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REACTION OF CMS-LINES AND O-TYPES OF SUGAR BEET TO EXTENDED NUTRITION AREA AT INCREASED PRECEDING FERTILIZATION AS AN ENVIRONMENTAL FACTOR

The article will consider the specific ability of sterility fixing lines and fixing agents of sterility to react on extended nutrition area at increased preceding mineral fertilization. Set of constituents of simple sterile hybrids is differentiated within the framework of their breeding value for such characters as yield, sugar content, and sugar yield.

Key words: yield, sugar content, sugar yield, nutrition area.

Introduction. Individual variability of sugar beet fluctuates significantly under different conditions of cultivation. Such approach as extended nutrition area is more powerful factor of variability than fertilizer rate, type of soil, and predecessor [1]. It is extended nutrition area for sort population of sugar beet that causes great variability of biotype within a sort. It can be predictable, that sugar beet lines as a homozygous material reacts in some way to the changes in conditions of growing i.e. genotype acts in a specific way. It is caused both by genetic peculiarities of selective material and its interaction with environment [2, 3].

The goal of the research is to reveal the influence of extended nutrition area on yield, sugar content, and sugar yield of CMS-lines of sugar beet at increased preceding fertilization.

The materials and method of research. For the experiment five CMS-lines of sugar beet of different origin that served for constituents of simple sterile hybrids (SSH) as female component were taken. Assessment of the lines for their productivity was carried at Verkhniatzka ESS in 2011–2012 at usual (UNA) 45×22,5 cm^2 and extended area (ENA) 45×45 cm^2 at increased preceding fertilization. Plots of 13.5 m^2 were placed randomly according the method [4].

The research results and their discussion. UNA and ENA, as an environmental factor, differentiate CMS-lines diversely.

The best yield results at UNA had CMC 4 (59.5 t/ha) and CMS 5 (59.1t/ha) though they showed worth estimates at ENA: 53,7 and 47,5 t/ha, respectively. CMS 2 and CMS 5 did not react to experimental factor. CMS 1 had significantly increased yield from 51.3 to 61.9 t/ha (Fig. 1).

Yield, t/ha CMS-lines UNA NA

Fig. 1 Yield of CMS-lines of sugar beet depending on nutrition area, 2011–2012.

For their sugar content, CMS-lines had different estimates at ENA (Fig. 2). Three out of five lines (CMS 1, CMS 2, and CMS 4) decreased sugar content at thinned density of stocking. The largest fall of sugar content had CMS 1 and CMS 2 0,7 and 0,9 %, respectively. CMS 5 did not decrease the estimate under adequate limits. And CMS 3 rose its sugar content from 16,3 to 17,4 %.

The same phenomenon of increasing or leveling off of sugar content at extended nutrition area was observed by A. Mazlumov [1]. This tells us about specific reaction of each genotype to this very modifier.

Sugar content, % CMC-lines UNA ENA.

Fig. 2 Sugar content of CMS-lines of sugar beet depending on nutrition area, 2011–2012.

Sugar yield as a resulting value of yield and sugar content of CMS-lines depending on nutrition area was different. It rose from 8.6 to 10.0 t/ha for CMS 1. It can be explained by the fact, that yield at ENA was high (the highest in the experiment) at decreased sugar content. CMS 5 line almost did not react to changed background for productivity elements and, consequently, for sugar yield (9,8 t/ha at UNA, 10.0 t/ha at ENA). But CMS 2, CMS 3, and CMS 4 showed lower estimates, caused both by CMS 2 sharp fall in sugar content, and CMS 3 and CMS 4 abrupt fall in yield (Fig. 3).

Sugar yield, t/ha CMS-lines UNA ENA.

Fig. 3 Sugar yield of CMS-lines of sugar beet depending on nutrition area, 2011–2012.

A specific reaction of sterility fixing agents to extended nutrition area caused by their genotypic peculiarities was observed. For all variants of experiment the differences between O-types genotype were significant because $F_{fact} > F_{theor}$ (Table 1).

1. O-types reaction to extended nutrition area for productivity, 2011–2012

O-types	Yield, t/ha		Sugar content,%	
	UNA	ENA	UNA	ENA
От 1	59,6	63,4	17,3	16,2
От 2	54,6	61,2	17,3	17,3
От 3	59,4	56,7	16,9	16,8
От 4	46,7	63,4	17,6	16,5
От 5	40,4	53,6	16,9	16,9
Average	52,1	59,6	17,2	16,7
$LSD_{0.5}$	4,3	4,4	0,5	0,5

In average, a general trend for yield of O-types was increase at ENA from 52,1 to 56,9 t/ha. Under these conditions, different increase of yield had O-type 4 and O-type 5, by 16,7 and 13,2 t/ha, respectively. At the same time, O-type 3 decreased its yield moderately from 59,4 to 56,7 t/ha.

There was no reaction of O-type 2, O-type 3, and O-type 5 to change of environmental factor, however other lines reacted considerably. For instance, O-type 1 decreased its sugar content at ENA by 1,1 % from 17,3 to 16,2 %; O-type 4 by 1,1 % from 17,6 to 16,5 %. In average, sugar content of O-types at ENA was lower by 0,5 % in comparison with UNA.

Conclusion. Therefore, variability of productivity elements of CMS-lines and O-types of sugar beet under different nutrition area (increased preceding fertilization) is as follows:

– Lines that deteriorate their practical value at ENA in comparison with UNA: CMS 3, CMS 4, O-type 3 – for their yield; and CMS 1, CMS 2, O-type 1, O-type 4 – for their sugar content.

– Lines that improve their practical value: CMS 1, O-type 1, O-type 2, O-type 4, O-type 5 - for their yield; CMS 3 – for its sugar content.

– Lines with weak reaction to nutrition area: CMS 2, CMS 5, O-type 3 – for their yield; O-type2, O-type 3, O-type 5 – for their sugar content. While forming SSH, the norm of reaction of components to environmental factor should be considered and lines stable for their high phenotype display of economic-valuable features should be selected.

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