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## **SUGAR BEET SEED QUALITY RELATED TO FIELD EMERGENCE: AUTOMATED PHENOTYPING IN LABORATORY TO PREDICT CROP ESTABLISHMENT**

### **ABSTRACT**

In order to enhance the competitiveness of the sugar beet industry, faced to the productivity of sugar cane, the AKER project, based on exploring variability in genetic resources, aims at creating new varieties with agronomical important traits, such as yield, sugar content, and tolerance to abiotic and biotic stresses.

Phenotyping the characteristics of the genotypes in the field at high throughput is a challenge. But another challenge is to develop testing methods in laboratory conditions on seeds or seedlings that could be predictive of differences in genotypes at early or later stages in the field. We have especially focused on the prediction of early stages in the field as they have a huge effect on the final yield.

For this purpose 5 genotypes of sugar beet have been phenotyped for their germination in optimal and stressful conditions (20, 15 and 10°C) using high throughput phenotyping image analysis systems. Early heterotrophic seedling growth (root and shoot) has also been measured at 20°C. The same genotypes have been sown in different locations in France and several criteria of early field emergence have been recorded: plant number and emergence rate, growth after emergence, as well as the final root and sugar yields.

Results obtained in field conditions showed a strong relation between early growth in the field and final yields. Early growth in the field was correlated with traits measured in laboratory conditions: speed of germination in cold temperature, radicle elongation rate and cotyledon area. This led to first interesting proposals of laboratory tests related to early field emergence.

These traits could be measured with high throughput on the large panel of genotypes that will be generated at the end of the project, due to automated tools previously or currently developed in the project. Traits of seed internal morphology are also currently explored and will be compared to germination and growth performance in laboratory and in field trials.