

Evolutionary wheat breeding in the Netherlands

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Abstract

Although the Netherlands have a strong position in vegetable breeding, not much cereal breeding is conducted as only one company has survived the consolidations. Organic wheat growers rely on a limited number of varieties that were developed about 20 years ago as only very few varieties combine good baking quality with adaptation to Dutch growing conditions. Varieties developed by organic breeders in Germany and Switzerland seem adapted to Dutch conditions. Still, this means a dependence on varieties developed for other climatic conditions. The total organic wheat acreage in the Netherlands (approx. 2000 ha) is too small to sustain a wheat breeding programme.

The question is whether evolutionary wheat breeding can be an alternative approach (Philips and Wolfe 2005). An added value of the evolutionary breeding approach is that increased diversity helps deal with biotic (pests, diseases) and abiotic (e.g. drought) stresses and more heterogeneity in soil fertility (Finckh 2008). Furthermore, genetic diversity would also allow such crops to co-evolve with changes in climate and adapt themselves to new growing environments (e.g. different farms).

Wageningen University is partner in a European “cycling” project wherein a winter wheat composite cross population (CCP) bred in the UK (Döring et al. 2010) is cycled to different European growing sites every year. We have replanted all populations every year next to the newly received populations and have analysed their progress in adaptation by comparing them for yield, yield components and traits related to vegetative growth.

However, evolutionary breeding based on natural selection is not expected to improve traits related to baking quality (Dawson et al. 2008). To overcome this drawback, a combination of evolutionary and directional selection is proposed (Murphy et al. 2005). Therefore, a second project in the Netherlands is being conducted with spring wheat to provide more information on possible solutions. It studies a modified evolutionary breeding approach together with Getreidezüchtungsforschung Dottenfelderhof (GD). In this modified evolutionary breeding scheme, CCPs are grown at a farmer field in the Netherlands; in the second generation, ear progenies selected at the farm are grown at the breeding station and tested for quality traits. Subsequently, the best ear progenies are mixed again and the optimised CCPs are returned to the farmer for further on-farm selection. In this presentation we will provide an update on the status of both projects.

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