RECURRENT SELECTION FOR SUNFLOWER CAPITULUM RESISTANCE TO ATTACK BY *Sclerotinia sclerotiorum.*

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SUMMARY

A pool formed of diverse restorer genotypes has been subjected to 8 cycles of recurrent selection for *Sclerotinia* resistance, using tests measuring the extension rate of mycelium on capitula and the delay in symptom appearance after ascospore infection.

Significant increases in resistance have been obtained with, for the mycelium tests, a reduction of 18% in lesion areas per cycle and, for the ascospore test, a 10% increase in latency period. At present, the population shows a mean extension rate only 40% of that on Rémil and a latency index greater than that of the best inbred lines.

However, the mean oil content of the pool is 35-40%, so two other pools have been formed, including high oil genotypes. These pools are selected for both *Sclerotinia* resistance and oil content. Progress is rather slow but after 4 cycles, oil content has increased and percentage *Sclerotinia* infection has been reduced.

INTRODUCTION

Attack of sunflower capitula by *Sclerotinia sclerotiorum* is one of the most potentially dangerous forms of this disease in many countries (e.g. France, Argentine, China...). No complete resistance is known, in cultivated or wild sunflowers, so that it is necessary to make use of good levels of partial resistance.

Resistance levels can be measured either under semi-natural attack (VEAR and TOURVIEILLE, 1987) or by breeding tests on individual plants or progenies (VEAR and GUILLAUMIN, 1977, TOURVIEILLE and VEAR, 1984). Resistance to capitulum attack measured by these methods has been shown to be polygenic and largely under additive control (ROBERT *et al.*, 1985, VEAR and TOURVIEILLE, 1988a). Selection to assemble a maximum number of resistance genes in one genotype therefore appears to be the best method to improve resistance levels.

A recurrent selection programme was started in 1978. At first, only a test measuring mycelial extension was used and it was found that after a rapid improvement at first, response to selection then decreased (VEAR and TOURVIEILLE, 1984). From the third cycle, a test measuring ascospore installation was added, and after two cycles, there was a significant gain in latency period (VEAR and TOURVIEILLE, 1985).

Eight cycles have now been completed and changes in methodology have been necessary to continue efficient selection. This paper describes these and the overall gains obtained. It also compares results of a similar breeding programme in which intensity of selection for oil content is as great as that for capitulum resistance to *Sclerotinia*.

MATERIALS AND METHODS

A. The sunflower populations.

The "*Sclerotinia*" population was constitued by interpollination of 30 restorer genotypes with good resistance to *Sclerotinia* in the field or in tests. The "*Sclerotinia*-Oil" population was developed from intercrossing of the genotypes chosen from the fourth cycle of the first population together with 10 high oil genotypes.

B. Recurrent selection programmes.

Each cycle is made up of two generations. The first consists of interpollination of the best 15% of progenies from the preceding cycle. For the "Sclerotinia" population, the progenies are mixed, for the "Sclerotinia-Oil" population, they are followed as half-sib families. In the second generation, the two

Table 1. Mean reactions of a population bred for capitulum resistance to *Sclerotinia* during 8 cycles of recurrent selection.

Cycle N°	Year	Mycelium test % *Rémil*	Ascospore test Infection %	Ascospore test Infection *Index*	Ascospore test Latency *Index*	Ascospore tests - Controls SD % *Inf.*	Ascospore tests - Controls SD *I.Lat.*	Ascospore tests - Controls GH % *Inf.*	Ascospore tests - Controls GH *I.Lat*
1	1979	200 a							
2	1981	104 c							
3	1982	107 c							
4	1983	122 b	98	119	83 a	83	110	82	90
5	1984	79 d	91	120	100 b	52	116	100	84
6	1986	48 ef	27	28	110 c	94	123	96	77
7	1988	52 e	18	25	103 bc	73	122	73	78
8	1990	41 f	88	90	144 d	95	123	100	77

Table 2. Mean reactions of a population bred for oil content and capitulum resistance to *Sclerotinia* during 4 cycles of recurrent selection.

Cycle N°	Year	Oil *Content%*	Mycelium test % *Rémil*	Ascospore test Infection %	Ascospore test Infection *Index*	Ascospore test Latency *Index*	Ascospore test - controls SD % *Inf.*	Ascospore test - controls SD *I.Lat.*	Ascospore test - controls GH % *Inf.*	Ascospore test - controls GH *I.Lat*
1	1985	36.8	79 b	40	114	83 b	24	125	46	75
2	1987	37.8	131 a	62	98	109 a	40	137	87	63
3	1989	40.4	122 a	39	186	81 b	8	120	34	80
4	1991	40.4	91 b	32	42	111 a	79	133	86	67

Note:
% Inf.= Percentage of diseased plants
I.Lat.= Latency Index

ACKNOWLEDGEMENTS

We would like to thank **PROMOSOL** and **CETIOM** for their support of this programme.

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