Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 3 [11] October 2014: 123-128

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE

Evaluation of Canola Genotypes for yield stability in the four Regions in Iran

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ABSTRACT
In order to determine the stability of grain yield of 10 genotypes of rapeseed, an experiment in randomized complete block design with four replications of four research stations of the country, anymore, Kermanshah, Varamin done. Using the data, the analysis of variance for grain yield in the region of 4 done separately in each region showed that the variation between genotypes. Parameters and methods, Eco valance Rick and Shukla, regression coefficient, polyvinylchloride willckikson as stability parameters were used in this study. The genotype - the Likord, cooper and Hyola401 were selected based on a more sustainable way. GGE Biplot diagram of Okapi cultivar was identified as a stable figure.
Key words: stability, genotyping, Shukla, GGE BIPLOT

Received 19.05.2014 Revised 15.06.2014 Accepted 10.08. 2014

INTRODUCTION

one of the main objectives of breeding programs rapeseed cultivars with high yield and stable. The effective yield stability of genotypes, the genotype *environment grading the different genotypes in different environmental conditions in which they are grown [1].

Genotype × environment interaction effects on traits such as yield, which can lead to an improved cultivars with high yield potential for different areas of recommended. Genotype × environment, so there is a need for the introduction of high-yielding varieties with high yield stability and adaptability are recommended private. Vargas and colleagues yield expressed as genotype × environment Whenever an evaluation experiment, several regional seed yield of some genotypes, the relative performance of different genotype than other genotypes changes are observed, then the genotype * environment interaction occurred. Discuss the concept of genotype * environment adaptability and yield stability are discussed. In general, adaptation is a complex concept, but in summary it can be said that the consistency of the definition of genetic capacity for a variety of high and stable yield in different environments [2].

Environments portion in whole variance is more than genotype environment interaction, and genotype environment interaction portion is more than genotype portion [4].

Annicchiarico in comparison of linear regression model and AMMI in interpreting affect interaction of 3 experiments data on durum wheat, 2 experiments data on corn and an experiment on bread wheat and oat, found out that AMMI's more ability is not limited to special plant, rather this method has more efficiency in a condition that environment restrictions has more effect on genotype reaction [3].

The aim of this study was to evaluate genotype effect and genotype environment interaction and to determine location's value for yield in ten canola cultivars. Results of this study may simplified apprehension about genotype and genotype environment interaction in canola and also can help to choose appropriate lines for each region.

MATERIALS AND METHODS

To evaluate the stability of yield in rapeseed 10 genotypes (Table 1) provide them in the form of statistical design of randomized complete block with 4 replicates and 4 Isfahan, anymore, Kermanshah and Varamin in crop year 1391-1392 the we analyzed. Land preparation operations include cleaning disc plow land leveling and water stress conditions for the atmosphere and the bed. Each plot consisted of

four rows 80 cm apart and 5 m row spacing of 20 cm between plants. Six kilograms of seed used per acre (60 plants per square meter) were considered. Mechanical method used to combat weed during planting to harvest other crops were implemented and finish care of each plot was harvested by hand. Generally during testing oil content and yield traits were taking notes.

For the statistical analysis, analysis of variance was performed for each region separately and then combined analysis of variance was performed on these analyzes were performed with SAS software. To test the stability of the Stability and JENSTAT software was used in this study.

RESULTS AND DISCUSSION

After the normal control data, the experimental error variance homogeneity test was performed using Bartlett's test. In a separate analysis of variance (Table 2), significant differences between genotypes Varamin% probability level and location of the place anymore Kermanshah and five percent levels respectively. The location was considerable variation in the yield of rapeseed.

Results of the analysis of variance for grain yield showed significant effect on the level of a percent (Table 3). Thus the yield of rapeseed in different places. It also suggests the usefulness of stability analysis for grain yield. The effect of cultivar was significant at the one percent level. The significance of experimental data the figure shows that the reaction is not the same in different regions. In other words, there is considerable variation.

According to the results, the effects of environment and genotype × environment interactions were significant at the one percent level. Significant genotype × environment to another reflects the performance of the different genotypes.

There is significant interaction between genotype and environment typical of variance analysis is not able to explain the stability of genotypes. Therefore, using statistical methods, analysis of genotype × environment needed to be identified stable genotypes.

Environmental variance and coefficient of variation method results

The results showed that the coefficient of variation Hyola308 Hyola401 and the lowest coefficient of variation were accounted for. Thus, the biological stability and flexibility are paramount. (Table 4 and Figure 1).

Eco valance Rick and the variance method results in stable:

Based on the results of the variance Shukla, figures Likord and Cooper, respectively, according to the lowest amount of variance Shukla, the figures are stable (Table 4).

In order to determine the contribution of each genotype _ genotype × environment interaction sum of squares is calculated as a test of endurance, _eco valance Rick statistics were calculated (Table 4). Results Rating Shukla and the variance showed these two parameters are the same, preferably from one of these two parameters can be used.

Lean methods results Baines:

Baines Lin [5] between the mean-square methods proposed location. They were operating from a place of stability calculation. The coefficient of variation the spatial Lane and Baines [5] as the fourth parameter type is presented in Table 5. Based on these figures Likord Cooper and the variation in both the lowest and the lowest coefficient of variation within the allocated space and were identified as the most stable genotype.

Finlay and Wilkinson's method:

In the figures that the regression coefficient is close or equal to 1 are moderately stable and consistent if their performance is above average general are good. If performance is below average and they are a weak adaptation. So this Cooper figures and Likord Regression Nearly a higher than average yield stability and general adaptability are average. Regression Zarfam figure close to the average performance and below average stability and general adaptability is poor. Opera also compared with regression coefficients close to average yield stability and general adaptability average is close to the average. Regression Hyola308 figures close to average performance and below average stability and general adaptability are weak (Table 5).

Method of Coefficient of determination or explain

Other models regression coefficient (or diagnosis) that is used to improve decision making based on the proposed model and the regression coefficient is greater the higher the credit. Using this _ Cooper and Karun figures having the highest coefficient of variation were identified as the most stable genotypes (Table 5). The method of Coefficient of determination represents the genotype alone cannot be sustained, because this method only shows the regression model. Therefore, this should be justified according to the regression model.

Determining mega environments (Mega environments) and the best figure in each location using GGE Biplot diagram:

Biplot of grain yield of 98.46% of the explained variance (Fig. 2). The shape of the plug farthest genotypes (bi-plot of the source) to another is to create a comprehensive and detailed information will be provided. The bi-plot using polygons within each location can be identified for mega platforms, and superior cultivars. In this figure 5, it is observed that Section 5 lines perpendicular to the sides of the polygon, is provided. Locations within these sections are necessary. Other genotypes (genotypes other than being the vertices) need to be located within the polygon. Cultivars Hyola401, Karun, Cooper, Okapi, Hyola308 located at the corners or vertices of the polygon. Place of Kerman, located in the top part of the figure is the Okapi. In fact, it is interpreted as the number of Okapi best genotypes Varamin.

Esfahan and Shahrod is located in a part of anymore places the figure at the top of the Cooper and Cooper Best genotype means that the number of locations and are anymore. The genotypes Opera, Zarfam, Hyola401, Karun, Modena, Likord, Sarigol, and Hyola308 are located in areas where there is no place in the sector. Another characteristic of is the bi-plot shows grouping environments. The point is to identify different mega environments. First of places anymore and formed a mega environment, Esfahan and Shahrod so Varamin and Shahrod also known as the second mega environment.

Average performance stability of genotypes:

With this bi-plot in Figure 2, the mean performance and stability of genotypes was evaluated. Genotypes generally horizontal axis in the positive direction are, the greater are the negative side of this axis. According to this figure, the highest figure 8 figure 10 showed the lowest performance. Average correlation coefficients are as follows:

10<3<2<5<6<1<9<4<7<8

Also Hyola308 Hyola401, the low yield, the highest yield volatility (highest volatility) showed that, for the longest line on the horizontal axis, vertical intervals. While the number of Cooper, Okapi Karun Sarigol after their genotypes were stable varieties.

Table 1 - Genotype been used

Geynotpe	**number**
Opera	1
Zarfam	2
Hyola401	3
Karun	4
Modena	5
Likord	6
Cooper	7
Okapi	8
Sarigol	9
Hyola308	10

Table 2 - Mean squares from analysis of variance of the 4 genotypes of rapeseed 4 area

	DF	Varamin station	Kermanshah station	Shahrod station	Esfahan station
	2	0.213	0.012	0.033	0.016
	9	2.758^{**}	0.976^{*}	0.128^{*}	0.083^{ns}
Error	18	6.696	3.736	0.520	0.318
CV%		9.02	6.77	3.12	2.66

**, *, ns: respectively, indicating no significant difference statistically significant at the 5 and 1 percent level

Table 3 - Analysis of variance of rapeseed in 4 locations

S.O.V	Df	MSe	MS	Df
Station	3	16.654**	49.964	3
Error	8	0.0690	0.552	8
Genotype	9	1.972**	17.753	9
Station*genotype	27	0.658**	17.769	27
Error	72	0.1574	11.335	72
Total	119		97.375	119
	CV: 6.50			

**, *, ns: respectively, indicating no significant difference statistically significant at the 5 and 1 percent level

Table 4 - Results of one variate methods based on analysis of the canola genotypes

Genotype	Sd_2	CV	Eco valance rick	Stability variance	Yield mean
Opera	**0.049**	**14.749**	**0.181**	**0.064**	**6.303**
Zarfam	**0.097**	**9.809**	**0.356**	**0.033**	**5.837**
Hyola401	**0.093**	**4.650**	**0.906**	**0.672**	**5.634**
Karun	**0.026**	**20.383**	**0.979**	**0.380**	**6.416**
Modena	**0.029**	**6.345**	**0.512**	**0.120**	**6.023**
Likord	**0.010**	**12.896**	**0.022**	**0.152**	**6.041**
Cooper	**0.004**	**14.552**	**0.127**	**0.034**	**6.497**
Okapi	**0.044**	**19.795**	**0.915**	**0.402**	**6.638**
Sarigol	**0.046**	**16.786**	**0.343**	**0.026**	**6.248**
Hyola308	**0.482**	**5.331**	**0.870**	**0.319**	**5.341**

Table 5 - Finlay and Wilkinson regression parameters for the stability of rap

Genotype	(R_i^2)	(b_i)	Yield mean
Opera	0.963	1.224	6.303
Zarfam	0.803	0.688	5.837
Hyola401	0.097	0.110	5.634
Karun	0.990	1.746	6.416
Modena	0.868	0.478	6.023
Likord	0.989	1.040	6.041
Cooper	0.997	1.267	6.497
Okapi	0.983	1.748	6.638
Sarigol	0.972	1.388	6.248
Hyola308	0.667	0.312	5.341

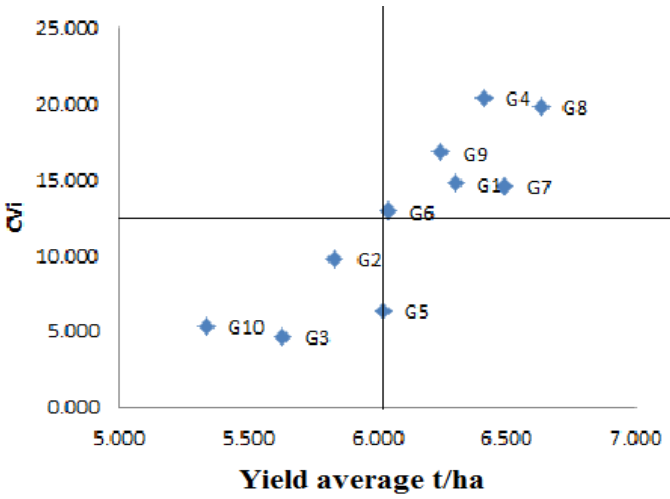

Figure 1 Scatter plot of canola genotypes in terms of yield and coefficient of variation

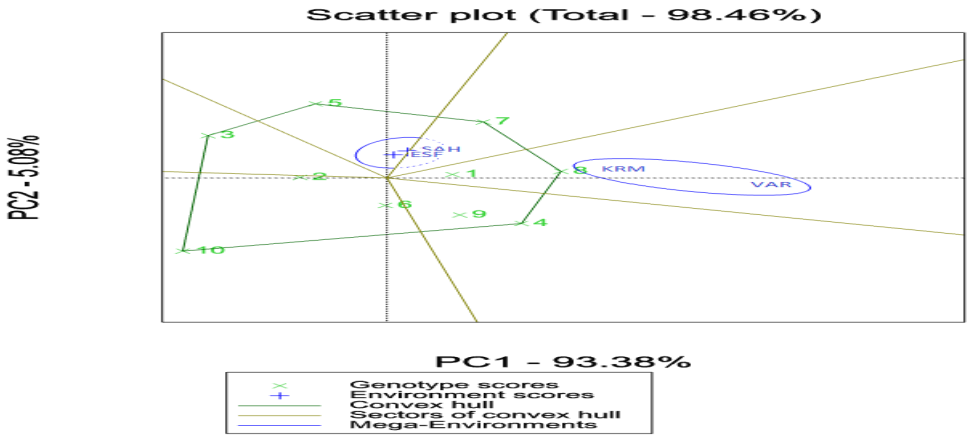

Figure 2 - Diagram of Polygons for mega environmental GGEbiplot method in rapeseed genotypes. (ESF, KRM, SAH, VAR, respectively, Isfahan, Kerman, and G1 to G10 anymore and Varamin cultivar Opera, Zarfam, Hyola401, Karun, Modena, Likord, Cooper, Okapi, Sarigol, Hyola308

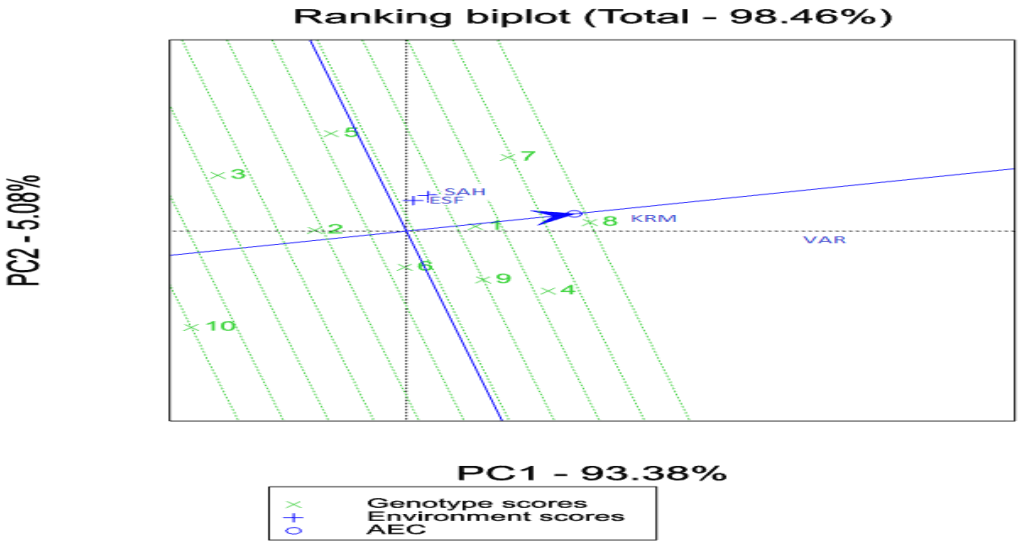

Figure 3 - Average yield and yield stability of genotypes performance. (ESF, KRM, SAH, VAR, respectively, Isfahan, Kerman; anymore and Varamin and G1 to G10 hybrids Opera, Zarfam, Hyola401, Karun, Modena, Likord, Cooper, Okapi, Sarigol , Hyola308 is).

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CITATION OF THIS ARTICLE

Amir M, Abdollah M, Shahrokh G. Evaluation of Canola Genotypes for yield stability in the four Regions in Iran. Bull. Env. Pharmacol. Life Sci., Vol 3 [11] October 2014: 123-128