

# Ten years experience of development and cultivation of winter oilseed rape hybrids in Europe based on the MSL system

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## Abstract

Since 1996 F<sub>1</sub> hybrid varieties of winter oilseed rape, based on the male sterility system Lembke (MSL), have been grown commercially and more than 5.5 MN hectares have been cumulatively cultivated in Europe over the last ten years. This development has been the common success of breeders, seed producers, agronomists and farmers. Altogether more than 40 MSL hybrid varieties have been released in different European countries. There have been significant improvements in seed yield, oil content, winter hardiness, plant length, straw stiffness and disease resistances against black leg, light leaf spot, downy mildew and club root. Further genetic progress in new hybrids is currently tested in the nurseries. The hybrid seed production is carried out in alternating female and male strip cultivation in suitable environments by well-trained and supervised seed producers. The hybridity levels of each seed lot are measured in field grow-out tests; all seed lots sold are well above the 90% limit. MSL hybrids grown on farmers' fields in Germany have shown a significant benefit in seed yield (mean of 11 years with 0.31 t/ha higher seed yield in comparison to open-pollinated varieties), especially in stress situations like late sowing, sowing after conservation tillage, winter damage or drought. Farmers have learnt to apply a specific cultivation technology for hybrids in contrast to OP varieties in order to make best use of the hybrid vigour and the yield security features of hybrids.

**Key words:** *Brassica napus*, oilseed rape, hybrids, breeding, agronomy

## Introduction

Heterosis in seed yield of winter oilseed rape (WOSR) is well-known since many years. In 1996 the company NPZ-Lembke started the marketing of the first F<sub>1</sub> hybrid varieties, based on the male sterility Lembke (MSL). After ten years experience in development and cultivation, the European seed market has adopted this variety type to the benefit of the whole rape seed industry.

## Materials and methods

The MSL system has been developed by NPZ-Lembke as a private genetic male sterility system. Several motherlines have been developed by crossings and backcrossing into high yielding backgrounds.

The MSL system can be described as follows:

- Good environmental stability of the male sterility
- Very good restoration of fertility
- Almost all varieties resp. lines are very good restorers
- No penalty on yield or other agronomic characters of the hybrid
- Glucosinolate content of the hybrids is similar or less than mid-parent level
- Commercial seed production can be carried out in different environments with medium to good seed yields on the motherline and with high hybridity levels

More than 40 MSL hybrids of WOSR have been registered in different national lists in Europe and commercially grown with great success.

## Results

The development of the acreage of MSL hybrids is demonstrated in figure 1. Since 1996, the acreage has been continuously increased. In 2006/07 there are more than 1.3 MN hectares planted with MSL hybrids in Europe which is about 21 percent of the total acreage. Around 900,000 hectares thereof are planted in Germany representing a market share of more than 60%. In many other countries, e.g. Switzerland, Austria, Denmark, Sweden, Czech Republic and Ukraine, MSL hybrids are cultivated on-farm with commercial success.

The yield benefit of F<sub>1</sub> hybrid varieties in comparison to open-pollinated (OP) varieties has been demonstrated in a lot of variety trials. Figure 2 demonstrates the advantage of hybrids in the official variety recommendation trial network in Germany. The mean yield advantage over 11 years in 712 trials is 0.31 t/ha. The same or even higher benefit has been measured on farmers' fields (figure 3). The eight-year mean, based on a panel of 17,029 farmer interviews, revealed an average of 7% higher seed yield on-farm. It is obvious that F<sub>1</sub> hybrids have better yield stability under difficult growing conditions, they are better adapted to late sowing conditions, conservation tillage systems etc.

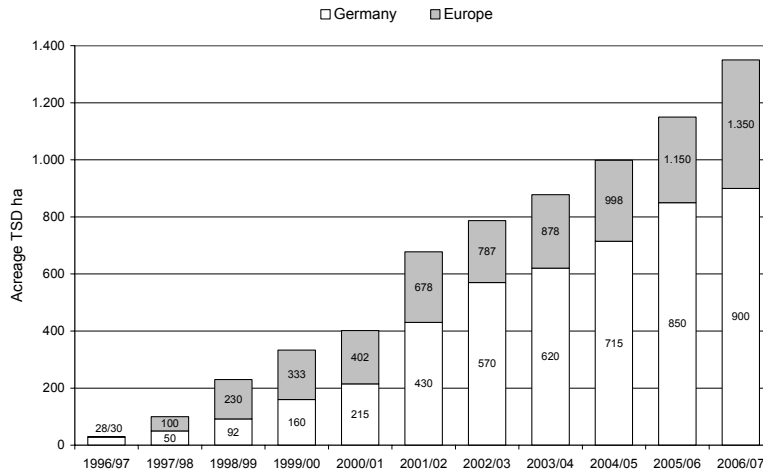


Fig. 1: Acreage of MSL hybrids in Europe

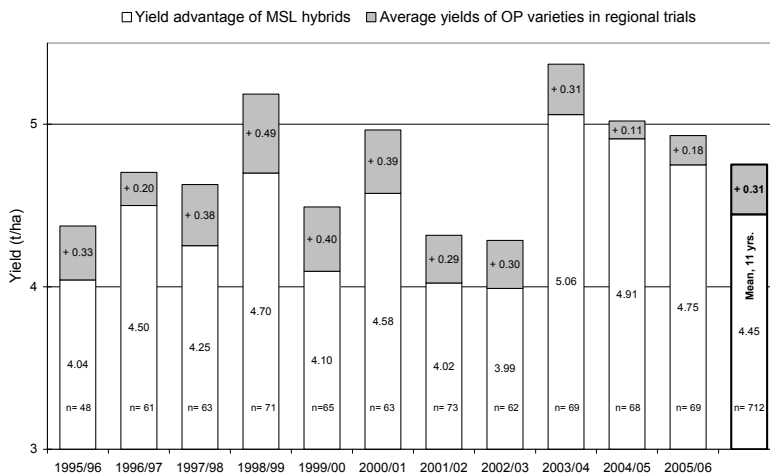


Fig. 2: Yield advantage of MSL hybrids above OP varieties in Germany during the years 1996 until 2006 (Average of official variety recommendation trial network „Landessortenversuche“)

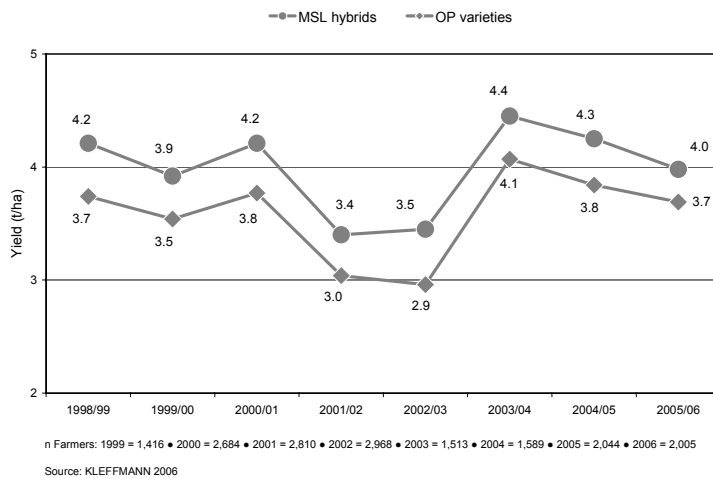


Fig. 3: Yield advantage of MSL hybrids above OP varieties on farmers' fields in Germany during the years 1999 until 2006 based on a panel of farmer interviews

Many new MSL hybrids have been developed which have merits in special characters (table 1).

**Tab. 1: MSL hybrids of WOSR with special merits**

Variety	Special merits	Remarks
Kronos, Kasimir	Winter hardiness	
Trabant, Alkido	Black leg resistance	
Elan	Downy mildew resistance	
Tuscan	Light leaf spot resistance	
Mendel	Club root resistance	Race-specific
Elektra	Shortness	
Artus, Titan	High stress tolerance	e.g. Conservation tillage
Zeppelin	High oil content, hybrid seed yield	
Tenno	Very low glucosinolate content	
Marcant	High erucic acid	

Experience has been gained in hybrid seed production, which is carried out in alternating female and male strip cultivation in suitable environments by well-trained and supervised seed producers. The hybridity level of each seed lot is measured in field grow-out tests, all seed lots sold are well above the 90% limit (figure 4).

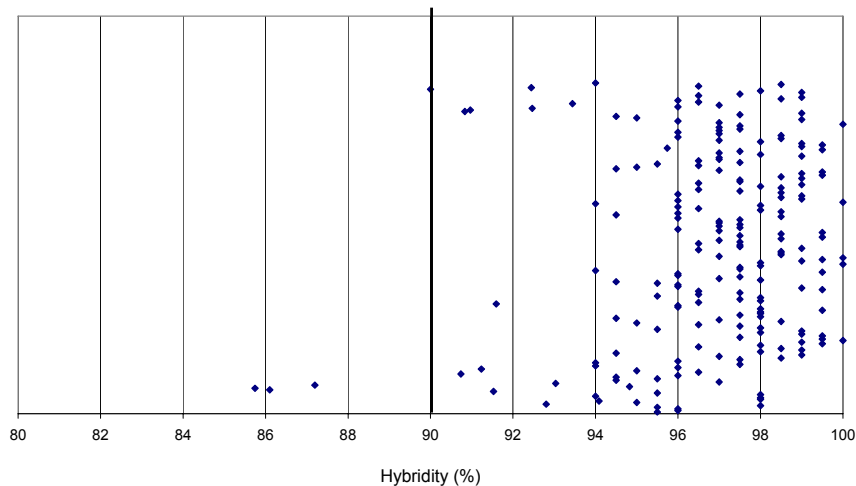


Fig. 4: Hybridity level of 209 different seed lots of MSL hybrids, results of the seed production 2003/04 estimated by field grow-out test in 2004/05

## Discussion

After one decade of breeding MSL WOSR hybrid varieties, a lot of experience in breeding, seed production and cultivation has been achieved. Today the main obstacle in breeding high yielding  $F_1$  hybrids is the lack of high heterosis between adapted double low inbred lines. We have introduced new and exotic germplasm in our breeding programme which will be selected for improved general combining ability (GCA). Further on the use of molecular markers for estimating genetic distances is a great challenge and part of current breeding programmes. Also the selection of adapted inbred lines for specific growing areas like atlantic or continental types is on the way. In order to reduce plant height and to improve straw stiffness, semi-dwarf hybrids will be of interest. There is no or less heterosis in oil content and disease resistances. Therefore these characters must be improved within the gene pools of motherlines and fatherlines, which is part of recurrent selection procedures. Further genetic progress in new hybrids will be introduced to the market within the next years.

## References

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