STUDY ON THE WAY OF RESTORING OF SOME NEW SOURCES OF CYTOPLASMIC MALE STERILITY IN SUNFLOWER

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SUMMARY

The study is conducted at "Dobroudja" IWS,General Toshevo.Pet-1 (produced by Leclercq),ARG-1,ARG-3 and AN-67(produced by Christov),275HP and HA-341 lines and several lines-restorers of fertility of Pet-1 are included in the study.
According to the results obtained there are no differences between the four CMS types included in the study regarding the fertility restoring.The lines-restorers of CMS Pet-1 fertility restore also the fertility of the three new CMS types: ARG-1, ARG-3 and AN-67.Lines 275HP and HA-341 are sterility maintainers of the four CMS types.

INTRODUCTION

Lines with a high general and specific combining ability,stable sources of sterility and carriers of Rf genes restoring the fertility of these sources are needed for the practical use of the heterotic effect in sunflower.
One of the basic purposes of the plant breeders is producing of cytoplasmic male sterility because the genic male sterility is practically not utilizable.For the first time Shtube(1968) reported for a source of CMS in sunflower.Gundaev(1968) reported that.in 1961 he had discovered male sterility in open pollination of VNIIMK 8931.Voljf(1968) communicated for two different types of CMS in sunflower similar to these in maize(Moldova and Texas). Leclercq(1969) discovered the most stable source of Cms in crosses between H.petiolaris and H.annuus(variety Armavirskij 9345). All sunflower hybrids are practically based on this source of CMS. Anashchenko(1974) discovered another source of CMS which was different from those discovered by Leclercq by crossing H.annuus ssp lenticularis and H.annuus ssp.annuus.Whelan(1980) reported for

discovering of three new sources of CMS disignated as CMG-1,CMG-2 and CMG-3.Heiser(1982) discovered a new type of CMS - Indiana1. Serieys(1987) reported for discovery of several CMS sources by the crossing of a sunflower wild species with the cultivated one. Two new CMS sources are found in crosses between a wild species of H.annuus and the cultivated sunflower,in Novi Sad-Skoric(1988) The aim of the present study is to compare the sources of CMS-ARG-1,ARG-3 and AN-67 produced by Christov(1990)with the Pet-1 type widely used in the world breeding programs.

MATERIALS AND METHODS

The investigation is conducted at "Dobroudja" IWS during 1989 - 1991.Sources of CMS:ARG-1,ARG-3 and AN-67 produced by crosses of H.argophilus and H.annuus(a wild species) with cultivated sunflower,and also ms HA-89 line as CMS,Pet-1 type,are used.The lines restoring the fertility of CMS,Pet-1 type,were included for testing of the restoring ability to the new sources of CMS; 147R, RHA-274,RHA-27,Z-8A,L-2052,L-2128,RHA-43 and RHA-265.Two lines of normal cytoplasm maintaining the sterility of Pet-1,275HP and HA-341,were also involved in the investigation.In 1989 crosses were conducted between lines-restorers of fertility and also between lines-restorers and 275HP line.The crosses between the lines-restorers,lines-maintainers and the four types of CMS were carried out in 1990,and also between the hybrids produced in 1989 and the same CMS sources studied.The hybrids produced in 1991 were planted in the field for recording of sterile and fertile plants.The number of the plants recorded in all the cases was over 100.Hybrids of some lines-restorers with lines on the basis of CMS ARG-1,ARG-3 and AN-67 were tested in an experiment with standards Albena and Super Start hybrids.

RESULTS

The following results are obtained after recording of the fertile and sterile plants in F_1 hybrids between lines and CMS sources tested(Table 1).

All tested lines restoring fertility of CMS,Pet-1 type,restore completely also the fertility of the new CMS type:ARG-1,ARG-3 and AN-67.

The lines maintaining the sterility of Pet-1(275HP and HA-341)

maintained the sterility of the new sources.
The date in Table 2 show that the disintegration of fertile and sterile plants in the hybrid progeny of the four CMS types crossed with hybrids between line-restorers included in the study and normal lines is similar.There are sterile plants only in the cases where lines 275HP and HA-341 are involved in the hybrid combination.On the contrary,the hybrids of the fertility line-restorers in the crosses studied with the four types of CMS did not express a disintegration of fertile and sterile plants. Sterile plants are not observed also in F_2 generation between these lines. This is an evidence that these lines carry identical Rf genes which restore the fertility of CMS types: Pet-1, ARG-1,ARG-3 and AN-67.
According to the results of testing of hybrids between line(restorers of fertility of CMS,Pet-1) and lines 3004 and HA-89 on the basis of ARG-1 and ARG-3,hybrids ARG-1(HA-89) x RHA-43,ARG-1 (HA-89) x 999R,ARG-3(3004) x 188R and ARG-3(3004) x RHA-43 exceed Albena hybrid(Table 3).The hybrids between lines of AN-67 cytoplasm and the used restorers do not exceed the standard.
These date,although annual,assume that there are differences between the single CMS on some other characters which,probably,are controlled and supplemented by the effect of out of nuclear genes.

CONCLUSION

The lines used in the investigation restoring the fertility of CMS type Pet-1,restore also the fertility of new CMS source:ARG-1 ARG-3 and AN-67.The lines maintaining the sterility of Pet-1(275HP and HA-341) maintained the sterility of the new sources.
A large number of new materials(lines-carriers of RF genes and lines with a normal cytoplasm),should be involved for discovering of some differences between these new three types of CMS.For this aim should be use and some biochemical methods.
The new sources of CMS : ARG-1,ARG-3 and AN-67 could be used for development of an analogue for lines with a good combining ability Lines restoring fertility of Pet-1 type of CMS could be used as male forms of these hybrids.

Table 1 Percentage of sterile plants in F_1 hybrids between some lines and types of CMS studied

Line	Pet-1	ARG-1	ARG-3	AN-67
147R	0	0	0	0
RHA-274	0	0	0	0
RHA-27	0	0	0	0
Z-8A	0	0	0	0
L-2052	0	0	0	0
L-2128	0	0	0	0
RHA-43	0	0	0	0
RHA-265	0	0	0	0
275HP	100	100	100	100
HA-341	100	100	100	100

Table 2 Percentage of sterile plants produced in crosses between F_1 hybrids of some lines and CMS types studied

F_1 hybrids	Pet-1	ARG-1	ARG-3	AN-67
147R x RHA-274	0	0	0	0
147R x Z-8A	0	0	0	0
RHA-274 x RHA-43	0	0	0	0
RHA-265 x Z-8A	0	0	0	0
RHA-265 x L-2128	0	0	0	0
275HP x HA-341	100	100	100	100
Z-8A x 275HP	-	-	29	24
147R x 275HP	23	-	-	22
L-2052 x 275HP	-	6	-	9
RHA-43 x 275HP	21	4	14	-
L-2128 x 275HP	17	13	-	8
275HP x RHA-265	-	16	-	-

Table 3 Seed and oil yield of some hybrids between restorer lines and lines on the basis of new sources of CMS

Hybrid	Seed yield (%from st)	Yield of oil (% from st)	Height (sm)	Veget.period(days)
ARG-1(HA-89) x RHA43	113,4	123,1	170	121
ARG-1(HA-89) x 999R	111,9	111,9	145	118
ARG-3(3004) x 188R	120,4	121,6	192	119
ARG-3(3004) x RHA43	115,8	113,3	208	119
Albena(st)	100,0	100,0	178	117
Super Start	102,1	109,6	174	120

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