ISSN 1313 - 8820
Volume 2, Number 1
March 2010

AGRICULTURAL SCIENCE AND TECHNOLOGY

2010

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

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Агромедия

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AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 2, No 1, pp 6 - 8, 2010

Phenotypic stability of new cotton varieties with improved fiber quality

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Abstract. *The genotype × environment interaction and stability of five cotton varieties were studied during 2002-2006. The years of the investigation appeared to be as different ecological environments. The stability variances (2i and S2i) of Shukla (1972) and YSi index of Kang (1993) were calculated. It was found that the cotton varieties tested interacted significantly with environmental conditions (years) in terms of total and September yields, boll weigt, fiber length and lint persentage, and height of first fruit-branch. For efficient breeding of these traits, the genotypes have to test in different years. Breeding usefull stability was observed for all studed traits, with a significant genotype -by-environment interaction. The variety Avangard-264 had a superior combination of yield and stability simultaneously and fiber length and stability; the variety Darmi - of fibre lint percentage and stability. The varieties containing G. barbadense L. germplasm, responsible for their longer fibre, because of their high stability by some traits with significant genotype × environment interaction, are recommended as very valuable in cotton breeding programs.*

Keywords: G. hirsutum L., genotype-inveronment interaction, phenotypic stability, economic traits

Introduction

In the last years six new cotton varieties with improved fiber quality were developed (Koynov and Stoilova, 1996; Stoilova and Saldzhiev, 2000, 2005, 2008a, 2008b). Their assessment of stability under different growing conditions in terms of most important economic traits is of great importance for breeding.

There are a number of methods, measures and concepts developed for evaluation of genotypic stability (Lin et al., 1986; Becker and Leon, 1988; Kang, 1998). The most common of them are the regression methods of Finlay and Wilkinson (1963), Eberhart and Russell (1966) and the variance method of Shukla (1972). Recently, more attention has been given to some newer methods for simultaneous assessment of yield and stability (Kang, 1993).

The objective of this study was to investigate the genotype × environment interaction and evaluate the stability of new cotton varieties with improved fiber quality in terms of most important economic traits.

Material and methods

The study involved five cotton varieties – Chirpan-539, Avangard-264, Darmi, Natalia and Colorit. The cultivar Chirpan-539 is of intraspecific origin (*G.hirsutum L.*) and it is used in breeding programs as a standard for earliness and productivity. The cv. Avangard-264 has interspecific origin (*G.hirsutum L.* × *G.barbadense L.*) and it is used as a standard for fibre quality. The varieties Darmi, Natalia and Colorit were obtained after the hybridization of the species *G.hirsutum L.* with stabilized lines of interspecific *G.hirsutum L.* × *G.barbadense L.* origin. The investigations were carried out in the experimental field of the Cotton and Durum Wheat Research Institute - Chirpan during the period 2002-2006. Different ecological environments occurred in the separate years. Usually, the cotton-growing regions of Bulgaria do not differ significantly in pedoclimatic conditions. The climatic factors, however, during the vegetation period in the separate years of study proved to be very varied and sometimes contrasting. The lines were tested in a trial with four replications and a harvesting plot of 30 m^2. The following traits were analyzed: total yield; September yield; boll weght; fibre length; fiber lint percentage and height of first fruit-brunch setting. The fibre length was determined by "butterfly" method on 40 individual plants (10 of replication), and the fibre lint percentage - on average sample for each replication. ANOVA were carried out for each year and over years. The program STABLE (Kang and Magari, 1995) was used to estimate genotype × environment interaction and stability parameters σ^2_i and S^2_i (Shucla, 1972) as well as Kang's YS_i parameter (Kang, 1993).

The years of the investigation were characterised as follow: 2002 and 2003 were warm and moderately wet; 2004 – cool and wet; 2005 - moderately warm and wet; 2006 – moderately warm and moderately dry.

Results and discussion

The two-factor analysis of variance (Table 1) showed that the effect of the genotypes was insignificant for the total and September yield, as well as for boll weight. For the other three traits, the analysis of variance showed significant differences among genotypes over all studied years. Therefore, it was concluded that the varieties tested had shown some genotypic diversity in terms of these traits, which was due to genetic reasons. Significant differences were observed for the total and September yields as well as for boll weght in separate years. The year-to-year variation had the greatest relative share for the total and September yields (92.2-95.7 %), boll weight and height of first fruit-brunch setting (71.7-74.4 %), showing the great importance of environmental conditions in trait assessment (data are not given hire). The genotype × environment interaction was significant for all studed traits conditioned by different response of genotypes to environmental changes. The selection of traits with genotype × environment interactions should be made in different

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Table 1. Analysis of phenotypic variance of studied characters

Sources of variation	DF	Mean squares					
		Total yield	September yield	Boll weight	Lint percent	Fiber length	Height of first fruit brunch
Genotypes	4	10768 ^{ns}	112432 ^{ns}	0.292 ^{ns}	35.87 $^{++}$	20.42^{++}	15.96 $^{+}$
Environments	4	12089650 $^{++}$	6174888 $^{++}$	1.936 $^{++}$	23.53 $^{++}$	3.56 $^{++}$	87.48 $^{++}$
Interaction	16	133048 $^{++}$	102196 $^{++}$	0.118 $^{++}$	2.26 $^{++}$	1.30 $^{++}$	3.42 $^{++}$
Heterogenity	4	19561 ^{ns}	156964 ^{ns}	0.154 ^{ns}	3.87 ^{ns}	2.74 $^{+}$	1.24 ^{ns}
Residnal	12	170876 $^{++}$	83939 $^{++}$	0.106	1.73 $^{++}$	0.82 $^{++}$	4.51 $^{++}$
Pooled error	60	33360	25548	0.032	0.57 $^{++}$	0.33	0.85

Significance of variances at P < 0,05(+) and P < 0,01(++), respectively

Table 2. Average data for the traits over years and stability parameters by Shukla (1972) (σ^2_i, S^2_i), and Kang (1993) (YS_i) for five cotton genotypes

Genotypes	Mean values	σ^2_i	S^2_i	YS_i
		Total yield, kg/ha		
Chirpan-539	2355	139403 $^{++}$	173349 $^{++}$	0
Avangard-264	2350	-1281 ^{ns}	-98 ^{ns}	6 $^{+}$
Natalia	2353	496679 $^{++}$	646099 $^{++}$	-1
Darmi	2300	-8970 ^{ns}	-12173 ^{ns}	-2
Kolorit	2330	39417 ^{ns}	47207 ^{ns}	-3
		September yield, *kg/ha*		
Chirpan-539	1740	109492 $^{++}$	99217 $^{+}$	-1
Avangard-264	1784	34982 ^{ns}	60159 ^{ns}	6 $^{+}$
Natalia	1619	172230 $^{++}$	157506 $^{++}$	-9
Darmi	1615	163246 $^{++}$	121142 $^{++}$	-10
Kolorit	1715	31036 ^{ns}	-18327 ^{ns}	4 $^{+}$
		Boll wight, *g*		
Chirpan-539	5.6	0.026 ^{ns}	0.031 ^{ns}	-3
Avangard-264	5.8	0.119 $^{++}$	0.066 ^{ns}	-2
Natalia	5.8	0.093 $^{+}$	0.138 $^{++}$	4 $^{+}$
Darmi	5.6	0.013 ^{ns}	0.028 ^{ns}	-2
Kolorit	5.8	0.339 $^{++}$	0.268 $^{++}$	-2
		Lint percentage, %		
Chirpan-539	40.2	6.736 $^{++}$	5.259 $^{++}$	0
Avangard-264	36.8	0.113 ^{ns}	0.153 ^{ns}	-2
Natalia	38.7	5.249 $^{++}$	3.177 $^{++}$	-1
Darmi	38.5	-0.187 ^{ns}	0.137 ^{ns}	6 $^{+}$
Kolorit	37.2	-0.347 ^{ns}	-0.048 ^{ns}	-1
		Fiber length, *mm*		
Chirpan-539	26.5	0.0697 ^{ns}	0.361 ^{ns}	-2
Avangard-264	28.4	0.0003 ^{ns}	0.260 ^{ns}	5 $^{+}$
Natalia	28.9	1.912 $^{++}$	2.194 $^{++}$	0
Darmi	28.7	2.720 $^{++}$	0.593 ^{ns}	-2
Kolorit	28.8	1.804 $^{++}$	0.705 ^{ns}	-1
		Height of first fruit brunch, *cm*		
Chirpan-539	18.8	-0.480 ^{ns}	-0.568 ^{ns}	0 $^{+}$
Avangard-264	18.5	3.075 $^{+}$	2.555 ^{ns}	-5
Natalia	19.1	0.835 ^{ns}	1.456 ^{ns}	0 $^{+}$
Darmi	19.8	9.201 $^{++}$	12.193 $^{++}$	-3
Kolorit	21.0	4.471 $^{++}$	6.913 $^{++}$	0 $^{+}$

environments. Among the six traits with significant genotype × environment interactions, a significant heterogeneity was established only for fibre lingth. The heterogeneity variances for the other five traits were insignificant. According to Shukla (1972), in nonlinear interactions (heterogeneity), the behaviour of genotypes with respect to their stability can be better evaluated through variance coefficients and not through regression ones.

Table 2 shows the mean values and the results obtained from the analysis of the phenotypic stability of traits with significant genotype × environment interactions.

Total yield. The varieties were not differed in seed cotton yield (2300-2355 *kg/ha*). According to Valcinkov (2000) the genotypes showed insignificant differences could be differed in stability. The stability variances (σ^2_i and S^2_i) of Shukla (1972), estimating the linear and non-linear interactions, respectively give a one-way assessment of phenotypic stability. Genotypes with lower values are considered more stable for their weaker environmental interactions. The negative values of σ^2_i and S^2_i are assumed to be 0. With significantly high values of any of the two parameters (σ^2_i or S^2_i), the respective genotypes are considered unstable. On this base, most stable with respect to total seed cotton yield were the varieties Avangard-264, Darmi and Colorit. Most unstable were Chirpan-539 and Natalia. Very useful information about the breeding value of genotypes is provided by the YS_i index of Kang (1993) that enables the simultaneous estimation for yield and stability on the basis of the statistical significance of differences (the genetic effects) and the variance of environmental interaction. In terms of that character, most valuable was Avangard-264. The analysis of the results obtained allowed the conclusion that the variety Avangard-264 had the highest breeding value for total seed cotton yield and stability. A breeding-useful stability was found for the varieties Darmi and Colorit.

September yield. The data for the September yield were analyzed for its relation to earliness (which is of paramount inportance to breeding under the conditions of Bulgaria). The varieties tested differed slightly in their September yield, Darmi and Natalia had lower September yield. The variance stability indices (σ^2_i and S^2_i) determined as most stable the varieties Avangard-264 and Colorit. Most unstable were Darmi and Natalia. The YS_i index determined as most valuable Avangard-264 folowed by Colorit.

Boll weight. The varieties had close values for the boll weight (5.6 to 5.8 *g*). The variances of stability - σ^2_i and S^2_i determined as stable the varieties Chirpan-539 and Darmi, which had the smallest boll weight. The YS_i index determined as most valuable the variety Natalia.

Fibre lint percentage. The fibre lint percentage varied from 36.8 to 40.2 % . The highest fibre lint percentage was established in Chirpan-539 and the lowest – in Avangard-264. The variances σ^2_i and S^2_i determined the varieties Avangard-264, Darmi and Colorit as stable. Based on the YS_i index, as most valuable was Darmi.

Fibre length. The fiber length varied from 26.5 *mm* to 28.9 *mm*. Of the genotypes studied, the longest fibre was found for Natalia and the shortest – for Chirpan-539. The varieties Avangard-264, Natalia, Darmi and Colorit were close in fiber length - 28.4-28.9 *mm*. In this trait, significant non-linear interactions (heterogeneity) were established (Table 1), that decreased the certainty of the regression coefficient. A higher degree of confidence was inspired by the variance methods, including the method of Kang (1993). The variances of stability -σ^2_i и S^2_i showed high stability for Chirpan-539 and Avangard-264. The YS_i index determined as most valuable the variety Avangard-264.

Height of first fruit branch set. Of the studied genotypes the biggest height of first fruit branch set was found for the variety Colorit - 21.0 cm. Cultivars Avangard-264 and Chirpan-539 set their first fruit brunch at height of 18.5-18.9 *cm*, Natalia and Darmi – at 19.1-19.8 cm. The variances of stability -σ^2_i и S^2_i determined Chirpan-539 and Natalia as the most stable. Based on the YS_i index Chirpan, Natalia and Colorit were the most valuable.

Conclusion

The studied cotton varieties interacted significantly with environmental conditions with respect to total and September yields, as well as to boll weight, fibre length, fiber lint percentage and height of first simpodium, which necessitates their further investigation in terms of stability. Breeding-useful stability was observed in all traits, with a significant genotype × environment interaction. A complex breeding value (with high trait levels and stability) was established in Avangard-264 as estimated simultaneously for three traits; in Natalia - for two of the traits; in Darmi, Chirpan-539 and Colorit - for one trait. The cv. Avangard-264 combained yield and stability, fiber length and stability, the variety Darmi – fiber lint percentage and stability. The high stability of the varieties with *G.barbadense* germplasm (responsible for the longer fibre) for some traits, made them still more valuable for breeding programs.

References

Becker HC and Leon J, 1988. Stability analysis in plant breeding. Plant Breeding, 101, 1-23.

Eberhart SA and Russell WA, 1966. Stability parameters for comparing varieties. Crop Science, 6, 36-40.

Finlay KW and Wilkinson GN, 1963. The analysis of adaptation in a plant-breeding programme. Australian Journal of Agricultural Research, 14, 742-754.

Kang MS, 1993. Simultaneous selection for yield and stability in crop performance trial. Agronomy Journal, 85, 754-757.

Kang MS, 1998. Using genotype - by - environment interaction for crop cultivar development. *Advances in Agronomy*, 62, 199-252.

Kang MS and Magari R, 1995. STABLE: A basic program for calculating stability and yield - Stability statistic. Agronomy Journal, 87, 276-277.

Koynov G. and Stoilova A, 1966. Avangard-264 - a new variety long fibre cotton. Plant science, 4, 13-15, (Bg).

Lin GS, Binns MR and Lefcovitch LP, 1986. Stability analisis: Where do we Stand. Crop Science, 26, 894-900.

Shukla GK, 1972. Some statistical aspects of partitioning genotype - environmental components of variability. Heredity, 29, 237-245.

Stoilova A and Saldjiev I, 2000. Perla-264 - a new cottyon variety. Plant Science, 37, 274-277, (Bg).

Stoilova A and Saldjiev I, 2005. Agronomic traits of new cotton variety Vega. Field Crops Studies, II, 2, 145-248, (Bg).

Stoilova A and Saldjiev I, 2008a. Darmi - a new cottyon variety. Plant Science, 45, 279-282, (Bg).

Stoilova A and Saldjiev I, 2008 b. Colorit - a new cotton variety. Plant Science, 45, 283-286, (Bg).

Valchinkov S, 2000. Contribution to winter malt barley breeding in Bulgaria. Thesis for Dsc, Sofia.

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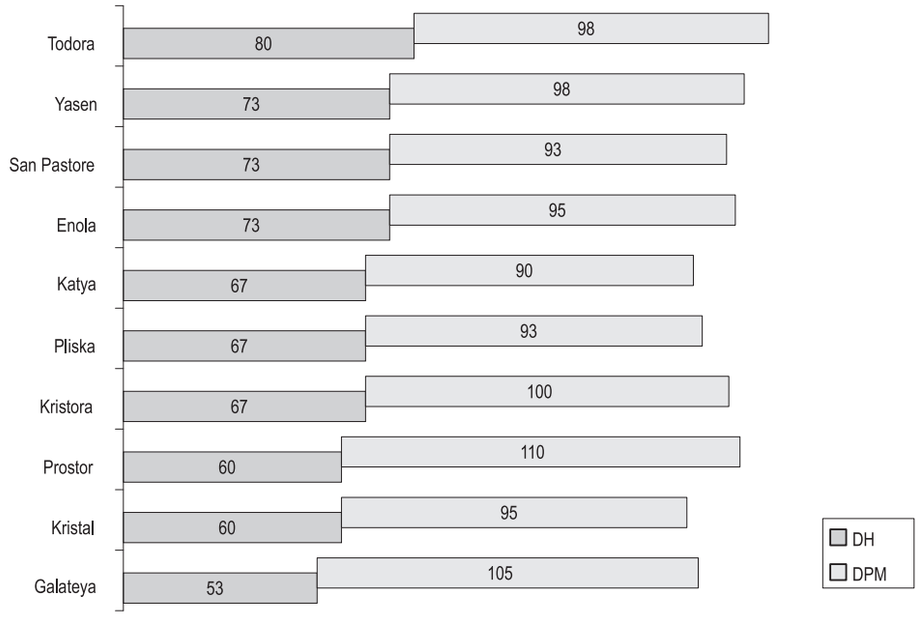

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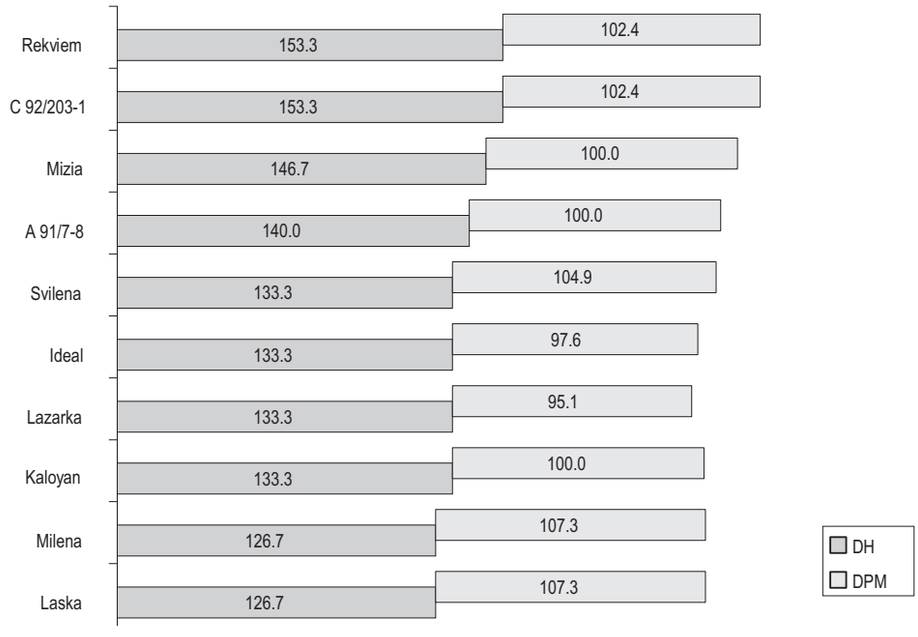

Figure 4. Duration of the period to heading and maturity in the group of late varieties expressed as relative value from the standard

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AGRICULTURAL SCIENCE AND TECHNOLOGY

Volume 2, Number 1
March 2010

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