

EVALUATION OF SELF-POLLINATED MAIZE LINES OF BSSS GERmplASM BY BREEDING TRAITS IN THE NORTHERN STEPPE OF UKRAINE

Paziuk N. V.

Scientific and Production Farming Enterprise Company Mais, 50 Tsentralna St., Zaitseve village, Synelnykove district, Dnipropetrovsk region, 52514, Ukraine

Topicality. BSSS germplasm is widely used in most breeding programs of leading companies, but is characterised by insufficient variety of precocious lines. The relevance of the work is to determine the main breeding traits of self-pollinated maize lines of the heterotic BSSS group adapted to the conditions of the Northern Steppe of Ukraine. **Purpose.** Our research is aimed at evaluating new self-pollinated lines of BSSS plasma in the Northern Steppe of Ukraine. **Materials and Methods.** The source material was composed of 25 self-pollinated maize lines of the BSSS germplasm. Research methods were used: visual for phenological observations; laboratory and field methods for determination of morphological and biological traits of plants; measuring and weighing methods for determination of yield and metric traits of plants; mathematical and statistical methods for calculation of reliability of results, indicators of trait variability, correlation of traits; analysis of variance; comprehensive assessment of morphological, biological and economic characteristics of inbred lines. **Results.** Twenty-five self-pollinated maize lines of BSSS germplasm were evaluated for the following traits: duration of the period from seedlings to flowering of 50 % of tassels, and from seedlings to flowering of 50 % of ears, plant height, ear insertion height, and grain yield. **Conclusions.** The self-pollinated maize lines with more stable breeding traits in different agronomic conditions were identified for two years of research, namely: SDM15, SDM2A, SDM96 and MS2439, and SDM84-35, which are valuable for breeding drought tolerant hybrids.

Key words: maize, self-pollinated lines, BSSS germplasm, duration of the period from seedling to flowering, grain yield

Introduction. The entire modern maize breeding gene pool is the result of many cycles of crosses and selections among several original varieties in the late 19th and early 20th centuries and is represented by several types of germplasm [1]. The inbred lines of the BSSS germplasm are the most widespread heterotic group in global maize breeding. Lines of this group combine well with lines of most genetic plasms used in many countries of the world. The BSSS genetic plasm originated from the Reid variety, which was developed as a result of a cross-breeding event in 1847. From 1890 to 1893, the Reid variety became widespread among farmers [2]. Subsequently, the Reid heterotic group was developed from the free-pollinated Reid Yellow Dent variety, and within it, in the early 1930s, the well-known synthetic population ISSS (Iowa Stiff Stalk Synthetic) was separated. The ISSS synthetic population was developed by cross-pollination of 16 self-pollinated lines selected for superior stalk quality. Since 1939, the modification of the BSSS population has been carried out in 7 cycles of selec-

tion with simultaneous development of lines in each cycle [3]. The modern inbred variety developed on the basis of the Reid Yellow Dent variety is divided into several independent groups: Reid Yellow Dent (Wf9), Funk and 176A Yellow Dent, Osterland Reid, Troyer Reid, Iodent and Stiff Stalk Synthetic (SSS). [4]. In Ukraine, Reid Yellow Dent (Wf9), Iodent and Stiff Stalk Synthetic (SSS) are more commonly used [5]. In Ukraine, Reid Yellow Dent (Wf9), Iodent and Stiff Stalk Synthetic (SSS) are more commonly used [5]. Inbred lines of BSSS germplasm stand out for their high combining ability, intensive moisture loss during maturation, resistance to lodging, pests and pathogens. At the same time, these lines are characterised by relatively low drought and heat resistance during the flowering and grain filling stages [2].

According to N. A. Bodenko, the positive response of the genotype to increasing plant density serves as an indirect indicator of drought resistance [6].

Increasing plant density dramatically leads to

Author information:

Nataliia V. Paziuk, *Postgraduate Student*, e-mail: pazyuk86@gmail.com, <https://orcid.org/0009-0007-8125-9493>

a sharp increase in soil moisture and nutrient consumption, reduces solar radiation due to shading of the lower tiers of leaves, resulting in a deterioration of photosynthetic activity, and thus a decrease in individual productivity and yield structure indicators [7]. Plant density is an important factor that significantly affects grain yields [8].

Materials and Methods. The experimental part of the study was carried out during 2021-2022 on the territory of the Scientific and Production Farming Enterprise Company Mais in the Synelnykove district of the Dnipropetrovsk region. The source material was 25 self-pollinated maize lines of the BSSS germplasm: DK239MV, DK3938, SDM95-10, SDM95-10A, SDM95-30, SDM95-30A, SDM125, SDM33, SDM51, SDM27A, SDM24A, SDM121, SDM121A, SDM15, SDM29A, SDM111-9A, SDM96, SDM2A, SDM46, MS2439, SDM77A, SDM73, SDM84-35, SDM103, SDM103A. DK239 MV line was used as the standard characterised by a period from seedling to flowering of 50 % of ears of 57 days, average height of plants and ear insertion of 154 and 51 cm, respectively, average yield of 2.24 t/ha, high combining ability, and medium cold and heat resistance.

All agrotechnical practices were carried out according to the methodology of field experiments with maize [8]. The experimental samples were evaluated according to two variants of plant density: 50,000 and 70,000 plants/ha. In 2021, the weather conditions of the growing season were favourable for maize cultivation in terms of hydrothermal regime, with more than 320 mm of precipitation during the three summer months, which significantly exceeded the long-term average. Favourable soil moisture supply during the maize growing season ensured high yields of the lines. In 2022, the weather was unfavourable in June and July, characterised by moderate temperatures with insufficient rainfall.

Results and Discussion. The period from seedlings to flowering of maize plants is particularly crucial for plant development. Starting from the emergence of sprouts above the soil surface, the plant starts to feed using the photosynthetic capacity of leaves and stem [9, 10]. Therefore, during this period, genotype peculiarities in the formation of vegetative and reproductive organs are revealed, starting with their

primary development at the first stages of organogenesis [11]. In the first half of the growing season, maize plants consume soil moisture sparingly. Later on, a sharp increase in vegetative mass requires higher moisture supply. Insufficient moisture supply in the stem elongation stage (11–13th leaf) inhibits plant growth and ear formation, and reduces maize productivity. There is also a reduction in maize productivity with insufficient moisture supply and increased temperature in the stage of tassel initiation due to delayed ear development compared to the tassel development, which results in under-pollination of the ear [12]. In our studies, we used such indicators as the duration of the periods from germination to flowering of 50 % of the ears and from germination to flowering of 50 % of the tassels (Table 1).

In 2021, the duration of the period from seedling to flowering of 50 % of tassels of self-pollinated maize lines was 56 days at a plant density of 50,000 plants/ha, and 58 days at a plant density of 70,000 plants/ha. The range of variation in the duration of this period by lines was from 51 to 61 days. In the standard line DK239 MV, the duration was 57 and 59 days at plant densities of 50,000 and 70,000 plants/ha, respectively. All lines had a proterandrous flowering type. The average duration of the period from seedlings to flowering of 50 % of the ears was 58 days at both plant densities. The range of variation in the duration of the period from seedlings to flowering of 50 % of the ears was 10 days at both densities. In the standard line DK239 MV, this period was 59 and 60 days at densities of 50,000 and 70,000 plants/ha, respectively. Increasing of plant density affected this indicator in twelve lines (SDM95-10, SDM95-10A, SDM51, SDM27A, SDM24A, SDM121, SDM121A, SDM15, SDM111-9A, SDM46, SDM103 and MS2439) by a significant prolongation of the period from seedling to flowering of 50 % of ears by 3–8 days, while in SDM95-30, SDM125, SDM103A lines the duration of this period decreased by 2, 3 and 1 day, respectively.

Weather conditions in 2022 had a negative impact on plant development. In the experiment, the duration of the period from seedling to flowering of 50 % of tassels in 25 lines ranged from 53 to 64 days at plant density of 50,000 plants/ha and from 54 to 66 days at plant density

Table 1. Duration of the periods from seedling to flowering of 50 % of tassels and from seedling to flowering of 50 % of ears for self-pollinated lines at different plant densities, 2021–2022

Lines	2021				2022			
	Plant density, plants/ha							
	50,000		70,000		50,000		70,000	
	Duration of period from seedling to flowering of 50 % of , days							
	tassels	ears	tassels	ears	tassels	ears	tassels	ears
DK239MV (standard)	57	59	59	60	61	64	63	65
DK3938	60	62	60	61	63	66	64	66
SDM95-10	56	57	59	60	60	63	62	66
SDM95-10A	54	56	58	59	59	62	62	64
SDM95-30	61	63	59	59	64	67	65	68
SDM95-30A	56	58	56	57	61	64	63	66
SDM125	57	59	54	55	61	64	63	65
SDM33	55	57	55	55	63	66	64	68
SDM51	55	57	58	60	60	63	61	62
SDM27A	56	58	59	61	61	64	64	65
SDM24A	55	57	59	60	60	63	62	64
SDM121	55	57	60	60	63	66	66	68
SDM121A	53	55	61	62	60	64	61	64
SDM15	56	58	59	60	60	63	62	65
SDM29A	57	59	59	60	61	64	62	65
SDM111-9A	56	58	59	59	60	64	62	64
SDM96	58	60	58	58	60	63	63	64
SDM2A	51	53	52	53	53	55	54	56
SDM46	51	53	55	55	59	63	60	61
MS2439	55	57	59	59	59	61	59	60
SDM77A	56	58	58	59	62	64	65	66
SDM73	57	59	58	59	58	60	60	62
SDM84-35	53	55	55	55	55	56	56	57
SDM103	53	55	58	59	59	62	61	63
SDM103A	58	60	57	57	63	66	65	67
Population average	56	58	58	58	60	63	62	64
LSD ₀₅ , days	2.80	2.90	2.90	2.90	3.00	3.15	3.10	3.20

of 70,000 plants/ha. All lines have a proterandrous flowering type. It should be noted that with an increased plant density (70,000 plants/ha), the duration of the period from seedling to flowering of 50 % of tassels extended by an average of 2 days. The duration of this period in five lines SDM95-10A, SDM27A, SDM121, SDM96, SDM77A extended by 3 days on average compared to the plant density of 50,000 plants/ha. There were six lines SDM121A, SDM29A, SDM2A, SDM46, MS2439, SDM84-

35, in which the duration of the period from seedling to flowering of 50% of tassels changed slightly, changes were up to 1 day.

Poor moisture supply in 2022 led to a significant increase in the duration of these periods in both tassels and ears of lines. On average, the duration increased by 4 days compared to favourable conditions in 2021. The greatest variation in the duration of the periods from seedling to flowering of tassels and ears was observed in the lines SDM95-10A, SDM125, SDM33,

SDM121 and SDM46. In these lines, the duration of the period from seedling to flowering of 50 % of tassels increased by 9–11 days, and the duration of the period from seedling to flowering of 50 % of ears increased by 9–13 days in 2022 compared to 2021. More stable in terms of these indicators were the lines SDM73A, SDM2A and SDM84-35, in which the duration of the period from seedling to flowering of 50 % of tassels increased by 3 days, and from seedling to flowering of 50 % of ears – by 1–2 days.

A significant influence of the weather conditions on the determination of plant height was found. In our experiments, the plant height of the lines in 2022 at plant densities of 50,000 and 70,000 plants/ha was on average 150 and 148 cm, respectively, and in 2021 – 196 and 198 cm, respectively. The plant height of self-pollinated lines decreased in 2022 by an average of 23.5 % at a density of 50,000 plants/ha and by 25.3 % at 70,000 plants /ha, respectively (Table 2).

Table 2. Plant height and ear insertion height of self-pollinated maize lines of BSSS germplasm at different plant densities, 2021–2022

Lines	2021				2022			
	Plant density, thousand plants/ha							
	50,000		70,000		50,000		70,000	
	Plant height, cm	Ear insertion height, cm	Plant height, cm	Ear insertion height, cm	Plant height, cm	Ear insertion height, cm	Plant height, cm	Ear insertion height, cm
DK239MV (standard)	204	77	215	73	158	48	155	48
DK3938	221	90	218	86	170	78	166	75
SDM95-10	206	75	223	78	166	50	160	48
SDM95-10A	173	64	184	72	146	41	146	45
SDM95-30	199	65	197	61	157	38	145	40
SDM95-30A	201	65	196	73	156	53	153	50
SDM125	185	68	193	70	140	44	138	42
SDM33	211	72	202	70	118	46	118	45
SDM51	211	72	203	68	159	43	155	40
SDM27A	208	69	210	69	180	52	185	55
SDM24A	210	77	211	80	161	47	158	45
SDM121	229	75	222	77	174	49	172	45
SDM121A	204	75	195	73	152	47	155	47
SDM15	194	75	201	78	123	45	121	43
SDM29A	199	79	201	79	149	47	147	47
SDM111-9A	168	65	170	64	130	33	130	33
SDM96	187	72	188	73	143	43	140	45
SDM2A	204	78	208	79	182	62	180	62
SDM46	207	69	195	62	155	39	149	40
MS2439	195	70	203	66	148	37	150	40
SDM77A	186	66	197	70	141	43	142	43
SDM73	189	70	200	75	149	46	146	45
SDM84-35	173	59	168	58	147	50	147	50
SDM103	185	64	187	66	118	37	120	40
SDM103A	159	52	160	45	123	32	125	32
Population average	196	71	198	71	150	46	148	46
LSD ₀₅ , cm	10	3	10	3	7	4	7	4

The analysis of the research results showed that the plant height and ear insertion

height of the lines were more influenced by the weather conditions of the years of study than by

the plant density. In particular, in 2021, increasing the plant density from 50,000 to 70,000 plants/ha resulted in a 1 % increase in plant height, and in 2022 – a 1.3 % increase. The average ear insertion height remained unchanged at different plant densities. However, in 2022 it was 35.2 % lower compared to 2021.

Genotypic features in the response to both plant density and weather conditions were noted. In both years, both a decrease and an increase in the above parameters were observed. In particular, in 2021, 64 % of the lines had higher plant height by 0.5–8.3 % due to increased plant density, and nine lines had a lower plant height by 1–5.8 %. In 2022, most lines (60 %) had a lower plant height by 1.1–6.2 %, and six lines had a higher plant height by 0.1–2.8 %.

In 2021, at a density of 50,000 plants/ha, five lines SDM95-10A, SDM125, SDM111-9A, SDM84-35, and SDM103 had significantly lower indicators, in particular, their plant height was 173 cm, 185 cm, 168 cm and 185 cm, respectively. Lines DK3938, SDM33, SDM51, SDM27A, SDM24A, and SDM121 were significantly taller with plant heights of 221 cm, 211, 211, 208, 210, 229 and 207 cm, respectively. The plant heights of five self-pollinated lines SDM95-10A, SDM111-9A, SDM84-35, SDM103, and SDM103A were significantly lower than the population average under plant density of 70,000 plants/ha, and were 184 cm, 170, 168, 187, and 160 cm, respectively. At the same time, five lines DK3938, SDM95-10, SDM27A, SDM24A and SDM121 were significantly taller than the population average, with heights of 218 cm, 223, 210, 211 and 222 cm, respectively.

Adverse weather conditions in 2022 led to a decrease in plant height of self-pollinated maize lines by an average of 46 cm at a plant density of 50,000 plants/ha and by 50 cm at 70,000 plants/ha compared to favourable conditions in 2021. The lines SDM2A, SDM84-35 and SDM27A were more stable in this indicator, with plant height being 25–27 cm lower in 2022. Among all genotypes studied, the line SDM33 was the most unstable in manifestation of this trait. Under the influence of the weather conditions, plant height decreased by 93 cm at a plant density of 50,000 plants/ha and by 84 cm at a density of 70,000 plants/ha.

Under unfavourable weather conditions,

seven lines SDM125, SDM33, SDM15, SDM111-9A, SDM77A, SDM103 and SDM103A had a low height of 140 cm, 118, 130, 141, 118 and 123 cm, respectively. The five lines DK3938, SDM95-10, SDM24A, SDM121 and SDM2A were significantly taller with plant heights of 166 cm, 160, 158, 172 and 180 cm, respectively. It should be noted that in 2022, the plant height of four lines SDM95-10A, SDM33, SDM111-9A, and SDM84-35 remained unchanged at both plant densities.

The level of seed productivity of self-pollinated lines determines their place in the structure of the hybrid and the economic efficiency in seed production of parental components and maize hybrids. Production efficiency depends on the yield of the parental components and its stability, because the yield determines the profitability of the future hybrid seed production [13, 14].

Under favourable conditions in 2021, the average grain yield of self-pollinated maize lines at plant densities of 50,000 and 70,000 plants/ha was 3.26 and 3.91 t/ha, respectively, and in 2022, the yield was equal to 1.52 at both densities (Table 3).

In 2021, the grain yield of corn lines averaged 3.26 t/ha at a plant density of 50,000 plants/ha, and at 70,000 plants/ha it was 0.65 t/ha higher (19.9 %). The maximum yield at a plant density of 50,000 plants/ha was provided by the line SDM29A (4.70 t/ha), and at 70,000 plants/ha – by the line SDM2A (3.47 t/ha).

Five lines DK3938, SDM95-30, SDM29A, SDM84-35 and SDM103 had significantly higher yields of 3.92 t/ha, 4.14, 4.70, 3.92 and 4.56 t/ha, respectively, at a planting density of 50,000 plants/ha. The four lines SDM121A, SDM15, SDM46 and SDM77A had significantly lower yields of 2.56 t/ha, 2.62, 2.10 and 1.85 t/ha, respectively. Seven lines DK3938, SDM95-10, SDM95-30, SDM29A, SDM2A, SDM73 and SDM103 at a plant density of 70,000 plants/ha had significantly higher yields of 4.41 t/ha, 4.66, 4.70, 4.82, 4.90, 4.38 and 4.75 t/ha, respectively.

Two lines SDM46 and SDM77A at a plant density of 70,000 plants/ha provided yields significantly lower than the population average of 1.56 and 2.78 t/ha, respectively.

It should be noted that there was a significant difference in the yield level of the lines at

Table 3. Yield of self-pollinated maize lines of BSSS germplasm at different plant densities, t/ha

Lines	Grain yield, t/ha					
	2021			2022		
	Plant density, plants/ha					
	50,000	70,000	± to 50,000	50,000	70,000	± to 50,000
DK239MV (standard)	3.14	3.65	0.5	1.31	1.15	-0.2
DK3938	3.92	4.41	0.5	1.92	1.66	-0.3
SDM95-10	3.14	4.66	1.5	1.62	1.43	-0.2
SDM95-10A	3.18	3.88	0.7	1.51	1.43	-0.1
SDM95-30	4.14	4.70	0.6	1.51	1.57	0.1
SDM95-30A	3.04	3.83	0.8	1.66	1.55	-0.1
SDM125	3.28	3.56	0.3	1.34	1.54	0.2
SDM33	2.95	3.90	1.0	1.26	1.63	0.4
SDM51	3.21	4.20	1.0	1.54	1.62	0.1
SDM27A	3.67	3.58	-0.1	1.81	1.64	-0.2
SDM24A	3.46	4.04	0.6	1.54	1.57	0.0
SDM121	2.67	3.61	0.9	1.55	1.48	-0.1
SDM121A	2.56	3.44	0.9	1.49	1.50	0.0
SDM15	2.62	3.76	1.1	1.73	1.89	0.2
SDM29A	4.70	4.82	0.1	1.21	1.17	0.0
SDM111-9A	3.45	4.06	0.6	1.67	1.56	-0.1
SDM96	2.67	3.43	0.8	1.63	2.08	0.5
SDM2A	3.47	4.90	1.4	2.21	2.00	-0.2
SDM46	2.10	1.56	-0.5	0.66	0.48	-0.2
MS2439	3.33	3.38	0.0	2.08	2.29	0.2
SDM77A	1.85	2.78	0.9	1.76	1.23	-0.5
SDM73	2.83	4.38	1.6	1.11	1.15	0.0
SDM84-35	3.92	3.27	-0.7	1.67	1.79	0.1
SDM103	4.56	4.75	0.2	1.04	1.24	0.2
SDM103A	2.93	3.63	0.7	1.24	1.38	0.1
Population average	3.26	3.91	0.7	1.52	1.52	0.0
LSD ₀₅ , cm	0.48	0.69		0.53	0.48	

both plant densities: from 1.85 t/ha to 4.7 t/ha at a density of 50,000 plants/ha and from 1.56 to 4.9 t/ha at 70,000 plants/ha. At the same time, five lines (20 %) significantly exceeded the standard and six (24 %) were inferior to the standard at a density of 50,000 plants/ha, and a similar situation was observed at 70,000 plants/ha for seven (28 %) and two (8 %) lines.

It is worth noting that the increase in plant density from 50,000 to 70,000 plants/ha led to an over 30 % increase in grain yields of nine lines of SDM95-10, SDM33, SDM51, SDM121, SDM121A, SDM15, SDM2A, SDM77A, and SDM73.

In the dry year of 2022, the grain yield of maize lines was on average the same (1.52 t/ha) at both plant densities. The range of variations was from 0.66 t/ha to 2.21 t/ha at a plant density of 50,000 plants/ha and from 0.48 t/ha to 2.29 t/ha at 70,000 plants/ha. Despite the unfavourable weather conditions of the year, thirteen lines (52 %) increased yields by 0.7–29.4 % due to the increased plant density. At the same time, nine (36 %) lines significantly exceeded the standard line DK239 MV by this indicator at a plant density of 50,000 plants/ha and eight lines (32 %) at a density of 70,000 plants/ha. Only the SDM46 line was inferior to the standard at both

plant densities.

Weather conditions in 2022 led to a decrease in grain yield in self-pollinated maize lines by an average of 1.74 t/ha (53.4 %) at a plant density of 50,000 plants/ha and by 2.39 t/ha (62 %) at 70,000 plants/ha compared to 2021. In the standard DK239 MV line, grain yields decreased by an average of 1.83 t/ha (58.2 %) compared to 2021. It was noted that the lines SDM29A and SDM103, providing the highest yields at both densities in 2021, significantly decreased the yields (more than 70 %) in 2022.

At a plant density of 50,000 plants/ha, two lines SDM2A and MS2439 had significantly higher yields of 2.21 and 2.08 t/ha, respectively. The line SDM46 had a significantly lower yield (0.66 t/ha). At a plant density of 70,000 plants/ha, significantly higher yields were formed by the lines SDM96, SDM2A and MS2439 (2.08, 2.00 and 2.29 t/ha, respectively). A significantly lower yield (0.48 t/ha) was obtained in the line SDM46.

For both years, the yields of the lines SDM15, SDM2A, SDM96 and MS2439 were more stable, their grain yield in 2022 decreased by 1.11 t/ha (40.8%) compared to 2021. The highest instability of this indicator at a density of 50,000 plants/ha was observed in the lines SDM95-30, SDM29A, SDM84-35 and SDM103, depending on the conditions prevailing during the studies. Under the influence of the weather conditions, the grain yield of these lines decreased by 2.63, 3.49, 2.25 and 3.52 t/ha (i.e. 63.5%, 74.2, 57.4 and 77.3%, respectively).

Worsened moisture supply in 2022 led to a decrease in grain yield of self-pollinated maize lines at a plant density of 70,000 plants/ha by an

average of 2.39 t/ha (62.1 %) compared to favourable conditions in 2021. In the standard DK239 MV line, grain yield decreased by 2.50 t/ha (68.4 %) compared to favourable moisture conditions in 2021. In 2022, at a plant density of 70,000 plants/ha, the most stable by this indicator were the lines SDM96, MS2439 and SDM84-35, whose grain yields decreased by 1.35 t/ha, 1.08 and 1.48 t/ha (39.4, 32.1 and 45.3%), respectively. The most unstable manifestation of this trait during the years of research at a plant density of 70,000 plants/ha were lines SDM95-10, SDM95-30, SDM29A, SDM46, SDM73 and SDM103, whose grain yield decreased by 3.23 t/ha, 3.13, 3.65, 1.08, 2.23, 3.51 t/ha (69.4 %, 66.5, 75.7, 69.5, 66.0 and 73.8 %, respectively).

Conclusions. The following conclusions can be drawn from the evolution of the influence of plant density and climatic conditions on such traits as the duration of the periods from seedling to flowering of 50 % of tassels and from seedling to flowering of 50 % of ears, plant height and ear insertion height, as well as grain yield of self-pollinated maize lines:

- manifestation of these traits was more influenced by the weather conditions of the year than by the plant density;

- clear genotypic response of the lines to agronomic and weather factors was observed;

- self-pollinated maize lines SDM15, SDM2A, SDM96 and MS2439, and SDM84-35, which during two years of research under different agronomic and technical conditions had more stable grain yields, were selected for the development of drought-resistant hybrids.

References

1. Cherchel, V. Yu., Dziubetsky, B. V., Satarova, T. M., Denysiuk, K. V., Stasiv, O. F. (2020). *Vykhidnyi material zarodkovoi plazmy Lankaster u selektsii i biotekhnologii kukurudzy* [Lancaster germplasm source material in maize breeding and biotechnology]. Kyiv: Agrarna nauka. [in Ukrainian].
2. Sprog, G. F. (1957). *Selektsiia kukuruzy. Kukuруза i yeyo uluchshenie* [Selection of corn. Maize and its improvement]. Moscow: N. p. [in Russian].
3. Troyer, A. F. (1999). Background of U. S. hybrid corn. *Crop Sci.*, 39. 601–626.
4. Troyer, A. F. (2000). Temperature corn – background behavior and breeding. *Speciality corns*. Second edition. CBS Press.
5. Dziubetsky, B. V., Cherchel, V. Yu. (2002). Modern germplasm in the corn breeding program at the Institute of Grain Farming of the Ukrainian Academy of Sciences. *Selektsiia i nasinnystvo* [Breeding and seed production], 86. 11–19. [in Ukrainian].
6. Bodenko, N. A. (2003). *Dobir ta otsinka vykhidnoho materialu na posukho- ta zharostiykist dlia selektsii serednostyhlykh hibrydiv kukurudzy* [Selection and assessment of the source material for drought and heat resistance for the selection of mid-ripening hybrids of corn] (Cand. Agric. Sci. Diss.) Instytut zernovoho hospodarstva UAAN. Dnipropetrovsk. Ukraina. [in Ukrainian].
7. Lebid, E. M., Tsykov, V. S., Pashchenko, Y. M., Shevchenko, M. S., Kirpa, M. Ya., Pashchenko, N. O., Kordin, O. I. (2008). *Metodyka provedennia po-*

- liovyykh doslidiv z kukurudzoiu* [Methodology for conducting field experiments with corn]. Instytut zernovoho hospodarstva UAAN. Dnipropetrovsk. [in Ukrainian].
8. Pashchenko, Yu. M., Borysov, V. M. (2015). *Tekhnologiiia vyroshchuvannia hibrydiv kukurudzy* [Technology of growing corn hybrids]. Dnipropetrovsk: Aktsent PP. 27 p. [in Ukrainian].
 9. Birchler, J. A., Auger, D. L., Riddle, N. C. (2003) In search of the molecular basis of heterosis. *Plant Cell*, 15. 2236–2239.
 10. East, E. M. (1908). Inbreeding in corn. Rep. Connecticut AgricExpStn. 419–428.
 11. Khadzhinov, M. I. (1957) Selection of self-pollinated linseed corn with sterile pollen and linseed fertility restorers. *Seleksiia i nasinnystvo* [Breeding and seed production], 1. 8–13. [in Russian].
 12. Palamarchuk, V. D., Polishchuk, I. S., Kalenska, S. M., Yermakova, L. M. (2013). *Biologhiia i ekologiia silskohospodarskykh roslyn* [Biology and ecology of agricultural plants]. Vinnytsia. 2013.
 13. Nelson, P. T., Coles, N. D., Holland, J. B. [et all.]. (2008). Molecular characterization of maize inbreds with expired U.S. Plant Variety Protection. *Crop Science*, 48 (5). 1673–1685. doi: 10.2135/cropsci.2008.02.0092 [in Ukrainian].
 14. Antoniuk, S. P., Galechko, I. D., Motrenko, V. I., Fedko, M. M. (2007). Selection evaluation of self-pollinated lines of corn of different genetic plasmas in the conditions of the South-Eastern Steppe of Ukraine. *Biuletyn Instytutu zernovoho hospodarstva UAAN* [Bulletin of the Institute of Grain Management], 30. 104–109. [in Ukrainian].

УДК: 633.15:631.526.322:581.14(477.63)

Пазюк Н. В. Оцінка самозапилених ліній кукурудзи зародкової плазми BSSS за селекційними ознаками в умовах Північного Степу України. Зернові культури. 2023. 7 (2) 240–247.

Науково-виробниче фермерське господарство «КОМПАНІЯ МАІС», вул. Центральна, 50, с. Зайцеве, Синельниківський район, Дніпропетровська область, 52514, Україна

Актуальність. Зародкова плазма кукурудзи BSSS широко використовується в більшості селекційних програм провідних компаній, проте визначається недостатньою різноманітністю скоростиглих ліній. Актуальність роботи полягає у визначенні основних селекційних ознак самозапилених ліній кукурудзи гетерозисної групи BSSS, адаптованих до умов Північного Степу України. **Метою** наших досліджень була оцінка нових самозапилених ліній плазми BSSS в умовах північного Степу України. **Матеріали і методи.** За вихідний матеріал взято 25 самозапилених ліній кукурудзи генетичної плазми BSSS. Методи: Візуальний – фенологічні спостереження; лабораторно-польовий – визначення морфо-біологічних ознак рослин; вимірювально-ваговий – визначення врожайності та метричних ознак рослин; математично-статистичні – розрахунок достовірності результатів, показників варіабельності ознак, кореляційної залежності ознак; дисперсійний аналіз; комплексне оцінювання морфо-біологічних та господарсько-цінних характеристик інбредних ліній. **Результати.** Проведена оцінка 25 самозапилених ліній кукурудзи зародкової плазми BSSS за наступними ознаками: тривалість періоду «сходи – цвітіння 50 % волотей» і «сходи – цвітіння 50 % качанів», «висота рослин» і «висота кріплення качана», «врожайність зерна». **Висновки.** Виділено самозапилені лінії кукурудзи, які за два роки досліджень за різних агротехнічних умов мали більш стабільні селекційні ознаки: СДМ15, СДМ2А, СДМ96 і МС2439, і СДМ84-35, які представляють цінність при створенні посухостійких гібридів.

Ключові слова: кукурудза, самозапилені лінії, генетична плазма BSSS, тривалість періоду «сходи – цвітіння», врожайність зерна