AMERICAN SOCIETY OF SUGAR BEET TECHNOLOGISTS

AKER Betterave2020

AKER a French Research Initiative for a competitive Innovation for Sugar Beet

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AKER is an 8 year programme (2012 to 2020) with 11 partners and a budget of around 20 Mio Euros with 5 Mio granted by the French Ministry of Research. As starting this initiative, all partners were convinced that breeding should play an important role in the capacity of sugarbeet to be competitive in front of cane. The challenge was to increase the rate of sugar yield gain (around 2% actually), and, as a more global challenge, creating varieties to meet high quality, safety and sustainable agriculture.

Global diversity available and its management to answer these questions is critical. Considering the funnel effect of breeding, AKER's project aims to widen this funnel maximizing the availability by exploring the genetic resources variability, and to shorten the time duration to the final elite production.

By taking into account all germplasm available including 50 world genebanks, and after genotyping, we estimated that a core collection of only 15 plants was sufficient to carry all allelic variability which is not encountered already in the elite germplasm.

After eight years of backcrossings with elite lines, by choosing the right complementary ones, we got 3,000 plants representing all variability coming from these 15 exotic plants into an elite background. The two years left within the program is to phenotype all this final core collection. We so expect to get a value of each of these small source of genomic variations. Bringing useful traits or dirty ones.

Another idea was to transferred this revolutionary methodology which we call genomic selection coming from cattle breeding to crop breeding, and particularly to sugar beet breeding. The goal is the increase the speed of genetic progress. We can summarize by acting that GS is really a promising tool, also for sugar beet breeding.

Concerning phenotyping, AKER is devoting 60% of its total budget. Remembering that we have to phenotype as much traits as possible the 3,000 hybrids from the Core Collection. We need high-throughput, non destructive, accurate and dynamic phenotyping. Phenotyping from seed, early growth stages to seedling and of course growing stage to harvest including diseases or any abiotic stress. Example such as seed phenotyping thanks to a three dimensional X-ray machine is shown. IR thermography to evaluate sugar content in young plantlets, MRI to get access to fat content of the embryo within dry seed, Hyper spectral image test (visible + IRP) to get access to biochemical content of organs. For the 2018 campaign, the field experiment consist of more than 70,000 plots specifically dedicated to AKER : to examine the 3,000 hybrids and some of the other AKER breeding experiment.

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