English

↘ Offer reference

- Lab/location : SVQV, 68000 Colmar
- Contract : PhD position
- Duration : 36 months
- Beginning : 01/11/2024
- Remuneration : 2 100 €/Brut/mois

↘ How to apply

Send your CV and motivation letter to:
Camille Rustenholz

- By email : camille.rustenholz@inrae.fr

✖ Deadline : **15/09/2024**