

# Development and perspectives of MSL-hybrids in winter oilseed rape in Europe

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## ABSTRACT

The first double low winter oilseed rape F<sub>1</sub>-hybrid varieties Joker and Pronto based on the MSL-system (Male Sterility Lembke®) have been registered in Germany in 1995. Until today, about 25 MSL-hybrid varieties have been listed in Europe and are currently marketed. The newest varieties, such as Talent, Disco, Kronos or Elan, have an improved yield potential, better oil content, better straw stiffness and improved resistance to Phoma or even against clubroot, as in the case of Mendel. The market share of MSL-hybrids has grown steadily in different countries during the last 6 years to about 45% in the German market in 2002/03 and to about 20% within Europe. Also in Central and Eastern Europe, especially in Czech Republic, Slovakia and Poland, MSL-hybrids have been successfully introduced. The main benefit of hybrids for the farmer is higher yield and yield stability, especially under conditions of late sowing. In Central and Eastern Europe, later sowing is very often due to dry conditions at sowing time. In these regions F<sub>1</sub>-hybrids are a key factor for a sufficient canopy development before winter and winter hardiness. Further breeding progress in yield, disease resistances, plant height and straw stiffness will be available in the next few years. The MSL-system is characterised by good and efficient restoration and by low glucosinolate contents. Further, there is a great flexibility for the choice of pollinator lines, which are directly restoring without backcrossing procedures. The breeding progress for the development of new sterile lines was quite low, but will be improved in future. The main obstacle to breed high yielding F<sub>1</sub>-hybrids in winter oilseed rape is the lack of high heterosis between adapted double low inbred lines. Therefore new and exotic material should be integrated into the breeding programme by recurrent selection.

**Key words:** Brassica napus – plant breeding – hybrid varieties – male sterility – agronomy

## INTRODUCTION

It is well-known since decades that heterosis in winter oilseed rape is available and can be used in F<sub>1</sub>-hybrid varieties. The company NPZ-Lembke in 1982 started to develop a hybrid system, which was named „Male Sterility Lembke® (MSL)“. This private hybrid system has been used for winter oilseed rape (WOSR) as well as spring oilseed rape. In WOSR the first F<sub>1</sub>-hybrid varieties „Joker“ and „Pronto“ were listed in Germany in 1995. Ever since, many other F<sub>1</sub>-hybrid varieties based on the MSL-hybrid system have been introduced to the European seed market.

## MATERIALS AND METHODS

After having developed the MSL-system, backcrossing procedures were started to develop sterile motherlines. Two motherlines are currently in larger commercial use: MSL 004 C and MSL 007 C.

The MSL-system can be described by follows:

- male sterility has a good environmental stability
- backcrossing of sterile and maintainer lines is difficult and time consuming
- initially only a few MSL-motherlines are available
- restoration of fertility is very good
- all varieties resp. lines are good restorers
- a lot of restorer lines (pollinators) are available
- no penalty on yield or other agronomic characters of the hybrid
- the glucosinolate content of MSL-hybrids is lower or less than the midparent level

A lot of different experimental hybrid combinations have been produced and tested up to now. The best hybrids were entered into official registration trials all over Europe.

## RESULTS

Since their first introduction in 1996, about 25 MSL-hybrid varieties have been listed in Europe and are currently marketed (figure 1). In 2002/2003 more than 900.000 hectares were planted with MSL-hybrids in Europe, which is about 20% of the total market, whereof 640.000 hectares in Germany which represent a market share of about 45%. Also in France, Denmark, Sweden, Switzerland, Austria, UK and in Central and Eastern Europe, especially in Czech Republic, Slovakia and Poland, MSL-hybrids have been successfully introduced to the market.

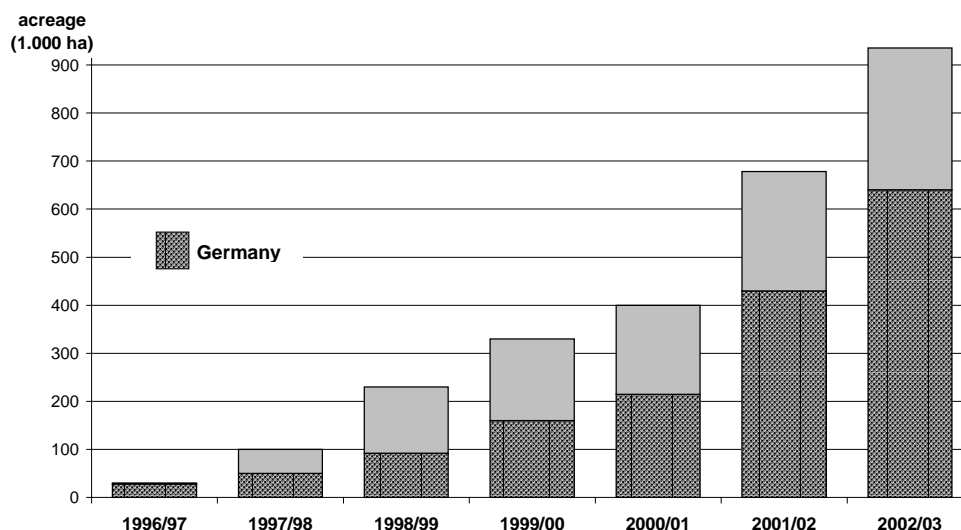


Fig. 1: Acreage (in 1.000 ha) of MSL-hybrids of WOSR in Europe and Germany since 1996

The main benefits of  $F_1$ -hybrid varieties are not only higher yield and better yield stability, but also better and vigorous seedling development. Therefore late sowing – often due to dry conditions at sowing time – can be much better tolerated by vigorous hybrids, which still have a sufficient canopy development before winter. The yield benefit of  $F_1$ -hybrids versus op-varieties has been demonstrated in a lot of variety trials (figure 2). The benefit on farmers fields is also significant (figure 3), the four year average of an inquiry of 9.800 German farmers revealed on average 12% higher seed yields on farm.

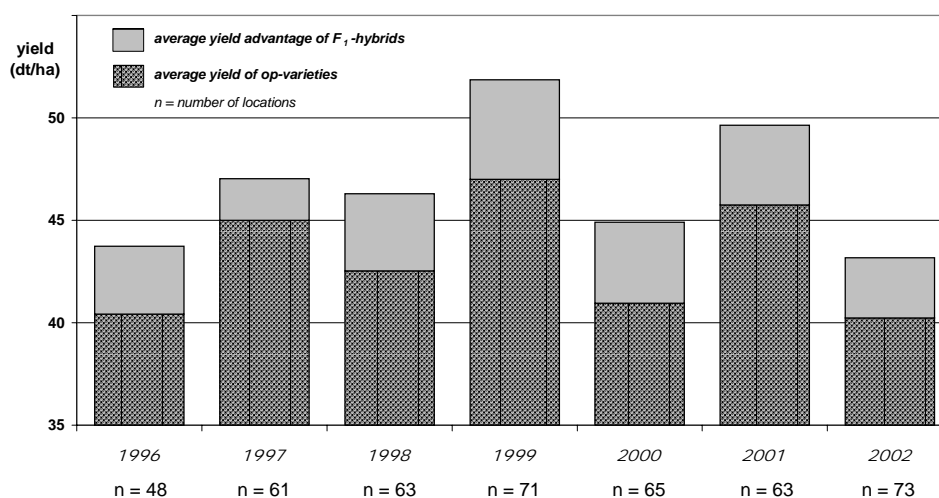


Fig. 2: Yield advantage of  $F_1$ -hybrids in regional variety recommendation trials in Germany (1996 – 2002)

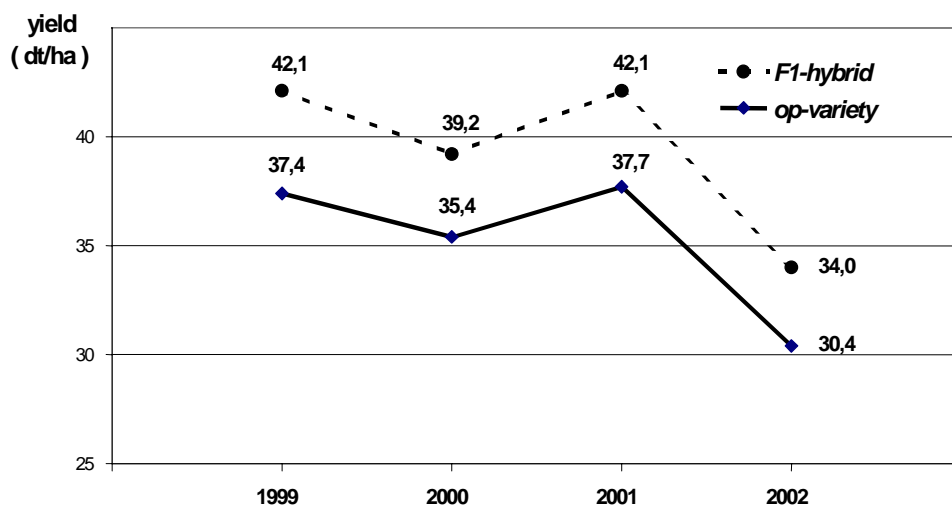


Fig. 3: Yield advantage of F<sub>1</sub>-hybrids on farmer fields in Germany (1999 – 2002)  
 (source: Kleffmann-inquiry; number of answers: 1999 = 1.416, 2000 = 2.684; 2001 = 2810; 2002 = 2.968)

The newest MSL-hybrids have not only better yield performance but also improvements and merits in special characters (table 1).

Table 1: MSL-hybrids of WOSR with special merits

Variety	special merits	Remarks
Kronos, Kasimir	winterhardiness	
Talent, Calypso, Libretto	Phoma resistance	
Elan	light leafspot resistance	
Mendel	clubroot resistance	race specific
Elektra	shortness	
Elan	high oil content	
Susanna	very low glucosinolate content	
Artus	strong stress tolerance	e.g. conservation tillage, poor soils
Avalon	herbicide resistance (LL)	variety not listed

### DISCUSSION

Breeding of hybrid varieties in winter oilseed rape is just at its beginning, only one or two cycles of recurrent selection have been carried out. The main obstacle to breed better, very high yielding F<sub>1</sub>-hybrids in WOSR is the lack of high heterosis between adapted double low inbred lines. This in principle is the case for all hybrid systems. New and exotic germplasm should be integrated in breeding programmes by recurrent selection. The development of improved sterile motherlines within the MSL-system is in progress, these lines will have a high general combining ability. Further breeding progress in yield, yield stability, disease resistances, plant height (semi-dwarf), straw stiffness and winterhardiness will be available in the next years.

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