Breeding and development of HOLL Winter Oilseed Rape hybrids

Nelly Guguin1, Lilli Lehmann2, Andrea Richter3, Heinrich Busch4, Jean Pierre Despeghel1.

1Monsanto SAS, Centre de Recherche de Boissay, Toury, France.
2Deutsche Saatveredelung AG, Leutewitz Nr. 26 01665, Kaebschuetztal, Germany.
3Monsanto Agrar Deutschland GmbH, Vogelsangerweg 91 40470, Düsseldorf, Germany.
4Deutsche Saatveredelung AG, Weissenburger Str. 5 59557, Lippstadt, Germany.

Abstract

Since the release in 2004 of the first pure line winter oilseed rape variety with high oleic and low linolenic acid content (HOLL); conventional hybrids have significantly increased in importance for most of the European markets and consequently breeders have concentrated their efforts in breeding hybrid HOLL varieties.

Trial results show that HOLL hybrids bring significant yield advantage over HOLL pure lines. Although the results vary from country to country the advantage can amount to 15% or more.

Results from small plots, large plot trials and farm scale evaluation s show that we may have HOLL hybrids with yield levels close to those of conventional hybrids.

Quality results suggest that HOLL hybrids can achieve the same oil profiles as HOLL pure lines.

Introduction

Breeding efforts carried out in European winter oilseed rape with a view to producing High oleic low linolenic (HOLL) varieties initially led to the release of the pure line variety Splendor (Despeghel et al, 2007). Other pure line varieties: V140OL, V141OL and V161OL then followed. These varieties have an oleic acid content above 75 % and a linolenic acid content lower than 3.5%. They are cultivated under contract for the food industry.

During the same period breeders have been intensively focused on conventional quality hybrid varieties. In consequence there is now a major yield gap between HOLL pure line varieties and conventional hybrids. In order for HOLL varieties to stay competitive, there is a need for rapid development of higher yielding HOLL hybrids.

Since early 2000 our German and French breeding teams have developed different gene pools using a combination of different breeding methods including pedigree breeding, dihaploidisation, backcrossing and marker assisted breeding. The parental lines were then combined with a view to developing competitive HOLL hybrids with similar quality to the pure lines.

The HOLL hybrids were tested widely in Europe in 2007-2008, 2008-2009 and 2009-2010 on up to 45 locations per year spread between F, UK, GY, DK, CZ, PL and HU.

To evaluate the yield performance of the HOLL hybrids versus conventional hybrids, preliminary trials were run in 4 countries including 2 conventional checks

Figure 1: Relative grain yield of six HOLL hybrids each compared to two conventional hybrids (multilocational plot trials)



From this preliminary study we can see that depending on country, some HOLL hybrids yield the same grain yield level as the existing regional conventional hybrids (figure 1)

In order to evaluate the quality of the HOLL hybrids, they were tested in a separate network on up to 40 sites (isolated from conventional oilseed rape and on fields without volunteers) in F, UK, GY, DK, CZ, PL, CH and HU. HOLL pure lines were used as checks

Figure 2: Grain yield (t/ha) of HOLL hybrids compared to HOLL pure lines in multilocational plot trials 2008/2009 (40 trials, transparent columns) and 2009/2010 (38 trials)



Figure 3: Linolenic acid content (in %) of HOLL hybrids compared to HOLL pure lines in the trial series 2008/2009 (40 trials, transparent columns) and 2009/2010 (38 trials)



Figure 4: Oleic acid content (in %) of HOLL hybrids compared to HOLL pure lines in the trial series 2008/2009 (40 trials, transparent columns) and 2009/2010 (38 trials)



The results indicate that HOLL quality is retained in the hybrid background. We can achieve the same quality (i.e. fatty acid profile) with HOLL pure lines <u>and</u> HOLL hybrids (figures 3 and 4) Out of this programme we selected some hybrids for experimental cultivation on farms in France and UK in large stripe plots (>150m2)

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Figure 5: Grain yield (in %) of HOLL hybrid CWH132 performance in large scale farm trial in UK (10 locations)

The results (Table 5) show that the grain yield of the best HOLL hybrid within a country can come close to the hybrid market leader, or that achieved by the most locally adapted hybrids. These results are very encouraging and should help to develop the cultivation of HOLL hybrids across Europe.

REFERENCES

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