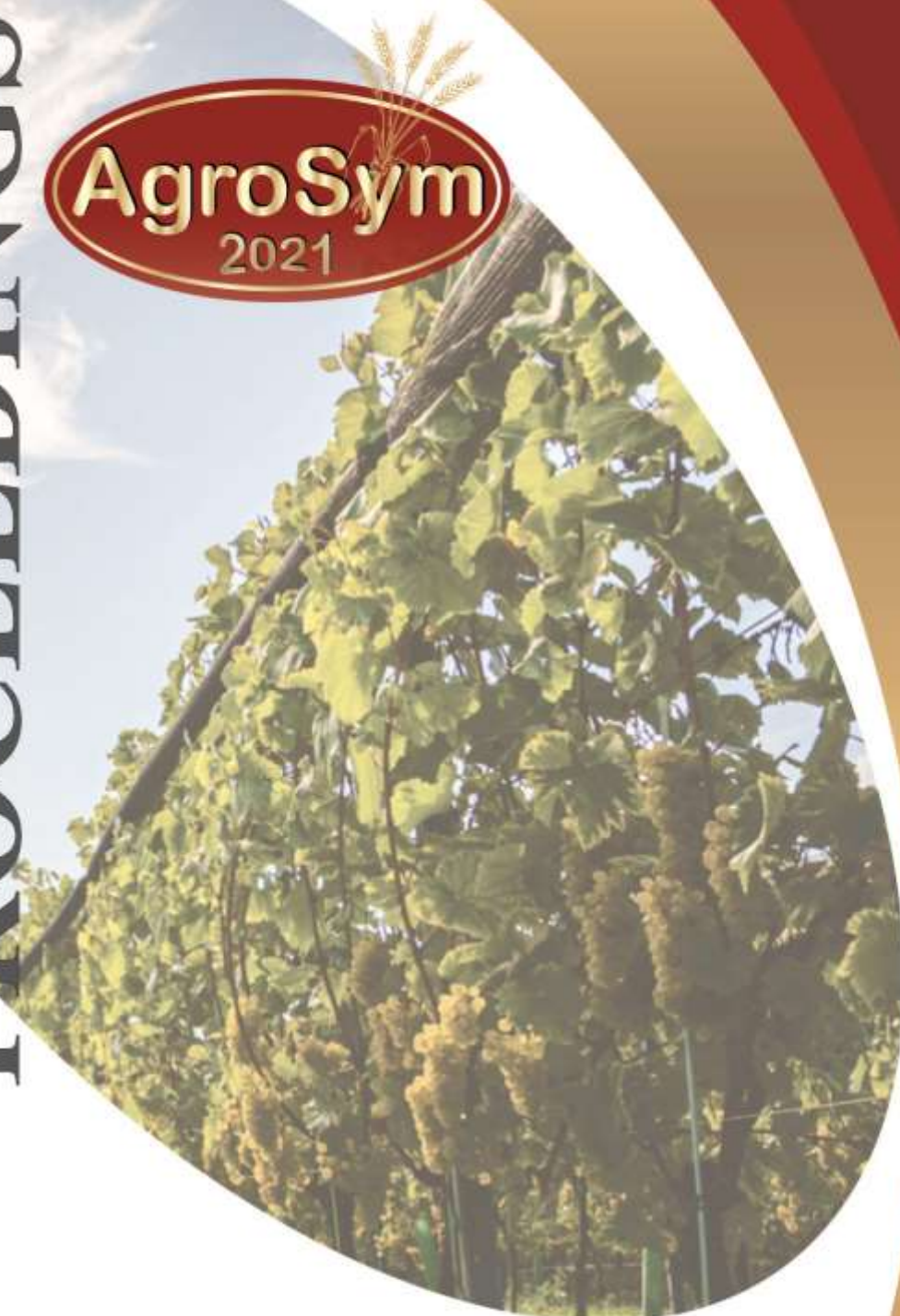


BOOK OF PROCEEDINGS



***XII International Scientific
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"AGROSYM 2021"
October 7-10, 2021***

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The influence of 2 factors on the measured parameters was observed: genotype and locality. All data is statistically processed in StatSoft Inc. STATISTICA, version 8.0 (2007) and shown as the mean value ± standard error. Statistical data processing implied analysis of the variance of the four-factor experiment (ANOVA) and the comparison of mean values with the LSD test (least significant difference) at the level of significance $P \leq 0,05$.

Stability of the observed traits were analyzed using the AMMI (Additive Main Effects and Multiplicative Interaction) analysis (Gauch, 1988; 1992). GxE interaction was interpreted based on the AMMI2 biplot graph - abscissa representing value of PC1, and ordinata representing value of PC2. AMMI stability value (ASV) was calculated according to the formula (Purchase, 2000):

$$ASV = \sqrt{\left[\frac{SS_{PC1}}{SS_{PC2}} \times (PC1 \text{ value}) \right]^2 + [PC2 \text{ value}]^2}$$

SS = sum of the squares; PC1 = the first major component; PC2 = the second major component.

AMMI analysis was performed using the R software, version 2.15.2 (A Language and Environment, Copyright 2012).

Results and discussion

Fruit length and width are very important features for fruit shape formation, and have been studied by a number of researchers (Chadha et al., 1987; Singh and Singh, 1985). Analysis of variance (ANOVA) revealed statistically significant differences between the studied genotypes, localities and genotype × environment interactions for both traits, fruit length and width (Table 1).

Table 1. Analysis of variance (ANOVA) for fruit length (A) and width (B)

	Source of variation	Df	SS	MS	F value	F – tabular	
						0,05	0,01
A. fruit length	Repetition	2	1,94	0,97	0,28 ^{nz}	3,07	4,80
	Genotype (G)	19	110.455,81	5.813,46	1.705,77 ^{**}	1,68	2,06
	Locality (L)	2	2.500,86	1.250,43	366,90 ^{**}	3,07	4,80
	G × L	38	26.929,71	708,68	207,94 ^{**}	1,51	1,78
	Error	118	402,16	3,41			
	Total	179	140.290,48				
B. fruit width	Repetition	2	7,49	3,75	1,53 ^{nz}	3,07	4,80
	Genotype (G)	19	55.439,00	2.917,84	1.187,68 ^{**}	1,68	2,06
	Locality (L)	2	83,27	41,64	16,95 ^{**}	3,07	4,80
	G × L	38	4.588,65	120,75	49,15 ^{**}	1,51	1,78
	Error	118	289,90	2,46			
	Total	179	60.408,31				

Df- Degrees of freedom; SS - The sum of the squares; MS - The middle of the square

Average fruit lengths ranged from 134.86 mm (K19) to 246.07 mm (K38). In both genotypes, a statistically significant deviation from the mean value of the general average was observed. The highest average fruit width (120.05 mm) was recorded in genotype K19 and differed significantly in relation to the average values of other observed genotypes. Genotype K19 also had the highest average value of fruit width at the localities Smederevska Palanka and Vranovo, 123.50 mm and 117.33 mm respectively. The lowest average fruit width was recorded in the K38 genotype at Smederevska Palanka and Kusadak localities (54.33 mm and 54.82 mm). The mean value of fruit length from the Kusadak locality was significantly ($p < 0.01$) higher than the general average (181.58 mm), and significantly longer fruit was recorded in 10 genotypes: K6, K13, K15, K16, K21, K22, K22, K25, K36 and K39.

Table 2. Analysis of AMMI model variance for length (A) and fruit width (B)

	Source of variation	Df	SS	SS (%)	MS	F Value
A. fruit length	Genotype (G)	19	110.434,00	78,73	5.812,30	1.782,68**
	PON	6	31,00	0,02	5,20	1,59 ^{nz}
	Locality (L)	2	2.499,00	1,78	1.249,30	240,42**
	G × L	38	26.940,00	19,20	709,00	217,44**
	PC1 (59,9%)	20	16.131,39	59,88	806,57	247,38**
	PC2 (40,1%)	18	10.808,93	40,12	600,50	184,18**
	PC3 (0%)	16	0	0	0	0
	Error	114	372,00	0,27	3,30	
	Total	179	140.276,00	100,00		
B. fruit width	Genotype (G)	19	55.416,00	91,78	2.916,62	1.288,30**
	PON	6	39,00	0,07	6,44	2,85*
	Locality (L)	2	82,00	0,13	40,76	6,33*
	G × L	38	4.585,00	7,59	120,65	53,29**
	PC1 (84,2%)	20	3.859,32	84,17	192,97	85,23
	PC2 (15,8%)	18	725,49	15,83	40,31	17,80
	PC3 (0%)	16	0	0	0	0
	Error	114	258,00	0,43	2,26	
	Total	179	60.380,00	100,00		

Df- Degrees of freedom; SS - The sum of the squares; MS - The middle of the square

AMMI analysis of eggplant fruit length and width showed significant differences between localities, genotypes, and their interactions (Table 2). 78.73% of the total sum of squares refers to the effect of genotype in the case of length (Table 2A) and even 91.78% in the case of fruit width (Table 2B). A large sum of squares of genotypes indicates a very pronounced divergence between the observed genotypes for the examined traits. For the length of the fruit, the sum of the squares $G \times L$ is ten times higher than the sum of the squares of the locality (Table 2A), while for the width of the fruit it is even 58 times higher (Table 2B). Based on the large sum of the squares of the interaction, we can conclude that there were significant differences between the reactions of the genotypes within different environments.

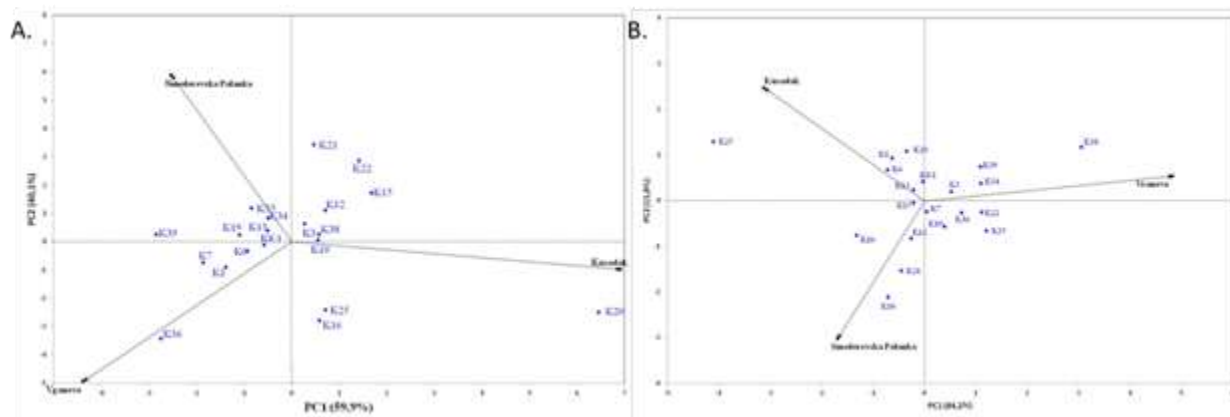


Figure 1. AMMI2 biplot for 20 genotypes of eggplant at three localities for the fruit length (A) and fruit width (B)

Legend: Locations: Smederevska Palanka, Kusadak, Vranovo; Genotypes: K1, K3, K6, K7, K8/1, K10, K12, K13, K15, K16, K19, K20, K21, K22, K25, K34, K35, K36, K38, K39

Figure 1. shows the relationship between the first and second main components - the $G \times L$ interaction is shown graphically. A smaller angle between the vectors represents a greater similarity in their interaction (Babić et al., 2010). The genotypes grouped on the graph have similar adaptability (Balalić, 2010), those located near the center of the section can be considered the most stable, while those furthest from the center of the section are the least stable.

The least stable locality, in terms of fruit length, was Kusadak, while the most stable was Smederevska Palanka, which means that there was the least variation of this trait at that locality. The least stable genotype K20 corresponded to the conditions of the locality Kusadak, where the most stable results for the observed trait were recorded. In addition, the conditions in this locality also affected the genotypes: K3, K10, K38. The most stable results for fruit length at the locality Vranovo were recorded in genotypes K36, K1, K6, K7, K8/1, while in Smederevska Palanka genotypes K13, K34 and K35 stood out in terms of stability (Figure 1A).

For the fruit width, the least stable locality was Vranovo, while the most stable was Smederevska Palanka. Environmental conditions at the Kusadak site favored genotypes K1, K6, K13, and they had the greatest stability in the conditions of this locality. The least stable genotype K25 was affected by the environmental conditions that characterized Kusadak, and the genotype K38, which was also unstable, was affected by the environmental conditions in Vranovo. The most stable results for fruit width at the locality of Smederevska Palanka were observed in genotypes K7, K12, K10, K21, while in Vranovo genotypes K3, K22, K34, K36 were singled out (Figure 1B).

Conclusion

Analysis of variance determined a statistically significant influence of all examined factors (genotype, locality and genotype \times locality interaction) on the observed traits: fruit length and width. Also based on AMMI analysis for all analyzed traits in this experiment, there were significant differences between genotypes, localities and their interactions.

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