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Stability of Durum Wheat Genotypes in Some Agronomic Traits Under Bursa Ecological Conditions

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A R T I C L E I N F O

Research Article

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A B S T R A C T

In the study it is aimed to determine the stabilities of some agronomic traits of 10 different durum wheats over the years in conditions of Bursa. Research was carried out in randomized complete block design with three replications between the years of 2008-2013. Averages of genotypes of agronomic characteristics, Eberhart and Russell's regression coefficient and deviation from regression, Francis and Kannenberg's coefficient of variation and environmental variance used as stability parameters. When the results of the study evaluated at the stability analysis, Amb × Çak-30 lines were determined to be stable in most of the agronomic traits. As for grain yield, which is of great importance for the producer, breeding lines of Amb × Çak -26 and Amb × Çak-30 were determined in good harmony at Bursa under different climatic conditions over five years.

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Introduction

Today, wheat cultivation areas have evidently reached their limit in Turkey; accordingly, wheat farming takes place even in marginal areas scarcely suitable for the process. Therefore, it is very important to produce varieties capable of highest possible yield. Nevertheless, such varieties should put down a stable performance with regard to environmental conditions for sustainable productivity (Özgen, 1991; Ünsal et al., 2009).

It is possible to determine adaptation and stability levels through selection of highly productive varieties by using several statistical methods in variety-yield tests. Stability of a variety regarding yield can be observed via low degree of change in productivity values under changing environmental conditions (Kahrıman et al., 2010).

In adaptation and stability analyses, one of the most common methods as stability parameter is regression coefficient (Finlay & Wilkinson, 1963; Eberhart & Russell, 1966). The closer the regression coefficient to 1, the higher is stability of genotype. As stability parameter, deviation from regression is also employed; accordingly, genotypes with deviation close to zero and those with a value higher than general average are considered stable (Özcan et al., 2005). Today, this model is the most common method among plant breeders.

Objective of hereby study is to determine the environmental adaptation and stability capacities of 10 wheat genotypes in Bursa by using different parameters with regard to agronomic attributes.

Material and Method

Hereby study is conducted for five years, between 2008 and 2013, on the trial area of Agricultural Research and Application Farm of Faculty of Agriculture, Uludağ University. In this study, F16 lines of several combinations were formed by the hybridization of cultivars Ambral, Bintepe, Cakmak-79, Gediz-75, Japiga, Sham-1, Yavoras and control cultivar Gediz-75 and these constituted the plant material. Genotypes considered in F16 were selected using pedigree method developed in the department of field crops, among the plant lines obtained highly productive and high-quality cultivars with high adaptability to Southern Marmara Region in 1990 (Ekingen 1988, Yagdi 1999). Genotypes were formed as: Ambral × Çakmak-79 (26), Ambral × Çakmak-79 (30), Ambral × Çakmak-79 (36), Sham-1 × Santa, Sham-1 × Yavoras (12), Sham-1 × Japiga, Bintepe × Gediz-75 (12), Gediz-75 × Cakmak-79 (33), Japiga × Gediz-75 (44) and Gediz-75 as control. Genotypes and pedigrees used in the trial is given in Table 1. Research was carried out in randomized complete block design with three replications. It is found out that the testing ground has a clay constitution, is salt-free, in neuter reaction, poor in lime, has a very low content of organic matter, and is sufficient in terms of obtainable potassium and phosphorus. Climatic data of Bursa are given in Table 2. Total precipitation over the years during which the experiment was carried out was compared to the total amount of the long years precipitation (1975-2008) (552.1 mm), the years of 2008-2009 (593.9 mm), 2009-2010 (896.6 mm), 2011-2012 (647.8 mm) and 2012-2013 (631.6mm) were above the average amount of the long years precipitation, the rainfall of 2011-2012 (458.1 mm) rainfall was behind the average of long years. The average temperature values of the years 2009-2010 (13.9°C), 2010-2011 (13.5°C) and 2012-2013 (14.8°C) were higher than the average of long years (12.8°C) temperature. It is observed that the years of 2008-2009 (11.6°C) and 2011-2012 (12.4°C) was lower than the average of long years (12.8°C).

Genotype x years combination is accepted as an environment and 4 stability parameters (Eberhart & Russell's (1966) regression coefficient (b_i) and regression deviation mean squares (S^2_{di}), Francis & Kannenberg's (1978) variation coefficient (CV_i) and environment variance (S^2_i) were employed.

Results and Discussion

Table 3 indicates results of combined variance analyses over average values of attributes examined on genotypes in the years of study, namely, from 2008 to 2013.

As an examination on Table 3 reveals, the number and weight of grains per spike, the grain yield and test weight attributes display significant differences in statistical terms with respect to genotype and environment. As for G × E interaction, significant differences is found in characteristics of grain number and weight per spike and grain yield, as well as test weight.

Table 1 Genotypes and pedigrees used in the trial

No.of. Genotypes	Genotypes	Pedigree
1	Shm × Yav-12	PLC/RUFF/GTA/TLT × D-12570/D-22234//D-27582
2	Amb × Çak-36	D-76018/Valdur × UVY 162/61-130
3	Sham × Jap	PLC/RUFF/GTA/TLT × -
4	Amb × Çak-26	D-76018/Valdur × UVY 162/61-130
5	Jap × Ged-44	- × LD-357-E/2*TEHUCAN-60//(SIB)JORI
6	Bint × Ged-12	- × LD-357-E/2*TEHUCAN-60//(SIB)JORI
7	Sham × Sant	PLC/RUFF/GTA/TLT × L-Me×-97-3/SELPEK// KOLIBRI/3/ HENIKA
8	Amb × Çak-30	D-76018/Valdur × UVY 162/61-130
9	Ged × Çak-33	LD-357-E/2*TEHUCAN-60//(SIB)JORI × UVY 162/61-130
10	Gediz	LD-357-E/2*TEHUCAN-60//(SIB)JORI

-: Pedigrees are not found.

Table 2 Climatic data of Bursa

Months	Total precipitation (mm)						Average Temperatures (°C)					
	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	LY	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	LY
November	65.2	80.6	24.0	1.6	53.3	85.4	12.3	10.0	15.5	6.4	12.7	10.3
December	93.9	119.1	152.6	120.7	178.5	96.4	7.7	9.8	9.5	7.2	12.7	7.1
January	116.6	149.7	72.4	121.2	93.4	80.3	6.1	6.6	5.8	3.1	7.1	5.4
February	156.6	178.9	18.4	123.5	80.2	66.2	7.2	9.4	6.1	3.6	9.2	5.9
March	121.1	115.3	67.4	89.6	78.2	62.7	8.8	9.0	8.2	7.2	11.2	8.5
April	26.9	63.4	76.8	100.0	43.0	65.2	12.3	13.5	10.6	15.2	13.7	13.0
May	-	29.4	27.3	80.6	23.8	43.4	-	19.3	16.8	17.8	20.0	17.7
June	9.2	135.2	14.0	3.6	60.2	33.6	24.1	22.7	22.2	24.6	22.3	22.4
July	4.4	25.0	5.2	7.0	21.0	18.9	25.9	25.6	26.4	26.9	24.4	24.6
Total	593.9	896.6	458.1	647.8	631.6	552.1						
Mean							11.6	13.9	13.5	12.4	14.8	12.8

LY: Long-years (1975 –2008)

Table 3 Combined variance analysis of genotypes

Source of variation	SD	GNS	GWS	GY	GW	TW
Blocks (Environment)	10	48.71*	0.233*	17.745*	24.07^{ns}	4.70*
Genotype	9	116.61**	0.281*	8.946**	15.44^{ns}	13.98**
Environment	4	170.17**	1.790**	203.52**	289.09**	508.26**
Genotype x Environment	36	99.57**	0.246**	12.000**	17.07^{ns}	6.11**
Error	40	25.00	0.121	5.326	12.72	1.91
Total	149					

Significant at P=0.05 (*), **P=0.01(**), ns= non significant, GNS: Grain Number/Spike, GWS: Grain Weight/Spike, GY: Grain Yield, GW: 1000 Grains Weight, TW: Test Weight

Table 4 Stability parameter values of genotypes

Grain Number/Spike		$\bar{X}$*	b_i**	S^2_{di}***	S^2_i***	CV***
1	Shm × Yav-12	38.1	0.36	70.16	53.37	19.17
2	Amb × Çak-36	34.5	0.04	1.76	1.33	3.34
3	Sham × Jap	38.2	-0.45	11.10	9.47	8.06
4	Amb × Çak-26	31.8	1.12	104.00	85.13	29.03
5	Jap × Ged-44	37.4	2.51	7.26	41.25	17.16
6	Bint × Ged-12	41.8	1.42	46.03	45.97	16.23
7	Sham × Sant	35.7	0.61	14.32	12.83	10.03
8	Amb × Çak-30	37.5	0.39	33.54	26.05	13.62
9	Ged × Çak-33	38.9	2.82	5.74	49.25	18.03
10	Gediz	39.6	1.18	30.48	30.74	14.00
Mean		37.3	1.00	32.44	35.54	14.87
Grain Weight/Spike		$\bar{X}$*	b_i**	S^2_{di}***	S^2_i***	CV***
1	Shm × Yav-12	1.84	-0.26	0.02	0.02	8.05
2	Amb × Çak-36	1.68	0.23	0.02	0.02	7.26
3	Sham × Jap	1.82	0.92	0.01	0.05	12.73
4	Amb × Çak-26	1.63	1.45	0.21	0.28	32.59
5	Jap × Ged-44	1.89	0.65	0.06	0.07	13.87
6	Bint × Ged-12	2.09	1.43	0.07	0.17	19.96
7	Sham × Sant	1.86	2.07	0.13	0.35	31.94
8	Amb × Çak-30	1.92	0.84	0.03	0.07	13.55
9	Ged × Çak-33	2.02	1.97	0.04	0.26	25.44
10	Gediz	1.86	0.69	0.02	0.04	10.65
Mean		1.86	1.00	0.06	0.13	17.60
Grain Yield		$\bar{X}$*	b_i**	S^2_{di}***	S^2_i***	CV***
1	Shm × Yav-12	415.31	0.45	3618.57	4076.61	15.37
2	Amb × Çak-36	402.82	1.13	9164.77	15599.72	31.01
3	Sham × Jap	388.48	0.92	6691.70	10705.95	26.63
4	Amb × Çak-26	468.35	1.18	820.77	10037.67	21.39
5	Jap × Ged-44	414.76	0.90	830.39	6085.58	18.81
6	Bint × Ged-12	414.15	0.80	3874.05	7246.42	20.55
7	Sham × Sant	448.09	1.32	5664.16	16083.94	28.30
8	Amb × Çak-30	433.21	1.00	3024.61	9738.77	22.78
9	Ged × Çak-33	432.06	1.59	450.57	17394.12	30.53
10	Gediz	452.09	0.67	5099.18	6875.95	18.34
Mean		426.93	1.00	3923.88	10384.47	23.37
Test Weight		$\bar{X}$*	b_i**	S^2_{di}***	S^2_i***	CV***
1	Shm × Yav-12	75.63	1.23	2.09	27.30	6.91
2	Amb × Çak-36	75.90	0.98	2.92	18.32	5.64
3	Sham × Jap	76.24	1.04	0.72	19.02	5.72
4	Amb × Çak-26	75.67	1.05	0.91	19.55	5.84
5	Jap × Ged-44	74.88	1.03	3.30	20.51	6.05
6	Bint × Ged-12	76.16	0.99	0.60	17.15	5.44
7	Sham × Sant	75.59	1.14	7.21	27.52	6.94
8	Amb × Çak-30	76.44	0.82	1.26	12.46	4.62
9	Ged × Çak-33	77.09	0.78	0.39	10.59	4.22
10	Gediz	73.54	0.92	1.29	15.35	5.33
Mean		75.71	1.00	2.07	18.78	5.67

*: printed values in bold are higher than the mean; **: cultivars with values in bold are considered stable; ***: printed values in bold are lower than the mean; cultivars with lower values than the mean for 4 stability parameters are regarded as stable; $\bar{X}$ = mean grain yield (kg/da), *bi* = regression coefficient, S^2_{di} = deviation from regression , S^2_i = environmental variance, *CV* = coefficient of variation

In the study, 4 stability parameters regarding agronomic attributes (Eberhart and Russell's, 1966) regression coefficient (b*i*) and regression deviation mean squares (S^2_{di}), Francis and Kannenberg's (1978) variation coefficient (CV_i) and environment variance (S^2_i)), which are estimated grounding on average of five years, are indicated on Table 4.

One of the conditions of stability is an above average. General average of grain number/ spike is found 37.3, the average in the lines Jap × Ged-44, Amb × Çak-30, Sham x Yav-12, Sham × Jap, Ged × Çak-33, Bint × Ged-12, and Gediz are above general average.

Varieties with regression coefficient higher than 1 have the capacity of special adaptation to good environments, while those with lower than 1 can adapt to bad environments. Accordingly, there is no genotype approaching the expected value bi=1 for regression coefficient (Table 4, Figure 1). Deviation from regression is calculated between values 1.76 and 104.00 via mean square. Under average S_{di}^2 and above general average, Ged × Çak – 33, Jap × Ged – 44, Sham × Jap and Gediz are more stable in different environment conditions. Francis and Kannenberg (1978) indicate that varieties with low variation coefficient and environment variance should be accepted stable. Sham × Jap, Amb × Çak-30 and Gediz genotypes, which have grain number per spike above average and have lower than average S_i^2, CV are determined ideal genotypes with regard to 2 studied parameters.

The average values of genotypes in terms of grain weight per spike are detected as 1.63 g and 2.09 g. Sham × Jap genotype has closest value to the expected regression coefficient (bi) with the value of 0.92 (Table 4) while it is observed that the regression coefficient gets values between -0.26 and 2.07 (Figure 2). For this property, it can be said that genotypes with less than 1 genotypes may be adhered to poor environmental conditions and those with bi values greater than 1 may be adhering to good environmental conditions (Table 4). Mean square of regression deviation is found 0.06. In terms of this parameter, Amb × Çak - 30 and Ged × Çak – 33 are found to be an ideal line with a value higher than general average and lower than average S_{di}^2 value. A collective analysis on parameters of S_i^2 and CV reveal Amb × Çak – 30 and Gediz genotypes as ideal genotypes with their low S_i^2 and CV, values and very few remaining below or equal to the general mean. Nonetheless, having a bi value lower than 1, these genotypes can adapt to unfavourable conditions.

In consideration of combined grain yield levels for years, Amb × Çak- 26 and Gediz displays highest grain yield with 468.35 kg da^{-1}, and 452.09 kg da^{-1}, respectively while Sham × Jap has the lowest grain yield with 388.48 kg da^{-1}. As closest genotypes to regression coefficient value bi=1 and having a grain yield above general average, Amb × Çak-30 (1.00) is determined as the best adapting genotypes to any environment (Figure 3). Sham × Sant, Ged × Cak-33, and Amb × Cak-26 lines are defined as lines with high yield values above general average and determined as lines that comply with good environmental conditions with bi values greater than 1 (Table 4). An examination of regression deviation mean square S_{di}^2 shows that the genotypes Amb × Çak -26, Ged × Çak - 33 and Amb × Çak – 30 which are below average S_{di}^2 and are above general average, are ideal types within the scope of this stability parameter but Amb × Çak -26 with regression coefficient higher than 1 has the capacity of special adaptation to good environments. A collective analysis on parameters of S_i^2 and CV Amb × Çak -26, Amb × Çak – 30 and Gediz lines revealed as ideal genotypes.

Table 5 Frequency of the number of stability parameters over all of stability parameters for each genotype

Genotypes	Grain Number/Spike						Grain Weight/Spike					
	$\bar{X}$	*bi*	S^2_{di}	S^2_i	*CV*	*F**	$\bar{X}$	*bi*	S^2_{di}	S^2_i	*CV*	*F**
Shm × Yav-12	+	-	-	-	-	1	-	-	+	+	+	3
Amb × Çak-36	-	-	+	+	+	3	-	-	+	+	+	3
Sham × Jap	+	-	+	+	+	4	-	+	+	+	+	4
Amb × Çak-26	-	-	-	-	-	-	-	-	-	-	-	-
Jap × Ged-44	+	-	+	-	-	2	+	-	-	+	+	3
Bint × Ged-12	+	-	-	-	-	1	+	-	-	-	-	1
Sham × Sant	-	-	+	+	+	3	-	-	-	-	-	
Amb × Çak-30	+	-	-	+	+	3	+	+	+	+	+	5
Ged × Çak-33	+	-	+	-	-	2	+	-	+	-	-	2
Gediz	+	-	+	+	+	4	-	-	+	+	+	3
Genotypes	**Grain Yield**						**Test Weight**					
	$\bar{X}$	*bi*	S^2_{di}	S^2_i	*CV*	*F**	$\bar{X}$	*bi*	S^2_{di}	S^2_i	*CV*	*F**
Shm × Yav-12	-	-	+	+	+	3	-	-	-	-	-	-
Amb × Çak-36	-	-	-	-	-	-	+	+	-	+	+	4
Sham × Jap	-	+	-	-	-	1	+	+	+	-	-	3
Amb × Çak-26	+	-	+	+	+	4	+	+	+	-	-	3
Jap × Ged-44	-	+	+	+	+	4	-	+	-	-	-	1
Bint × Ged-12	-	+	+	+	+	4	+	+	+	+	+	5
Sham × Sant	+	-	-	-	-	1	-	-	-	-	-	-
Amb × Çak-30	+	+	+	+	+	5	+	-	+	+	+	4
Ged × Çak-33	+	-	+	-	-	2	+	-	+	+	+	4
Gediz	+	-	-	+	+	3	-	+	+	+	+	4

$\bar{X}$ = mean grain yield (kg/da), bi = regression coefficient, S^2_{di} = deviation from regression, S^2_i = environmental variance, CV = coefficient of variation. *F = frequency of the number of stability parameters over all of stability parameters for each genotype, if a genotype is above the average mean and had four or five values of F, it could be considered stable

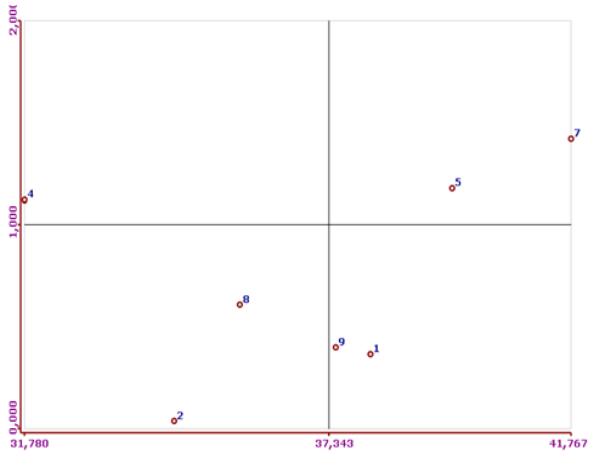

Figure 1 Graphs of regression coefficients of grain number/spike for durum wheat genotypes
1: Shm × Yav-12, 2: Amb × Çak-36, 3: Amb × Çak-36, 4: Amb × Çak-26, 5: Jap × Ged-44, 6: Bint × Ged-12, 7: Sham × Sant, 8: Amb × Çak-30, 9: Ged × Çak-33, 10: Gediz.

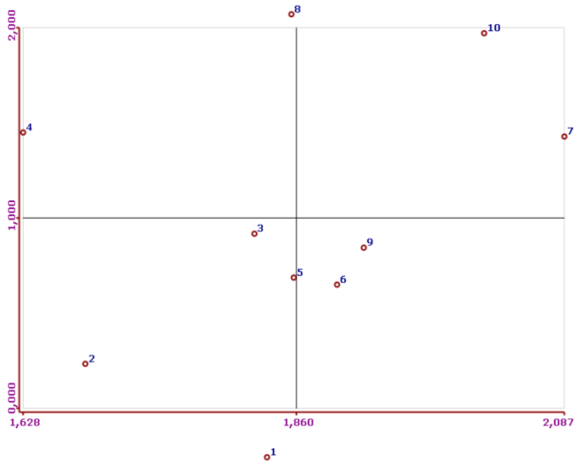

Figure 2 Graphs of regression coefficients of grain weight /spike for durum wheat genotypes
1: Shm × Yav-12, 2: Amb × Çak-36, 3: Amb × Çak-36, 4: Amb × Çak-26, 5: Jap × Ged-44, 6: Bint × Ged-12,
7: Sham × Sant, 8: Amb × Çak-30, 9: Ged × Çak-33, 10: Gediz.

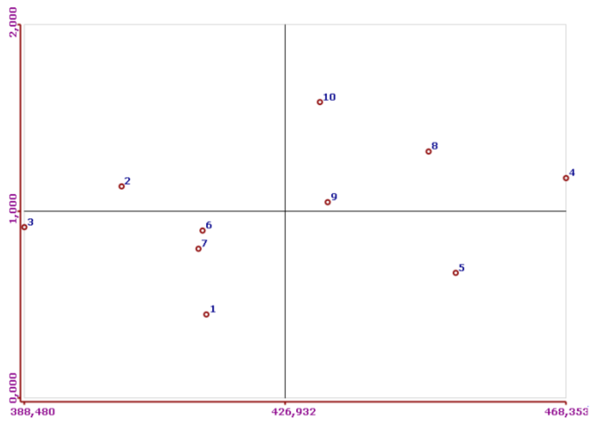

Figure 3 Graphs of regression coefficients of grain yield for durum wheat genotypes
1: Shm × Yav-12, 2: Amb × Çak-36, 3: Amb × Çak-36, 4: Amb × Çak-26, 5: Jap × Ged-44, 6: Bint × Ged-12,
7: Sham × Sant, 8: Amb × Çak-30, 9: Ged × Çak-33, 10: Gediz .

According to stability parameters analysis of genotypes regarding 1000 grains weight, the general average is found 46.68 g; Sham × Jap (48.84), Amb × Çak-26 (49.84), Jap × Ged-44 (48.68), Bint-Ged-12 (51.12) and Sham × Sant (51.00) genotypes display a value above average. According to our study, the 1000 grains weight is not significant in terms of genotype × environment interaction that's why all studied lines is considered to be stable for this property.

Average test weights of genotypes vary between 73.54 and 77.09 kg L^{-1}. Amb × Çak-36, Bint × Ged-12, Sham × Jap, Amb × Çak-30 and Ged × Çak-33 are the genotypes with values above general average. As for regression coefficients (bi) of genotypes, Amb × Çak-36, Bint × Ged-12 and Sham × Jap lines that are closest to bi=1 and are above general average are highly adaptable to all environment conditions. On the other lines, it is accepted that the ones with bi values lower than 1 are considered to comply as bad environmental conditions and those with values higher than 1 comply with good environmental conditions (Table 4, Figure 4). According to analysis on genotypes with respect to regression deviation mean square (S_{di}^2), environment variance (S_i^2) and variation coefficient (CV) parameters, Bint × Ged-12, Amb × Çak-30 and Ged × Çak-33, which are above general average and have lower values than average of examined stability parameters, are determined as genotypes adaptable to all environmental conditions. Moreover, the cultivar of Gediz is decided to be stable in terms of bi, S_{di}^2, S_i^2 and CV parameters but below an average than general.

Many agronomic attributes are taken into account in selection of the licence to be submitted for registry, and most of these attributes are influenced by environment (Özcan et al., 2005). Plant breeders are confused about which parameters should be used within target areas, since there are abundant parameters with respect to concepts of adaptation and stability. There are many recent studies on the environmental adaptation capacity of wheat genotypes depending on their grain yield, in which stability attributes are assessed pursuant to diverse stability parameters (Özcan et al., 2005; Ülker et al., 2006; Khan et al., 2007; Arain et al., 2011; Hamlabad, 2012, Mohammadi et al.,2012). Kaya and Taner (2003) employ series analysis so as to evaluate nine bread wheat varieties in terms of yield in 11 different environments. Stability analyses are often implemented in multi-location tests. Nevertheless, these methods can also be used in order to measure the reactions by varieties against changes in the same environment during several years and to determine their status of stability. Indeed, pursuant to this approach, Akcura et al., (2007) tested 11 bread wheat varieties in Kahramanmaras / Turkey conditions for 6 years and made use of different stability parameters for adaptation assessment of varieties. Likewise, Kahrıman et al., (2010) carried out a comprehensive assessment on the data obtained from wheat variety-yield tests conducted in Çanakkale / Turkey for 4 years and sought to determine the usability of different statistical methods in variety selection.

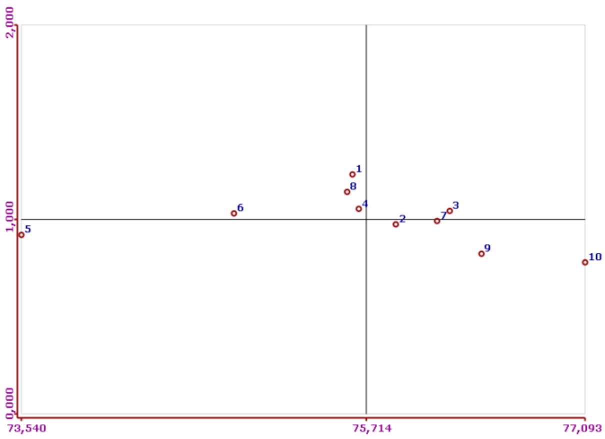

Figure 4 Graphs of regression coefficients of test weight for durum wheat genotypes
1: Shm × Yav-12, 2: Amb × Çak-36, 3: Amb × Çak-36, 4: Amb × Çak-26, 5: Jap × Ged-44, 6: Bint × Ged-12,
7: Sham × Sant, 8: Amb × Çak-30, 9: Ged × Çak-33, 10: Gediz .

Hereby study examines 10 durum wheat genotypes cultivated under different climatic conditions of Bursa for five years. Genotypes, which are above the average value of relevant attribute and those which have a value lower than average in all five or at least four analysed stability parameters, are accepted stable line or variety. The statuses of genotypes pursuant to averages of agronomic attributes and stability parameters, examined in the study, are given on Table 5.

As for genotypes in terms of grain number per spike, Sham x Jap and Gediz are considered as stable lines, since they present lower values than stability parameter averages in all and most stability parameters. In their stability studies on wheat genotypes, El Ameen (2012), Gupta et al., (2012), Olgun et al., (2014) and Racz et al., (2015) analysed grain number per spike per genotypes and determined stability capacities of relevant genotypes. As for grain weight per spike, Amb × Çak-30 and Gediz were found to be above and equal general average and to display values lower than average in all or five studied stability parameter. The genotype Sham x Jap is stable in terms of all parameters examined, but was determined to remain below the overall average. Similarly, Hassan et al., (2013) and Olgun et al., (2014) determined stability of relevant genotypes. With regard to grain yield, Amb × Çak-26 and Amb × Çak-30 are accepted as stable genotypes as they meet required levels in three of examined stability parameters. On the other hand, Jap × Ged-44 and Bint × Ged-12 got lower values than all stability parameter averages, and their grain yields was slightly below general average. Mladenov et al., (2012), Ali and Hussain (2014) and Karimizadeh et al., (2104) pointed that stability of yield shows significant differences between genotypes. According to our study, the 1000 grains weight is not significant in terms of genotype x environment interaction that's why all studied lines is considered to be stable for this property. In their study, Dhindsa et al., (2002), Parveen et al., (2012) and Racz et al., (2015) determined stability of different genotypes with regard to 1000 grains weight. Ali and Hussain (2015) reported that stability parameters showed a wide range of variation between cultivars. The results of the current study is in disagreement with those results. According to stability regarding test weight, Bint × Ged-12, Amb × Çak -26, Amb × Çak -30 and Ged × Çak -33 are found as stable genotypes in terms of all environmental conditions. Gediz variety displays a lower value than stability parameter averages; nevertheless, its test weight average is found below general average. Barnett et al., (2006), Kılıc and Yagbasanlar (2010) and Khazrotkulova et al., (2015) analysed of genotypes in terms of environmental stability and genetics of their test weight features. According to all agronomic characteristics on Table 5, Amb-Çak-30 line is above general average, and highly adaptable to all environments for most of the analysed agronomic attributes.

Hereby study is conducted for five years, using different durum wheat genotypes; consequently, we have attained average agronomic attributes of mentioned genotypes, as well as their adaptation capacities according to different stability parameters. Plant breeders intend that a variety, which is developed in a certain region, can stably yield at average level under unfavourable environmental conditions and consistently provide highest productivity under good conditions. Evidently, varieties with low productivity and stability have no importance or value for cultivators. According to results of stability analysis in hereby study Amb × Çak-30 line is found stable with respect to most agronomic attributes; as for grain yield, which is of utmost importance for plant breeders and producers, the breeding lines of Amb × Çak-26 and Amb × Çak-30, are found to display good adaptation to under different climatic conditions in Bursa.

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