

Agronomic performance and fiber quality of the new cotton varieties Tiara and Melani

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Abstract

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The aim of this research was to study the productive potential and to evaluate the fiber technological properties of the new cotton varieties Tiara and Melani, compared to the standard cultivars. These varieties were studied in competitive varietal trials conducted in 2017-2019, in the experimental field of the Field Crops Institute in Chirpan. In the IASAS system, the Tiara and Melani varieties were tested in 2019-2020. They were approved as new varieties in 2021. Both varieties were obtained by remote hybridization and belong to the *Gossypium hirsutum* L. species. Tiara and Melani are early and productive varieties, in terms of seed cotton yield, on average for three years, they surpassed the cultivar Chirpan-539 (standard for productivity) by 8.1% and 6.5%, respectively. According to IASAS data, in seed cotton yield, 2809 kg/ha for Tiara and 2784 kg/ha for Melani, on average for two years, they equalized with the cultivar Chirpan-539 and outperformed the cultivar Avangard-264. In terms of fiber yield (1141 kg/ha and 1066 kg/ha) Tiara variety exceeded the two standard cultivars, Melani variety surpassed the cultivar Avangard-264 and leveled with the cultivar Chirpan-539. These varieties had a number of valuable fiber technological qualities and in some respects exceeded the two standard cultivars or equalized with the Avangard-264. The Tiara variety showed better agronomic performance than the Melani variety, achieving higher fiber yield, as a result of higher lint percentage. The Melani variety had better fiber technological qualities than the Tiara variety. Compared to the standard cultivars, the Melani variety was characterized by a better spinning, consistency index (SCI), lower micronaire, greater strength and better spectroscopy with reflection of the difference RD. This variety showed a better combination of the agronomic indicators with the fiber technological qualities than the Avangard-264, a standard for fiber quality. The results obtained define the new cotton varieties as a very good combination of earliness, productivity and fiber quality. This makes them very valuable for the cotton production and breeding programs with cotton.

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

Abbreviations: Exclusive Agency for Variety Testing, Approbation and Seed Control (IASAS); Spinning, consistency Index (SCI); Reflection of the difference (RD); Upper Half Mean Length (UHML)

Introduction

The main goal of each breeding program is to create new varieties with the desired characteristics, possessing high genetic potential for yield and with improved fiber quality, adapted to specific growing conditions, resistant to abiotic and biotic stress. Many new cotton varieties have been created

in the world, with great productive potential and high quality of the fiber, tolerant to various stressors. Based on transgenic technologies, many genetically modified varieties resistant to specific herbicides and boll worms have been created. With the help of various selection methods, significant improvements have been made in the seed cotton yield and the fiber quality, and in the genetic composition of cotton plant.

Traditional breeding approaches for developing of new stress tolerance cotton varieties are being complemented by innovative technologies, utilizing molecular markers and transgenic technologies or genome editing techniques to obtain desired features (Mubarik et al., 2020; Sabev et al., 2020; Yang et al., 2020). Genetic technologies are widely used to identify genes (Islam et al., 2020; Liu et al., 2020) and to develop different breeding strategies to solve specific problems – breeding for disease resistance (Aini et al., 2022), breeding for herbicide resistance (Iqbal et al., 2022), drought tolerance (Magwanga et al., 2020), heat tolerance (Majeed et al., 2021) and others.

The main goal of the cotton breeding in our country is to create varieties with high and stable yield over the years and enhanced fiber quality. Significant breeding and improvement work has been performed to increase both yield and fiber quality. The main breeding methods are intraspecific and interspecific hybridization and experimental mutagenesis. As a result of successful selection, in recent years, at the Field Crops Institute in Chirpan, many new cotton varieties have been created, early and high yielding (Valkova, 2009; Valkova & Bozhinov, 2010; Valkova, 2014a; 2014b) and of improved fiber quality (Stoilova & Saldzhiev, 2010; Stoilova & Nistor, 2012; Stoilova & Meluca, 2013).

The Sirius and Tsvetelina varieties, obtained by experimental mutagenesis, were newer achievements in the selection of earliness and productivity combining a number of other valuable traits for the production and textile industry (Valkova, 2017; Koleva & Valkova, 2019). Variety Aida, created by remote hybridization, showed high and stable productivity over years and a number of valuable fiber technological qualities (Dimitrova, 2022).

In 2020 the Perun variety was approved, in 2021 four new cotton varieties Anabel, Tiara, Melani and Kristal were recognized by the IASAS.

The aim of this research was to study the productive potential and to evaluate the technological fiber properties of the newest Tiara and Melani cotton varieties, compared to the standard cultivars.

Material and Methods

The variety Tiara was created by remote hybridization and backcross technology, through the crossing of line 413 – *Gossypium hirsutum* L. ($2n = 52$) with the wild diploid species *Gossypium davidsonii* Kel. ($2n = 26$) and triple backcrossing of the amphidiploid (allohexaploid) ($413 \times G. davidsonii Kel.) ($2n = 78$) with the cultivar Chirpan-603, early-maturing, and high productive. Crosses with the wild species *G. davidsonii* Kel. were performed only with F_1 hybrids of *G. hirsutum* L.$

$\times G. barbadense$ L. or lines obtained by combining of this hybridization with intraspecific, as line 413 was obtained. The first backcross was in C_1 and the next two backcrosses were in F_3BC_1 . The starting plant was selected in F_3BC_2 of F_3BC_1 .

The Melanie variety was also created by remote hybridization, by the crossing of the allotetraploid *Gossypium thurberi* Tod. $\times G. raimondii$ Ulbr. with the variety Darmi – *Gossypium hirsutum* L., and backcrossing of the triple hybrid (*G. thurberi* Tod. $\times G. raimondii$ Ulbr. \times Darmi) with the Darmi variety. The Darmi variety was distinguished by a high productive potential, which was realized in favorable for cotton years, large bolls, longer fiber than that of the standard *G. hirsutum* L. cultivars and a lower lint percentage inherited from the *G. barbadense* L. species. The starting plant was selected in F_3BC_1 .

In the progenies of the selected initial plants, a repeating selection was performed on the economically most important traits. In 2012, as selection lines No. 550 (Tiara) and No. 553 (Melani) were included in a control testing, in 2013 they were included in a preliminary variety testing, and since 2014 both lines were included in competitive variety trials.

The trials were conducted in the experimental field of the Field Crops Institute in Chirpan on leached vertisol type and were plotted by the block method, in 4 replications, and a 20 m² 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, very good ecological plasticity and stability. Standard cotton growing technology was applied. 10 plants of each replicate were observed. To evaluate the economic qualities, the following traits were taken into account: seed cotton yield (kg/ha); fiber yield (kg/ha); boll weight (g); lint percentage (%) and fiber length measured by the “butterfly” method (mm).

A two-factor analysis of variance was performed on the results obtained (Lidanski, 1998). The ANOVA 123 program was used.

Tiara and Melani varieties were included for testing in the IASAS (Exclusive Agency for Variety Testing, Approbation and Seed Control) system (state variety testing) in 2019 and 2020. Both varieties were 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 southern Bulgaria. The main cotton areas are located in this region. 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 the new cotton varieties were compared with the two standard cultivars and with an average standard – the mean value of the two standard cultivars.

In the IASAS network the new cotton varieties were tested under non-irrigated conditions, for biological and economic qualities, for homogeneity, distinctiveness and stability, and on an artificial infectious background for resistance to verticillium wilt (*Verticillium Dahliae*).

The fiber properties measured by HVI were: Spinning, consistency Index (SCI); the Upper Half Mean Length (UHML), mm – the average length of the longest ½ fibers in the sample and is expressed in *inch*; Uniformity – a ratio between the Mean Length and the Upper Half Mean Length of the fibers and is expressed as a percentage (ML/UHML); Micronaire – it is a measure of fiber fineness and maturity and is expressed as „micronaire“ or „mic“; Strength (Str) in *g/tex* and elongation (Elg) which is expressed as a percentage; Color Grade (C Grad) *Upland*; Spectroscopy with reflectance of the difference RD and 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 years of testing were characterized as follows: in terms of temperature sum, all years were warm (P = 16.13-20.0%); in terms of rainfall, 2017 (P = 35.71%) and 2019 (P = 23.33%) were moderately wet, 2018 (P = 13.79%) was wet and 2020 (P = 87.10%) was dry. The variability of years in terms of rainfall was greater than it was in terms of temperature sum.

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 the study were compared with the average long-term values of the base period of the last 30 years (1991-2021). This period was taken as a climatic norm (Alexandrov et al., 2010).

Results and Discussion

The Tiara and Melani varieties have 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 den-

sity. The leaves are medium-sized, palm-shaped, 3-5 lobed, with strong hairiness on the underside, available glands and grassy-green colour. The fruiting branches are medium long, with medium-long internodes. The flowers are creamy, without anthocyanin spot at the base of the petals. Pollen is whitish, and the stigma is located visibly higher than the anthers. The bolls of the Tiara variety are small to medium in size, oval-ovate in shape, with a fine to rough surface, and a medium protrusion at the top. The degree of boll opening at full maturity is strongly. The seeds are medium-sized, covered with thick whitish fuzz. The bolls of Melani variety are medium-sized, oval-ovate, with a medium protrusion at the top and their surface is medium rough. When ripe, they have a medium degree of opening. The seeds are of medium to high mass, covered with thick fuzz. The fiber of both varieties is white, with a relatively high lint percentage for the Tiara variety and lower for the Melani variety, medium-long, medium-fine, medium strong to strong for Melani, with average uniformity in length and moderate elongation.

The Tiara and Melani varieties are characterized by relatively high productivity for the conditions of our country, with insufficient temperature sum and rainfall availability for cotton. Cotton is grown under non-irrigated conditions. The testing results of the new cotton varieties in the experimental field of Field Crops Institute in Chirpan showed that the seed cotton yield in individual years varied from 1748 kg/ha in 2018 to 2008 kg/ha in 2019 for the Tiara variety and from 1598 in 2017 to 2059 in 2019 for the Melani variety (Table 1). The new varieties significantly exceeded the standard cultivar Chirpan-539 in seed cotton yield during the three years of testing, Tiara variety by 12.5% to 24.1% in 2017 and Melani variety by 11.2% to 16.3% in 2019. Tiara variety realized a higher seed cotton yield than the Melani variety in 2017, while in the other two years they had the same productivity, the difference in 2019 was non-significant. On average for the three years (2017-2019), seed cotton yield of 1847 kg/ha for Tiara variety and 1802 kg/ha for Melani variety was realized, which was by 8.1% and 6.5%, respectively more than the standard cultivar Chirpan-539.

Table 1. Seed cotton yield resulting from the new cotton varieties Tiara and Melani included in competitive variety trial, conducted at the Field Crops Institute in Chirpan, during 2017-2019

Cultivar/Variety	Seed cotton yield, kg/ha				In % to Chirpan-539
	2017	2018	2019	Mean	
Chirpan-539	1437	1554	1772	1587	100.0
Tiara	1784 ⁺⁺⁺	1748 ⁺⁺	2008 ⁺⁺	1847	108.1 ⁺⁺⁺
Melani	1598 ⁺⁺⁺	1748 ⁺⁺	2059 ⁺⁺⁺	1802	106.5 ⁺⁺
GD 5%	82	141	163	74	4.7
GD 1%	109	188	215	98	6.2
GD 0.1%	141	246	278	127	8.0

The results obtained characterize the new Tiara and Melani cotton varieties as high-yielding for our conditions and responsive to years with sufficient rainfall during the summer months, especially in July, the period of flowering and fruiting. 2017 was characterized by less rainfall in July and higher temperature than the other two years (data are not given here).

The new Tiara and Melani cotton varieties in terms of fiber yield – 731 kg/ha and 708 kg/ha, respectively, surpassed the standard cultivar Chirpan-539 by 14.6% and 11.0% (Table 2). The boll weight was the same for the new varieties and the standard cultivar. The Tiara variety had the same fiber length as the standard variety, while the Melani variety showed by 0.9 mm longer fiber than it. In lint percentage (39.6% for Tiara and 39.3% for Melani), both varieties were inferior to the standard cultivar by 0.6% and 0.9%. Given that the two varieties in terms of lint percentage were very slightly inferior to the standard cultivar, they outperformed it in fiber yield due to the higher seed cotton yield.

The results of the state variety testing of the two cotton varieties (IASAS data), are presented in Table 3. The September harvest, cotton harvested until September 30, was used as the main criterion for determining the earliness of varieties. In 2019, the new varieties in September harvest exceed the two standard cultivars and the average standard by 2.8-2.9%. In 2020, both varieties were inferior to Chirpan-539, Tiara by 2.1%, Melani by 3.7%, exceeded Avangard-264 and the average standard by 5.4% and 3.6%, respectively. On average for the two years, by this trait, they were equal to the standard cultivar Chirpan-539, superior to the Avangard-264 and the average standard, Tiara by 3.9%, Melani by 3.1%.

The results for the total seed cotton yield corresponded to the September harvest, in 2019 the new varieties exceeded the two standard cultivars and the average standard, in 2020 they fell behind Chirpan-539 and exceeded Avangard-264 and the average standard, and on average for the two years, they were equal to Chirpan-539, exceeded Avangard-264 and the average standard, Tiara by 4.1%, Melani by 3.1%.

The results obtained for the September harvest and total

seed cotton yield characterize the new cotton varieties as earlier and more productive than Avangard-264.

In terms of fiber yield, in 2019 the Tiara variety surpassed both standard cultivars and the average standard, while the Melani variety was equal to Chirpan-539 and surpassed Avangard-264 by 3.7%. In 2020, the standard cultivar Chirpan-539 had the highest fiber yield. Tiara variety was closer to Chirpan-539, surpassing Avangard-264 and the average standard, Melani variety was inferior to Chirpan-539 and superior to Avangard-264. On average for the two years, the highest fiber yield was obtained for the Tiara variety, exceeding the standard cultivars and the average standard by 7.4%. Melani variety had a lower fiber yield than Tiara variety and about this trait it was inferior to Chirpan-539, superior to Avangard-264 and equal to the average standard. As for the lint percentage, the Tiara variety was equal to the Chirpan-539, superior to Avangard-264 and the average standard, while the Melani variety had a lower lint percentage and was inferior to Chirpan-539 and the average standard.

Based on the results obtained, compared with the Melani variety, the Tiara variety showed a higher fiber yield as a result of the higher lint percentage.

Both new varieties, as well as the standard cultivars, are suitable for machine harvesting of cotton. In terms of the height of 1st fruiting branch setting (19.7 cm and 20.6 cm), the new varieties equalized with Chirpan-539, superior to Avangard-264 and the average standard, Melani by 6.2%.

In the state variety testing, the growing season for Tiara was 112 days, for Melani it was 111 days, with 110 days for Chirpan-539 and 111 days for Avangard-264 (the data are not given here).

The results for the fiber technological properties are presented in Table 4. Compared to the two standard varieties (Chirpan-539 for productivity and Avangard-264 for fiber quality) the Melani variety showed a higher spinning consistency index (SCI) in both testing years. Tiara variety was inferior to Avangard-264 in 2020. On average for the two years, the SCI was 110 for Tiara variety and 118 for Melani variety, for the standard cultivars it was lower, 108 for Chirpan-539 and 107 for Avangard-264.

Table 2. Economic traits of the new cotton varieties Tiara and Melani included in competitive variety trial, conducted at the Field Crops Institute in Chirpan, during 2017-2019

Cultivar/Variety	Fiber yield, kg/ha	Boll weight, g	Fiber length, mm	Lint percentage, %
Chirpan-539	638	5.1	25.8	40.2
Tiara	731	5.1	25.7	39.6 ⁰
Melani	708	5.1	26.7 ⁺⁺⁺	39.3 ⁰⁰
GD 5%		0.2	0.5	0.6
GD 1%		0.3	0.7	0.8
GD 0.1%		0.4	0.9	1.0

Table 3. Results obtained from the testing of the new cotton varieties Tiara and Melani in the IASAS system (state variety testing) in 2019-2020

Cultivar/Variety	2019	2020	Mean	In % to average standard
<i>September harvest, kg/ha</i>				
Average standard	3147	1988	2568	100.0
Chirpan-539	3153	2140	2647	103.1
Avangard-264	3141	1835	2488	96.9
Tiara	3238	2095	2667	103.9
Melani	3235	2060	2648	103.1
<i>Seed cotton yield, kg/ha</i>				
Average standard	3368	2030	2699	100.0
Chirpan-539	3384	2180	2782	103.1
Avangard-264	3351	1881	2616	96.9
Tiara	3473	2145	2809	104.1
Melani	3456	2110	2784	103.1
<i>Fiber yield, kg/ha</i>				
Average standard	1349	775	1062	100.0
Chirpan-539	1378	854	1116	105.1
Avangard-264	1320	696	1008	94.9
Tiara	1448	832	1141	107.4
Melani	1369	762	1066	100.4
<i>Lint percentage, %</i>				
Average standard	40.1	38.1	39.1	100.0
Chirpan-539	40.7	39.2	40.0	102.3
Avangard-264	39.4	37.0	38.2	97.7
Tiara	41.7	38.8	40.3	100.7
Melani	39.6	36.1	37.9	96.9
<i>Height of 1st fruiting branch setting</i>				
Average standard	18.2	20.6	19.4	100.0
Chirpan-539	18.5	21.4	20.0	103.1
Avangard-264	17.8	19.7	18.8	96.9
Tiara	18.8	20.5	19.7	101.5
Melani	20.1	21.1	20.6	106.2

Compared to the two standard varieties, the Tiara variety showed a lower micronaire in 2019 and a higher one in 2020. The micronaire value determines the fiber fineness. A lower micronaire means a finer fiber. On average for the two years, the fiber micronaire value of Tiara variety (4.90 mic) was approaching to Avangard-264 (4.88 mic) and lower than Chirpan-539 (5.09 mic) and the average standard (4.99 mic). The Melanie variety had a lower fiber micronaire than the standard cultivars during the two testing years and on average over the two years (4.74 mic), which means that the fiber of this variety was slightly finer.

In terms of the Upper Half Mean Length (UHML), the Tiara variety was equal to Chirpan-539 and was equal or inferior (2020) to Avangard-264. On average for the two years, the Tiara variety in fiber length 24.7 mm was inferior to Avangard-264 and was leveled with Chirpan-539.

Melani variety in fiber length, in 2019 exceeded the two standard cultivars, while in 2020 it was close to Avangard-264. On average for the two years, the Melani variety in fiber length 25.6 mm exceeded Chirpan-539 by 1.0 mm, Avangard-264 – by 0.3 mm, the average standard – by 0.7 mm.

Tiara and Melani varieties in terms of fiber uniformity (UL) (81.4% and 81.9%) and in fiber elongation (7.2-7.3%), were equal to the standard cultivars. Both new varieties showed high maturity index (0.87) and were leveled with the standard cultivars (0.87-0.88).

The Tiara variety in fiber strength 27.6 g/tex, on average for the two years, equalized with Chirpan-539, surpassed Avangard-264 by 0.9 g/tex and the average standard by 0.4 g/tex. Melanie variety in fiber strength 28.3 g/tex, on average for the two years, exceeded the two standard cultivars,

Chirpan-539 – by 0.8 g/tex, Avangard-264 – by 1.6 g/tex, the average standard – by 1.6 g/tex.

The Melani variety showed better spectroscopy with reflection of the difference RD than the standard cultivars, Tiara variety was leveled whit them.

The Melani variety showed the lowest content of short fibers (SFC), followed by the Avangard-264. The presence of short fibers by weight expressed by SFC (w) was 8.2% for Melani and 9.1% for Avangard-264. The Melani variety and the standard cultivar Avangard-264, which were found to have a longer fiber, have shown a lower content of short fibers, which is a favorable trend. Stoilova et al. (2012) reported the same trend for Avangard-264, which is confirmed in this study.

The microner value and strength of the fiber, for the new varieties and standard cultivars, were higher in 2020, influenced by the year conditions. In the same year, the quality of fiber was better in terms of its coloring and the content of short fibers was lower.

The Melani variety has shown stable indicators for most fiber quality traits as length, uniformity in fiber length, fiber elongation, short fiber content, spectroscopy with reflectance of the difference RD, color grade, for the two years of testing.

Summarized results of the analysis showed that the new cotton varieties in September harvest and total seed cotton yield were at the same level with the high-yielding standard cultivar Chirpan-539, were superior to Avangard-264

Table 4. Technological fiber properties of the new cotton varieties Tiara and Melani according to the IACAS data, 2019-2020

Year	Average standard	Chirpan-539	Avangard-264	Tiara	Melani
<i>Spinning, consistency Index (SCI)</i>					
2019	103	107	98	109	117
2020	112	108	116	110	118
Average: 2019-2020	108	108	107	110	118
Deviation:		0	-1	+2	+10
<i>Micronaire (Mic)</i>					
2019	4.79	4.96	4.62	4.51	4.35
2020	5.18	5.21	5.14	5.28	5.12
Average: 2019-2020	4.99	5.09	4.88	4.90	4.74
Deviation:		+0.10	-0.11	-0.09	-0.25
<i>Maturity (Mat) Index</i>					
2019	0.87	0.88	0.86	0.87	0.85
2020	0.88	0.87	0.88	0.87	0.88
Average: 2019-2020	0.88	0.88	0.87	0.87	0.87
Deviation:		0.00	-0.01	-0.01	0.01
<i>Upper Half Mean Length) (UHML), mm</i>					
2019	24.8	24.7	24.8	24.6	25.8
2020	25.0	24.4	25.7	24.7	25.3
Average: 2019-2020	24.9	24.6	25.3	24.7	25.6
Deviation:		-0.3	+0.4	-0.2	+0.7
<i>Uniformity (UL) %</i>					
2019	80.9	81.4	80.4	81.2	81.7
2020	81.8	81.6	81.9	81.5	82.1
Average: 2019-2020	81.4	81.5	81.2	81.4	81.9
Deviation:		+0.1	-0.2	0.0	+0.5
<i>Short fibers (SFL), 12.7 mm</i>					
2019	10.2	10.7	9.7	10.6	8.3
2020	8.9	9.4	8.4	8.4	8.0
Average: 2019-2020	9.6	10.1	9.1	9.5	8.2
Deviation:		+0.5	-0.5	-0.1	-1.4

Table 4. Continued

<i>Strength (Str), g/tex</i>					
2019	25.8	27.1	24.4	26.8	27.2
2020	28.5	27.9	29.0	28.4	29.5
Average: 2019-2020	27.2	27.5	26.7	27.6	28.3
Deviation:		+0.3	-0.5	+0.4	+1.1
<i>Elongation (Elg), %</i>					
2019	7.0	6.5	7.4	6.0	7.4
2020	7.5	7.9	7.1	8.4	7.1
Average: 2019-2020	7.3	7.2	7.3	7.2	7.3
Deviation:		-0.1	0.0	-0.1	0.0
<i>Spectroscopy with reflectance of the difference RD</i>					
2019	80.9	80.5	81.3	80.4	82.3
2020	81.8	81.9	81.7	82.9	82.5
Average: 2019-2020	81.4	81.2	81.5	81.7	82.4
Deviation:		-0.3	+0.1	+0.3	+1.0
<i>Yellowness (+b)</i>					
2019	8.3	8.3	8.3	8.1	8.4
2020	9.4	9.3	9.4	9.3	9.3
Average: 2019-2020	8.9	8.8	8.9	8.7	8.9
Deviation:		-0.1	0.0	-0.2	0.0
<i>Color Grade(C Grad) Upland</i>					
2019	-	21-1	21-1	21-2	11-2
2020	11-1	11-1	11-1	11-1	11-1
<i>Trash (Tr Cnt)</i>					
2019	8	8	7	9	2
2020	6	5	6	3	5
Average: 2019-2020	7	6.5	6.5	6	3.5
Deviation:		-0.5	-0.5	-1.0	-3.5
<i>Trash (Tr Ar), %</i>					
2019	0.07	0.07	0.07	0.10	0.02
2020	0.06	0.05	0.07	0.05	0.06
Average: 2019-2020	0.07	0.06	0.07	0.08	0.04
Deviation:		-0.01	0.00	+0.01	-0.03

and the average standard. In terms of fiber yield, the Tiara variety exceeded the two standard cultivars, while Melani variety surpassed Avangard-264 and equalized with Chirpan-539.

The Melani variety had better fiber technological qualities than the Tiara variety. Compared to the standard cultivars, the Melani variety had a better spinning, consistency index (SCI), which means better spinning, greater Upper Mean Length (UNML) than Chirpan-539, lower micronaire, which means finer fiber, greater strength, which is important for yarn strength and better spectroscopy with reflection of the difference RD. This variety showed a better combination of economic traits with the technological fiber properties than the cultivar Avangard-264, a standard for fiber quality.

Campbell (2021) tested the hypothesis that three USA Pee Dee germplasm lines previously identified as rare recombinants can generate populations with a decreased negative relationship between agronomic performance and fiber quality. The results showed that two of the three Pee Dee germplasm lines generated populations with a decreased negative relationship and presumably transmit beneficial allelic combinations for lint percent and fiber quality traits in coupling phase linkage with one another or fixed in offspring.

The results obtained in this study, give grounds to conclude that Melani variety also showed a decreased negative relationship between agronomic performance and fiber quality compared to the standard cultivars. In this variety a more optimal combination of productivity and fiber quality has been achieved.

Compared to the cultivar Avangard-264, (standard for fiber quality), the new variety Melani had better agronomic performance (higher September harvest, seed cotton yield and fiber yield), the same Upper Half Mean Length, greater fiber strength, better spinning, consistency (SCI) Index, lower micronaire, better uniformity in length, better spectroscopy, lower short fibers and lower trash content.

According to the USDA Cotton Classification (2004), (USDA international standards), the new cotton varieties, as well the standard cultivars, in fiber length (24.7-25.6 mm) and micronaire (4.74-4.90 mic) belong to “medium staple cotton” and “medium fine cottons” (from 4.0 to 4.9 mic). In fiber strength, the new varieties (27.6 g/tex and 28.3 g/tex) and standard cultivars (26.7 g/tex -27.5 g/tex) refer to the group of medium strong (25-27 g/tex) to strong (28-30) with average uniformity in fiber length and moderate elongation. The new varieties as well as the standard cultivars had high maturity index and according to international requirements belong to the group of „mature“ cotton (> 82).

There was no development of verticillium wilt and bacteriosis on a natural infectious background.

The new varieties were stable, sufficiently homogeneous and clearly distinguishable from all other varieties.

Both varieties have been approved by the Expert commission of the IASAS as new cotton varieties in 2021 (Order No RD 12-13/23.06.2021 of the Minister of Agriculture) and they are in the process of certification from the Patent Office of the Republic of Bulgaria.

Conclusions

Tiara and Melani are early-maturing and productive new cotton varieties, in seed cotton yield, on average for three years, they surpassed the cultivar Chirpan-539 (standard for productivity) by 8.1% and 6.5%, respectively.

According to IASAS data, the Tiara and Melani varieties in earliness and productivity were levelled with the cultivar Chirpan-539 and surpassed the cultivar Avangard-264. In fiber yield, Tiara exceeded both standard cultivars, while the Melani surpassed Avangard-264 and was equal to Chirpan-539.

The Tiara variety showed better agronomic performance than the Melani variety, achieving higher fiber yield as a result of higher lint percentage. The Melani variety distinguished by better technological fiber qualities compared to the Tiara variety.

Compared to the standard cultivars, the Melani variety was characterized by a better spinning, consistency (SCI) Index, lower micronaire, greater strength and better spectroscopy with reflection of the difference RD and it had longer fiber than Chirpan-539.

The Melani variety showed a better combination of agronomic indicators with the technological fiber qualities than the cultivar Avangard-264, a standard for fiber quality.

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