

REACTION OF MAIZE LINES WITH ERECTOID PHYTOLOGY ON CYTOPLASMIC MALE STERILITY OF M AND C TYPES

O. Y. Chekanova, postgraduate student

A determination of the reaction of maize lines with erectoid phytology on cytoplasmic male sterility of M and C types was carried out.

Keywords: *sterility fixers, fertility reductants, the reaction of lines, CMS, C-type, M-type, maize with erect placing of leaves.*

The basis of maize selection is the use of a heterosis phenomenon, the practical application of which was possible with the discovery of cytoplasmic male sterility (CMS). Using CMS, the necessity of parent plants panicle deflowering is eliminated in areas of hybridization, and therefore it reduces labor costs and the means to produce hybrid seeds. Each type of CMS has its own set of genes that determines sterility-fertility. CMS is controlled by the interaction of specific altered cytoplasm and recessive alleles *rf*. Several types of CMS are discovered. C (Paraguay) and M (Moldovan) types are the most widely used in maize breeding. Restoration of M-type fertility is due to gene *Rf 3*, and C-type – *Rf 4*, *Rf 5* and *Rf 6* [1-4].

The use of CMS phenomenon in maize breeding lines requires a detailed study of the composition of genes fixing sterility and restoration of fertility in crosses with testers, genotype of which is well known.

The study of the reaction of potential parental forms for different types of sterility is prior to practical use of cytoplasmic maize male sterility. The ability of the line to strengthen fertility or restore sterility is largely determined by the type of CMS, on which hybrid seed production will be carried out, and a line place in a future hybrid [5-8, 10, 13]. Maize lines with erectoid phytology are created in UNUH.

The aim of the research is determination of the reaction of maize lines with erectoid phytology on cytoplasmic male sterility of M and C types.

The research methodology. The research was carried in the research fields of Uman NUH during 2011 – 2012. To determine the response of the lines on the CMS, the analyzing crossing of the 35th line with erectoid phytology was carried. The experiment was laid at the density of 50,000 plants per hectare. Samples were sown in two-fold repetition on four-row plots of 10 plants per row. The sowing was performed by hands with the placement of plants 70 x 70 cm.

The source of M-type sterility was Π 346M line, C-type – 7/25 line. Sterility and fertility were determined by Hontarovskyy method by panicles examination in the field [11]. A sterility-fertility characteristic was defined in the phase of stigma mass appearance in the beginning. Plants of C and M type were divided into sterile, fertile, half sterile, and half fertile plants.

Sterility fixers include lines which give sterile pollen hybrids in the offspring during the crossing of sterile forms. Lines-recreators of fertility recreate 70-100% of flowering panicles during the crossing of sterile forms. Incomplete recreators of fertility or incomplete fixers of sterility give up to 30% of half sterile and fertile plants along with sterile plants during crossing with the sources of sterility [9].

The research results. Maize lines with erectoid phytolaxy showed high stability of sterility and fertility display signs each year. The study of hybrids received from crossing of sterile forms regardless of the types of sterility, allowed to divide lines according to CMS response on sterility fixers, fertility recreators, incomplete sterility fixers and fertility half recreators. The most characteristic lines are given in the Table.

Reaction of CMS maize lines of C and M types, 2011 – 2012

Line name	Characteristic of erectoidship	CMS	
		C-type	M-type
3338/12	erectoid	st	st
3371/12	half erectoid	st	st
3375/12	erectoid	st	st
3379/12	erectoid	st	st
3383/12	erectoid	st	st
3385/12	erectoid	st	st
3991/12	erectoid	st	st
3395/12	erectoid	st	st
3417/12	erectoid	st	st
3387/12	erectoid	st	h/st
3338/12	erectoid	st	h/f
3418/12	half erectoid	st	h/f
3350/12	super erectoid	f	st
3342/12	erectoid	f	st
3344/12	erectoid	f	st
3393/12	erectoid	f	st
3399/12	erectoid	f	st
3405/12	erectoid	f	st
3415/12	erectoid	f	st
3437/12	erectoid	f	st
3403/12	erectoid	f	h/st
3338/12	super erectoid	f	h/f
3357/12	erectoid	f	h/f
3995/12	erectoid	f	h/f

* St – sterile, h/st-half sterile, f – fertile, h/f – half fertile.

Thus, in 2011-2012 responses determination of 35 maize lines with erectoid *phytolaxy* on CMS of M and C types showed that there were 17 lines of fertility fixers of C type, representing 48.6% of the total number of lines, and 21 line of V type which is 60% of the total number of lines. Fertility recreators of C type were 18 lines, representing 51.4% of lines, and 5 lines of M type, i.e. 14.3% of lines. In M-type the sterility indicator is higher by 11.4% than in C-type, and the fertility indicator of C-type is significantly higher than the one of M-type by 37.1%. Sterility fixers and fertility recreators of C-type showed clear response. Some lines of M-type showed fuzzy response: nine lines, i.e. 27.5% of lines were incomplete sterility fixers and fertility half recreators. Incomplete sterility fixers and half recreators require further breeding work with selection for fixing or recreating capacity, depending on a line place in a hybrid.

It should be noted that nine lines were sterility fixers of M and C types. Among the lines researched, one line was sterility fixer of C-type, and fertility half-recreator of M-type. One line, sterility fixer of C-type, proved to be incomplete sterility fixer of M-type. Nine lines that turned out to be sterility fixers of M-type were fertility recreators. The line, fertility recreators of C-type, was incomplete sterility fixer of M-type. Fertility recreators of C-type (four lines), proved to be fertility half recreators of M-type. Ability of a line to fix sterility or recreate fertility indicates CMS type. This will lead to further research of hybrid seed and set a line place in hybrid.

Selection of universal sterility fixers and fertility recreators that fix sterility and recreate fertility simultaneously in two types of CMS and more is a subject of concern. This is due to greater genetic reconstruction of a line than selection of fixers and recreators of one type. However, a comparative research of universal fixers and fertility recreators of lines has not lead to the identification of any significant differences according to breeding valuable characters [12].

It should be noted that *erectoid phytolaxy* was characteristic of ten lines of C-type and 14 lines of M-type which were sterility fixers. Half *erectoid phytolaxy* was peculiar for two lines of C-type sterility fixers: one line was M-type sterility fixer, and the other one was fertility half recreator of M-type. Ten lines of fertility recreators of C-type and 5 lines of M-type also had *erectoid phytolaxy*. Attention is drawn to the fact that of two lines of C-type, which recreated fertility, one line of M-type fixed sterility and the other one was half creator of fertility, and they were with super erectoid phytolaxy (an extremely vertical phytolaxy of all leaves). In the studied set of 35 maize lines, according to the response to cytoplasmic male sterility, the quantity of sterility fixers of C-type with *erectoid phytolaxy* was 28.6%, M-type 40% and 5.7% of sterility half fixers of M-type. There are 28.6% of fertility recreators with erectoid phytolaxy of C-type, and 14, 3% of M-type. Half erectoid phytolaxy was peculiar for 5.7% of sterility fixers lines of C-type, and 2.8% of fertility half recreators lines of M-type. 5.7% of fertility recreators lines of C-type, 2.8% of sterility fixers lines, and 2.8% of fertility half recreators of M-type had super erectoid phytolaxy.

Conclusions. Reaction of 35 maize lines to CMS of M and C types with erectoid phytolaxy was determined. There were distinguished 17 lines of sterility

fixers of C-type and 21 lines of M-type, 18 lines of fertility recreators of C-type and 5 lines of M-type.

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