Proposal of research thesis (2nd MSc. year)

January-June 2023

Topic

Evaluating the efficiency of phenomic selection in dairy cattle.
Laboratory, place
INRAE, Animal Genetics and Integrative Biology (GABI) Research Unit, Jouy en Josas

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Context, stakes, scientific issues, purpose

Genomic selection has become a reference method in the genetic improvement of plants and animals. This approach is based on predicting the performance of non-phenotyped individuals using genotyping data. It has made it possible, particularly in dairy cattle, to considerably shorten selection intervals, which has led to a significant increase in genetic progress. Beyond this emblematic example, this technique has made it possible to increase the efficiency of selection programs in many animal and plant species. One of the main limitations of this technique lies in the fact that it requires genotyping of all individuals, whether they are in calibration or validation.

In 2018, Rincent et al, proposed the concept of phenomic selection, in which genotyping is replaced by phenomic data as obtained for example by near infrared spectroscopy (NIRS). The NIRS is a very cheap, and non-destructive method, and already implemented routinely in the breeding programs of many plant species to assess the quality of products. The main idea behind PS, is that the spectra are able to capture the genetic similarities between the individuals. In dairy cattle, milk composition is routinely predicted by mid-infrared spectroscopy (MIRS) produced from milk sampled in lactating cows in milk recording. But MIRS has never been used in phenomic selection model to predict other traits, potentially unrelated to milk composition. We propose to use these data to assess the interest in implementing phenomic selection in dairy cattle.

The objectives of this internship are to compare genomic and phenomic evaluations in a large dataset of 8000 cows with both genotyping data and mid-infrared spectra measured in milk at different stages of lactation. The comparison of genomic and phenomic evaluation approaches will be carried out on milk production, udder health and reproduction traits.

During this work, the student will develop shell scripts in Unix/Linux and the SAS or R programming language and will use different software dedicated to genomic and phenomic evaluation.

The internship will take place at INRAE in Jouy en Josas in the GABI research unit, as part of the Bovine Genetics and Genomics (G2B) team in collaboration with the Quantitative Genetics and Plant Breeding Methodology (GMQS) team at Saclay.

Supervision, contact person

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