https://doi.org/10.61308/AHGE9596

Selena – a new cotton variety

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Citation: Dimitrova, V., & Nedyalkova, S. (2024). Selena – a new cotton variety. *Bulgarian Journal of Crop Science, 61*(1), 31-41.

Abstract: The aim of this research was to study the productive potential and evaluate the fiber properties of the new Selena cotton variety. The variety was studied in competition variety trials conducted in 2017-2022 in the experimental field of the Field Crops Institute in the town of Chirpan. In the IASAS system the variety was tested in 2021-2022. It was approved as a new cotton variety in 2023. Selena variety was created by remote hybridization from the crossing of the allotetraploid *Gossypium thurberi* Tod. × *Gossypium raimondii* Ulbr. with Dorina variety and subsequent backcrossing with Darmi variety. Selena variety is an early and productive new cotton variety with improved fiber quality. The vegetation period was 106-111 days. In seed cotton yield of 1663 kg/ha, on average for 6 years, it surpassed the standard cultivar Chirpan-539 by 12.3%. According to the IASAS data, in seed cotton yield of 2163 kg/ha it exceeded the two standard cultivars, Chirpan-539 - by 2.2%, Avangard-264 - by 1.3%, the average standard (average of the two standards) - by 1.8%. In lint yield of 95.5 kg/ha Selena variety was equal to Avangard-264, surpassed Chirpan-539 by 2.9% and respectively the average standard - by 1.4%. Selena variety had a number of valuable technological fiber qualities and in some indicators surpassed both standard cultivars. Compared to the two standard cultivars it had better Spinning Consistency Index (SCI), greater Upper Half Mean Length and fiber strength, lower micronaire, better spectroscopy with RD difference reflection than Chirpan-539, less yellowness than Avangard-264 and better fiber whiteness. Selena variety combines better productivity with better technological fiber qualities than the standard cultivars, which defines it as a new achievement in the selection of cotton in our country.

Keywords: cotton; *G. hirsutum* L.; new variety; productivity; fiber properties

INTRODUCTION

The main goal of each cotton breeding program is to create new varieties with the desired characters, possessing high genetic potential for yield and improved fiber quality, adapted to specific growing conditions, resistant to abiotic and biotic stress factors. Improving productivity and fiber quality are the primary objectives of any breeding program with cotton (Chapara & Madugula, 2021).

A constant task of cotton breeding in our country is to create varieties with high and stable yields over years and better fiber quality. Despite the difficult economic conditions, the cotton breeding in our country continues to develop at relatively good paces. In recent years, as a result of intensive selection and improvement work both seed cotton yield and fiber quality have been increased (Dimitrova et al., 2022). Intraspecific and interspecific hybridization and experimental mutagenesis are the main breeding methods.

New achievements of selection are the new cotton varieties: Sirius, Tsvetelina, Pirin, Perun (Valkova, 2017; Koleva & Valkova, 2019; 2023), Aida, Anabel, Tiara and Melani (Dimitrova, 2022a; 2022b; 2023). These varieties combine a complex of valuable traits, they are very early, have higher productivity than standard varieties, Anabel and Melani are distinguished by improved fiber quality characteristics. Pirin, Perun and Anabel varieties were obtained by intraspecific hybridization, Sirius and Tsvetelina varieties were created by experimental mutagenesis,

Aida, Tiara and Melani varieties were the result of remote hybridization and backcross technology. New candidate varieties and new promising lines were obtained. The new varieties and new genetic material obtained are a good genetic basis for further breeding work with cotton.

The aim of this research was to study the productive potential and evaluate the technological fiber properties of the new cotton Selena variety compared to the standard cultivars.

MATERIAL AND METHODS

Selena variety was created by remote hybridization from the crossing of the allotetraploid *Gossypium thurberi* Tod. × *Gossypium raimondii* Ulbr. 2(D_1D_5) (2n=52) with Dorina variety and subsequent backcrossing with Darmi variety [(F7 *Gossypium thurberi* × *G. raimondi*i) × Dorina] × Darmi. The initial plant was selected in F_5BC_1 and the progeny was subjected to multiple negative selection on the most economically important traits. In 2015, as a selection line No. 678, it was included in a control nursery, in 2016 - in a preliminary variety test and since 2017 it has been tested in competitive variety trials. The trials were carried out in the experimental field of the Field Crops Institute in town of Chirpan on pellic vertisol, by the block method, in 4 replications, and a 20 m^2 harvest plot. The cultivar Chirpan-539 was used as a standard. This variety is very early, high yielding and is distinguished by high lint percentage, ecological plasticity and stability. Standard cotton growing technology was applied. Ten plants of each replicate were observed. To evaluate the economic qualities the following traits were taken into account: seed cotton yield (kg/ha); lint yield (kg/ha); boll weight (g); lint percentage (%) and mean fiber length (mm). A two-factor analysis of variance was performed on the results obtained (Lidanski, 1998). The ANOVA 123 program was used.

Selena variety was included for testing in the IASAS (Exclusive Agency for Variety Testing, Approbation and Seed Control) system (State Variety Testing) in 2021 and 2022. In 2021 it was tested in only one location, at the Experimental Station for Variety Testing in Radnevo, at the IASAS. Radnevo region is typical in climatic and soil conditions for cotton cultivation in South Bulgaria. The main cotton areas are located in this region. In 2022 the variety was tested in two locations in Radnevo and in Plovdiv. The standard cultivars were Chirpan-539 for earliness and productivity and Avangard-264 for fiber quality. These two cultivars are the national cotton standards. In the State Variety Testing (IASAS) the new cotton varieties are compared with the two standard cultivars and with an average standard, the average of the two standards.

In the IASAS network the new variety was tested under non-irrigated conditions, for Biological and Economic Qualities and for Distinctiveness, Homogeneity and Stability, and on an artificial infectious background for resistance to verticillium wilt (*Verticilium Dahliae*).

Fiber properties measured by HVI were: Spinning Consistency Index (SCI); the Upper Half Mean Length (UHML) in mm; Uniformity - a ratio between the Mean Length and the Upper Half Mean Length expressed as a percentage (ML/UHML); Micronaire - it is a measure of fiber fineness and maturity expressed as „micronaire“ or „*mic*“; Strength (Str) in *g/tex* and elongation (Elg) in percentages; Color Grade (C Grad) *Upland*; Spectroscopy with reflectance of the difference (RD) and yellowness (+b). The color of cotton is measured by the degree of reflectance (RD) and yellowness (+b). Reflectance indicates how bright a sample is, and yellowness indicates the degree of color pigment.

The period under study (2017-2022) included years with different temperature sums and rainfall during the growing season of cotton (Table 1). In terms of temperature sum in May-September, 2018 and 2020 were warm (P=18.75% and P=15.62%); 2017, 2019 and 2022 were moderately warm (P=25.0%; P=21.87% and P=37.50%); 2021 was average (P=43.75%). In terms of rainfall in May-August, 2018 was wet (P=12.50%); 2017 and 2019 were moderately wet (P=37.50%

and P=21.87%); 2022 was average (P=46.87%); 2021 was moderately dry (P=75.03%) and 2020 was dry (P=90.63%).

P% is the coverage factor (coefficient of security) for the temperature sum in May-September and for the rainfall in May-August. The years of study were compared with the average long-term values of the base period of the last 30 years (1991-2020). This period was taken as a climatic norm (Alexandrov et al., 2010).

RESULTS AND DISCUSSION

Selena variety has a medium-high conical in shape shrub. The stem is reddish-green with strong hairiness in the upper part. The leaf mass is of medium density. The leaves are medium-sized, palm-shaped, 3-5 lobed, with strong hairiness on the underside, available glands and grassy-green color. The sympodial branches are medium long, with medium-long internodes. This variety sets

Table 1. Climatic characteristics for the Chirpan region for the period April-September of 2017-2022 compared to multi-year values of the base period 1991-2020

Years	Months						Σ IV-IX	Σ VI-VIII	Σ V-IX
	IV	V	VI	VII	VIII	IX			
Sum of temperatures, Σ t °C									
1991– 2020	369	532	641	741	745	575	3603	2127	3234
2017	356	514	664	758	779	621	3692	2201	3336
±	-13	-18	+23	+17	+34	+46	+89	+74	+102
2018	471	585	647	710	749	651	3813	2106	3342
±	+102	+53	+6	-31	+4	+76	+210	-21	+108
2019	335	533	681	727	772	624	3672	2180	3337
±	-34	+1	+40	-14	+27	+49	+69	+53	+103
2020	314	516	615	765	788	662	3660	2168	3346
±	-55	-16	-26	+24	+43	+87	+57	+41	+112
2021	309	524	616	793	789	564	3595	2198	3286
±	-60	-8	-25	+52	+44	-11	-8	+71	+52
2022	367	537	659	774	782	565	3684	2215	3317
±	-2	+5	+18	+33	+37	-10	+81	+88	+83
Rainfall, mm									
1991 - 2020	43.9	56.8	53.9	55.2	35.0	51.1	295.9	144.1	252.0
2017	22.6	59.5	84.3	35.4	42.7	46.3	290.8	162.4	268.2
±	-21.3	+2.7	+30.4	-19.8	+7.7	-4.8	-5.1	+18.3	+16.2
2018	9	62	88	98	22	23	302	208	293
±	-34.9	+5.2	+34.1	+42.8	-13.0	-28.1	+6.1	+63.9	+41.0
2019	51.4	21.4	123.2	77.5	26.8	15.7	316.0	227.5	264.6
±	+7.5	-35.4	+69.3	+22.3	-8.2	-35.4	+20.1	+83.4	+12.6
2020	62.2	50.3	62.6	12.0	2.4	3.2	192.7	77.0	130.5
±	+18.3	-11.7	+8.7	-43.2	-32.6	-47.9	-103.2	-67.1	+121.5
2021	84.0	34.9	42.8	49.0	34.4	5.0	250.1	126.2	166.1
±	+40.1	-21.9	-11.1	-6.2	-0.6	-46.1	-45.8	-17.9	-85.9
2022	36	29.4	80.3	7.7	68.8	34.9	257.1	157	221.1
±	-7.9	-27.4	+26.4	-47.5	+33.8	-16.2	-38.8	+12.9	-30.9

the 1st sympodium at an average height of 27.6 cm.The flowers are creamy, without anthocyanin spot at the base of petals. Pollen is whitish, and the stigma is located visibly higher than the anthers. The bolls are medium in size, oval-ovate in shape, with a fine to rough surface, and a slight to medium protrusion at the top. The degree of boll opening at full maturity is strongly. The seeds are medium large, covered with medium dense whitish fuzz.

Selena is an early and productive variety, with very good technological fiber qualities. The fiber is white, with a relatively high lint percentage, medium-long, medium-fine, strong, with good uniformity in length, medium good elongation, high maturity and very good spinning consistency index (SCI).

On a natural infectious background, the variety is not attacked by verticillium wilt and bacteriosis. Against an artificial infectious background, the variety is moderately resistant to verticillium wilt agents.

The new variety is stable, homogeneous and distinguishable from other varieties.

Testing results of the new cotton variety in the experimental field of Field Crops Institute in Chirpan showed that the seed cotton yield in individual years varied from 1486 kg/ha in 2021 to 2006.3 kg/ha in 2022 (Table 2). The new variety in seed cotton yield exceeded the standard cultivar Chirpan-539 during all years of testing by 7.3% in 2018 to 14.9% in 2022. The differences were statistically significant in three years and non significant in the other three years. Variation of yields by years was due to different climatic conditions during the critical periods for cotton such as emergence, flowering and fruiting. Temperature sums and rainfall in individual years did not show a certain regularity. Rainfall during the cotton growing season was very unevenly distributed (Table 1).

Seed cotton yields of both the standard cultivar and the new cotton variety were lowest in 2018 and 2021, and highest in 2022. Rainfall in the months of June, especially July and early August, period of flowering and fruit formation, is of great importance for the formation of seed cotton yield. In 2021, rainfall was below normal for the months of May, June, July, August and September. In 2018, rainfall for the months of June (+88 mm) and July (+98 mm) were way above the norm for many year period, while the temperature sum for the month of July was below the norm (-31°C).

Lower yields were due not only to the year conditions, but also of dely of germination, later implementation of some agro-technical measures such as cotton weed control.

On average for the six years (2017-2022), Selena variety produced seed cotton yield of 1663 kg/ha and exceeded significantly by 11.3% the standard cultivar Chirpan-539.

Selena variety in lint yield of 657 kg/ha surpassed the standard cultivar Chirpan-539 by 9.9% (Table 3). The boll weight was by 0.3 g significantly bigger than that of the standard cultivar

Table 2. Seed cotton yield obtained from the new cotton Selena variety included in Competitive Variety Trial, conducted at the Field Crops Institute in Chirpan, during 2017-2022

Cultivar/ Variety	Seed cotton yield, kg/ha						Mean kg/ha	In % to Chirpan-539-St
	2017	2018	2019	2020	2021	2022		
Chirpan-539-St	1437	1392	1521	1491	1326	1795	1494	100.0
Selena	1628 13.3%***	1494 7.3%	1638 7.7%	1671 12.1%***	1486 12.1%	2063 14.9%***	1663 11.3%	111.3 ***
GD 5.0%	88	119	163	74	187	155	51	3.4
GD 1.0%	116	157	215	98	249	205	68	4.6
GD 0.1%	151	204	278	127	323	266	90	6.0

and the fiber length was by 0.9 mm longer. In lint percentage (39.5%) the new variety was very slightly inferior by 0.5% to the standard cultivar. Given that Selena variety was very slightly inferior to the standard cultivar Chirpan-539 in terms of lint percentage, the realized higher lint yield was due to the realized higher seed cotton yield.

A two-factor analysis of variance was performed on the studied characters of the new cotton variety and the standard cultivar for 2017 - 2022 (Table 4). Genotypes of the new variety and the standard cultivar, the years and the interaction of genotypes × years had different effects on the total variation of studied traits. The year conditions had the greatest influence on the formation of all traits under study. Contribution of years in the total variation of boll weight and fiber length was the strongest 76.01 - 73.51%. Participation of years in the total variation of seed cotton yield was 68.57%, of lint percentage - 56.47%. These results show that seed cotton yield, boll weight, lint percentage and fiber length were most strongly influenced by the year conditions. Genotypes also had significant effect on the formation of studied traits, which means that the new variety and the standard cultivar differed in these traits. After years, genotypes were of importance for seed cotton yield, boll weight and fiber length, the genotype × year interaction was non-significant for these traits. Regarding lint percentage the genotype × year interaction was significant and had greater influence than the genotype in the total variation of this trait. This indicates that the new variety and the standard cultivar have reacted specifically to the environmental conditions (the years).

Results of the State Variety Testing (IASAS, 2021; 2022) of Selena variety for economic traits are presented in Table 5. The data for September harvest, seed cotton yield and lint yield are presented for 2022, for lint percentage, height of first fruiting branch setting (first sympodium) and technological fiber qualities (Table 6) are given for 2021 and 2022. September harvest (cotton harvested until September 30) is used as a criterion to assess the earliness of varieties. The new variety Selena in September harvest exceeded the two standard cultivars and the average standard by 2.2%. In seed cotton yield in Radnevo location, it was equal to Chirpan-539 and was inferior to Avangard-264 by 3.5%, to the average standard by 1.6%. In Plovdiv location, it significantly exceeded both standards and the average standard by 6.4%. On average, from the two locations, Selena variety achieved seed cotton yield of 2163 kg/ha, surpassing slightly the two standards and the average standard by 1.8%. In lint yield it was equal to Avangard-264, surpassed Chirpan-539 and the average standard by 1.5%.

Results obtained for the September harvest and total seed cotton yield characterize the new cotton Selena variety as early maturing and productive variety.

Selena variety in lint percentage of 38.4%, on average for the two years, slightly surpassed the two standards and the average standard by 0.5%. In the first year of testing, Selena variety in lint percentage of 37.26% was very slightly inferior to the two standards (37.55% for the cultivar Chirpan-539 and 37.50% for the cultivar Avangard-264) and the average standard (37.53%). In

Table 3. Economic traits of the new cotton Selena variety included in Competitive Variety Trial, conducted at the Field Crops Institute in Chirpan, during 2017-2022 (average for six years)

Cultivar/ Variety	Lint yield kg/ha	Boll weight g	Lint percentage %	Fiber length mm
Chirpan-539	598	5.1	40.0	25.0
Selena	657	5.4***	39.5^{00}	25.9***
GD 5%	-	0.1	0.4	0.3
GD 1%	-	0.2	0.5	0.4
GD 0.1%	-	0.3	0.7	0.6

Table 4. Analysis of variance of studied traits for Selena variety and the standard cultivar (average for six years)

Sources of variation	Degrees on freedom	Sum of squares	Correlation ratio, %	Dispersion	F experimentally
	Seed cotton yield, *kg/ha*				
Total	47	222257.5	100.0	-	-
Replications	3	253.7	0.11	84.6	0.11
Variants	11	197242.5	88.75	17931.1	23.90***
Genotypes-A	1	41421.3	18.64	41421.3	55.20***
Years-B	5	152398.8	68.57	30479.8	40.62***
Genotypes ×years (A×B)	5	3422.5	1.54	684.5	0.91
Errors	33	24761.3	11.14	750.3	-
	Boll weight, *g*				
Total	47	12.15	100.0	-	-
Replications	3	0.15	1.27	0.05	1.13
Variants	11	10.50	86.38	0.95	20.99***
Genotypes-A	1	0.96	7.93	0.96	21.20***
Years-B	5	9.24	76.01	1.85	40.64***
Genotypes ×years (A×B)	5	0.30	2.43	0.06	1.30
Errors	33	1.50	12.34	0.05	-
	Lint percentage, %				
Total	47	78.23	100.0	-	-
Replications	3	1.69	2.17	0.57	1.27
Variants	11	61.91	79.15	5.63	12.71***
Genotypes-A	1	4.76	6.09	4.77	10.76**
Years-B	5	44.17	56.47	8.83	19.94***
Genotypes ×years (A×B)	5	12.98	16.59	2.59	5.86***
Errors	33	14.61	18.68	0.44	-
	Fiber length, *mm*				
Total	47	90.52	100.0	-	-
Replications	3	1.31	1.44	0.43	1.30
Variants	11	78.16	86.35	7.10	21.22***
Genotypes-A	1	9.36	10.34	9.36	27.96***
Years-B	5	66.54	73.51	13.31	39.75***
Genotypes ×years (A×B)	5	2.26	2.50	0.45	1.35
Errors	33	11.04	12.21	0.33	-

the second test year, Selena variety in lint percentage outperformed both standards and the average standard. In this year, compared to the first test year, higher lint percentage was obtained for the new cotton variety (39.5%) and for the standard cultivars (38.4% and 38.18%). Based on the results obtained, Selena variety had higher by 1.5% lint yield than the standard cultivar Chirpan-539 as a result of higher by 0.5% lint percentage and higher by 1.8% seed cotton yield. The

height of first fruiting branch setting is of importance for the new variety suitability for mechanized harvesting of cotton with a combine harvester. In the first test year, this indicator had higher values for the new variety and the standard cultivars compared to the second test year. During the two years of testing, Selena variety set higher first fruiting branch than both standard cultivars and the average standard, respectively. On average for the two years, Selena variety in height of first fruiting branch setting of 27.5 cm surpassed the cultivar Chirpan-539 by 1.7 cm, the cultivar Avangard-264 and the average standard by 1.2 cm. The results obtained for this indicator show that the new variety, as well as the standard cultivars, are suitable for machine harvesting of cotton.

In the State Variety Testing, the growing season for Selena variety was 106 days, with 103 days for Chirpan-539 and 105 days for Avangard-264 in the first testing year and 111 days for Selena and 112 days for the standard cultivars in the second testing year, average for the two years - 108.5 days for Selena variety, 107.5 days for Chirpan-539 and 108.5 days for Avangard-264 (the data are not given here). These results show that the new Selena variety is early-ripening, with a vegetation period comparable to the standard cultivars.

To assess the technical value and commercial value of cotton fiber, a number of technological characteristics are determined. The most important of them are: Spinning Consistency Index (SCI), length; uniformity in length; maturity; strength; elongation, spectroscopy reflecting the difference (RD), color grade, yellowness, short fiber content, etc.

Results for fiber technological properties are presented in Table 6. Compared to the two standard cultivars (Chirpan-539 for productivity and Avangard-264 for fiber quality) Selena variety showed a higher Spinning Consistency Index (SCI) in both years of testing. On average for the two years, the SCI was 115 for Selena variety and for the standard cultivars it was lower, 111 for Chirpan-539, 106 for Avangard- 264 and 108 for the average standard.

Fiber fineness is important for the quality (fineness and strong) of fabrics and yarns produced. Usually, the fiber fineness is expressed by the micronaire value (mic). The finest cottons are those with micronaire value below 3, and the coarsest - above 6. Selena variety had lower fiber micronaire than the standard cultivars during the two testing years and on average over the two years, which means that the fiber of this variety was slightly finer. The fiber of Selena variety had micronaire value of 5.15 mic, compared to 5.42 mic for Chirpan-539, 5.39 mic for Avangard-264 and 5.41 mic for the average standard.

Maturity characterizes the quality of fiber cellulose and affects its strength and elasticity. The degree of maturity is usually expressed as a maturity ratio or maturity percentage. Cotton is con-

Table 5. Results obtained from the testing of new cotton Selena variety in the IASAS system (State Variety Testing) in 2021-2022

Cultivar/Variety	September harvest, kg/ha	In % to average standard	Seed cotton yield, kg/ha			In % to average standard	Fiber yield, kg/ha	In % to average standard	Lint percentage, %	Height of 1st fruiting branch setting, cm
			Radnevo	Plovdiv	Mean					
Average standard	1788	100.0	2456	1793	2125	100.0	941	100.0	37.9	26.3
Chirpan-539	1758	98.3	2411	1820	2116	99.6	928	98.6	38.0	25.8
Avangard-264	1818	101.7	2501	1766	2134	100.4	955	101.5	37.8	26.3
Selena	1828	102.2	2417	1907***	2163	101.8	955	101.5	38.4	27.5

sidered mature when the percentage of maturity is above 82. As for fiber maturity index, in the individual years of testing and on average for the two years (0.87) Selena variety was equal to the standard cultivars and the average standard, respectively.

Fiber length is of greatest importance in determining its technical value. The quality of the resulting yarns and fabrics mainly depends on it. Various parameters have been adopted to characterize this indicator - modal length, staple length, base, uniformity, elongation, coefficient of variation. Internationally, lengths determined on the Fibrograph and HVI are most commonly used. Selena variety in Upper Half Mean Length (UHML) exceeded the two standard cultivars in both years of testing. On average for the two years, Selena variety in UHML of 25.62 mm exceeded Chirpan-539 by 0.64 mm, Avangard-264 - by 1.06 mm, the average standard - by 0.85 mm. In terms of fiber uniformity (UL) Selena variety was inferior to Chirpan-539 in both years of testing. On average for the two years, for this indicator (81.7%) it was inferior to Chirpan-539 (82.2%), very slightly surpassed Avangard-264 (81.4%) and was leveled to the average standard (81.8%). Selena variety in fiber elongation of 8.9%, average for the two years, was slightly inferior to Avangard-264 (9.1%) and was equal to Chirpan-539.

Fiber strength directly affects the strength of yarns and fabrics. In addition, stronger cottons tolerate mechanical manipulations better. In practice, it mainly determines the strength of a bundle of fibers, which is measured in g/tex. When measuring strength in g/tex, cottons with strength 31 and above 31 are considered very strong, 29-30 – strong, 26-28 – with medium strength. The new cotton Selena variety had better fiber strength than the standard cultivars in both testing years. In the first year, fiber strength was 30.2 g/tex which means very strong. In the second year of testing, fiber strength was lower for the new variety and the standard cultivars, influenced by the year conditions. Selena variety in terms of fiber strength 29.4 g/tex, on average for the two years, surpassed Chirpan-539 by 1.1 g/tex, Avangard-264 - by 1.4 g/tex, the average standard - by 1.2 g/tex.

Selena variety during the first testing year showed better spectroscopy reflecting the difference (RD) than Chirpan-539 and was leveled with Avangard-264. In the second year and averaged over the two years, it had better spectroscopy than the two standard cultivars and the average standard. Selena variety performed better in fiber yellowness than the standard cultivars and the average standard in both testing years and respectively averaged over the two years. In terms of Color graduate (C Grad) *Upland*, in the first testing year Selena variety showed better fiber whiteness than Chirpan-539 and has leveled with Avangard-264, in the second year it had better whiteness than the two standard varieties. The content of short fibers was low (8.5 on average for the two years) as it was in the standard varieties (8.3 and 9.3).

Research results for economic and technological fiber qualities characterize the new cotton Selena variety as early and productive, with improved fiber quality. In the IASAS system Selena variety showed better fiber technological properties during the two testing years, compared to the two standard cultivars. On average for the two years of testing, Selena variety had better performance for agronomic traits such as higher September harvest, higher seed cotton yield and higher lint yield, and for fiber technological properties such as greater Upper Half Mean Length and fiber strength, better Spinning Consistency Index (SCI), lower micronaire, better spectroscopy reflecting the difference (RD) than Chirpan-539, less yellowness than Avangard-264 and better fiber whiteness. Selena variety combines better productivity with better fiber technological qualities than the standard cultivars, which defines it as a new achievement in the selection of cotton in our country.

In the textile industry, American standards for the quality of cotton fiber are generally accepted as international. According to the USA international standards (USDA Cotton Classification, 2004.), in fiber length the new cotton variety (25.62mm), as well the standard cultivars

Table 6. Technological fiber qualities according to IASAS data by years and on average for the two years 2021-2022

Year	Average standard	Chirpan-539	Avangard-264	Selena
Spinning Consistency Index (SCI)				
2021	116	118	114	121
2022	100	103	97	109
Mean	108	111	106	115
Micronaire (Mic)				
2021	5.49	5.55	5.43	5.18
2022	5.32	5.28	5.35	5.12
Mean	5.41	5.42	5.39	5.15
Maturity (Mat) Index				
2021	0.88	0.88	0.88	0.88
2022	0.86	0.86	0.86	0.86
Mean	0.87	0.87	0.87	0.87
Upper Half Mean Length (UHML), mm				
2021	25.22	25.26	25.17	25.72
2022	24.32	24.69	23.94	25.51
Mean	24.77	24.98	24.56	25.62
Uniformity (UL) %				
2021	82.8	83.1	82.5	82.6
2022	80.8	81.2	80.3	80.7
Mean	81.8	82.2	81.4	81.7
Fiber strength (Str), g/tex				
2021	29.3	29.8	28.8	30.2
2022	27.0	26.8	27.2	28.6
Mean	28.2	28.3	28.0	29.4
Elongation(Elg), %				
2021	7.5	7.4	7.5	7.2
2022	10.6	10.4	10.7	10.7
Mean	9.0	8.9	9.1	8.9
Spectroscopy reflecting the difference (Rd)				
2021	80.3	79.2	81.3	81.1
2022	81.4	81.5	81.3	82.0
Mean	80.8	80.3	81.3	81.5
Yellowness (+b)				
2021	8.7	8.6	8.7	8.3
2022	8.8	8.5	9.0	8.7
Mean	8.7	8.5	8.8	8.5
Color graduate (C Grad) Upland				
2021	21-2	21-2	21-1	21-1
2022	11-2	11-2	11-2	11-1

(24.98-24.56 mm), belong to "medium staple cotton" and in micronaire - to "medium coarse cotton". In fiber strength, the new variety (29.4 g/tex) and the standard cultivars (28.0 -28.3 g/tex) refer to the group of strong cotton (26-29 g/tex) with good uniformity in fiber length and medium good elongation (8-9%). The new variety as well as the standard cultivars had high maturity index and according to international requirements belong to the group of „mature" cotton (> 82).

In the State Variety Testing, the new Selena variety on a natural infectious background did not show development of *Verticillium wilt* and *bacteriosis*. Against an infectious background, Selena variety showed average resistance, as did Chirpan-539, while Avangard-264 showed resistance.

The new cotton Selena variety was stable, sufficiently homogeneous and clearly distinguishable from all other varieties.

Selena variety has been approved by the IASAS expert commission as a new cotton variety in 2022 (Order No RD 12-4/19.04.2023 of the Minister of Agriculture) and it is in process of certification from the Patent Office of the Republic of Bulgaria.

CONCLUSIONS

Selena is an early and productive new cotton variety with improved fiber quality. In seed cotton yield, average for six years, it surpassed the standard cultivar Chirpan-539 by 11.3%, in lint yield – by 9.9% and had bigger boll weight and longer fiber by 0.9 mm, only in lint percentage it was slightly inferior to the standard.

Based on the IASAS data, Selena variety in productivity exceeded both standard cultivars, Chirpan-539 - by 2.2%, Avangard-264 – by 1.4% and in earliness was equal to the standards. In lint yield it exceeded Chirpan-539 by 2.9% and was equal to Avangard-264 and had slightly higher lint percentage.

Selena variety was characterized by stable and better fiber technological qualities. Compared to the two standard cultivars the new cotton variety had better Spinning Consistency Index (SCI), greater Upper Half Mean Length and fiber strength, lower micronaire, better spectroscopy with reflectance of the difference (RD) than Chirpan-539, less yellowness than Avangard-264 and better fiber whiteness.

Selena variety combines better productivity with better technological fiber qualities than the standard cultivars, which defines it as a new achievement in the selection of cotton in our country.

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Received: September 18 2023; *Approved:* December 08 2023; *Published:* February 2024