#035

Implementation of heterotic pools and genomic selection in a commercial winter oilseed rape program

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Background:

Hybrid varieties outperform their inbred progenitors in most field crops. However, the cost and time required for hybrid breeding is considerably higher than for inbred breeding. Hybrid seed production is generally more expensive and time-consuming than inbred seed production, especially in winter crops. In winter oilseed rape (*Brassica napus L.*) the conversion into a sterility system is additionally imperative, since manual castration is too laborious, and gametocides are not available.

Objective:

The era of genomic selection offers new opportunities to save time and resources in hybrid breeding programs. In winter oilseed rape we use genomic selection to (1) improve the choice of parents in breeding, (2) to predict the general combining ability (GCA) of new elite lines and (3) to predict the best hybrid combinations. However, the performance of genomic hybrid predictions is hindered by low general combining ability between the genetic pools used for selection of hybrid parents in commercial breeding populations.

Methods:

Two sets of 50 elite winter oilseed rape breeding lines were selected as founders for fast-track creation of genetic pools. Several thousand elite lines with elevated GCA were produced and tested for per se performance in field trials. Selected fractions have been forwarded to an experimental commercial hybrid breeding program for hybrid testing with testers.

Results:

With novel breeding methodologies we were able to separate poorly differentiated germplasm into genetically distinct heterotic pools and increase the efficiency of genomic selection in a commercial winter oilseed rape breeding program.

Conclusions:

The presentation demonstrates how genomic selection strategies can help to increase selection intensity, selection accuracy and shorten the breeding cycle in a commercial winter oilseed rape breeding program and how the identification and establishment of heterotic groups can improve the efficiency of genomic selection and ultimately increase hybrid performance.