

COMBINING ABILITY ANALYSIS OF SOME YIELD COMPONENTS IN RICE (ORYZA SATIVA L.)

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INTRODUCTION

Potential for yield of modern rice varieties usually varies because the properties of panicle, as length of panicle, number of primary and secondary branches in panicle, number of grains per panicle, size of grains in panicle, grains mass per panicle etc. The rice plant these properties cannot reach its maximum at the same time. But it can be determine the most favorable relationship between them which will result in a high yield of panicle and in proper combination with other components to yield to give a maximum yield of grain. Besides the variety, great influence on the properties of panicle have external conditions.

MATERIAL AND METHODS

The experiment for this research was conducted on the area of rice Department - Kocani



Fig. 1. Location of the study area, rice Department in the R. Macedonia

Location

The material was placed by using randomized block design in three replications. The length of the row was 1 m with 17 cm space in the rows and 20 cm space within rows. The standard growing measures were applied during the vegetation

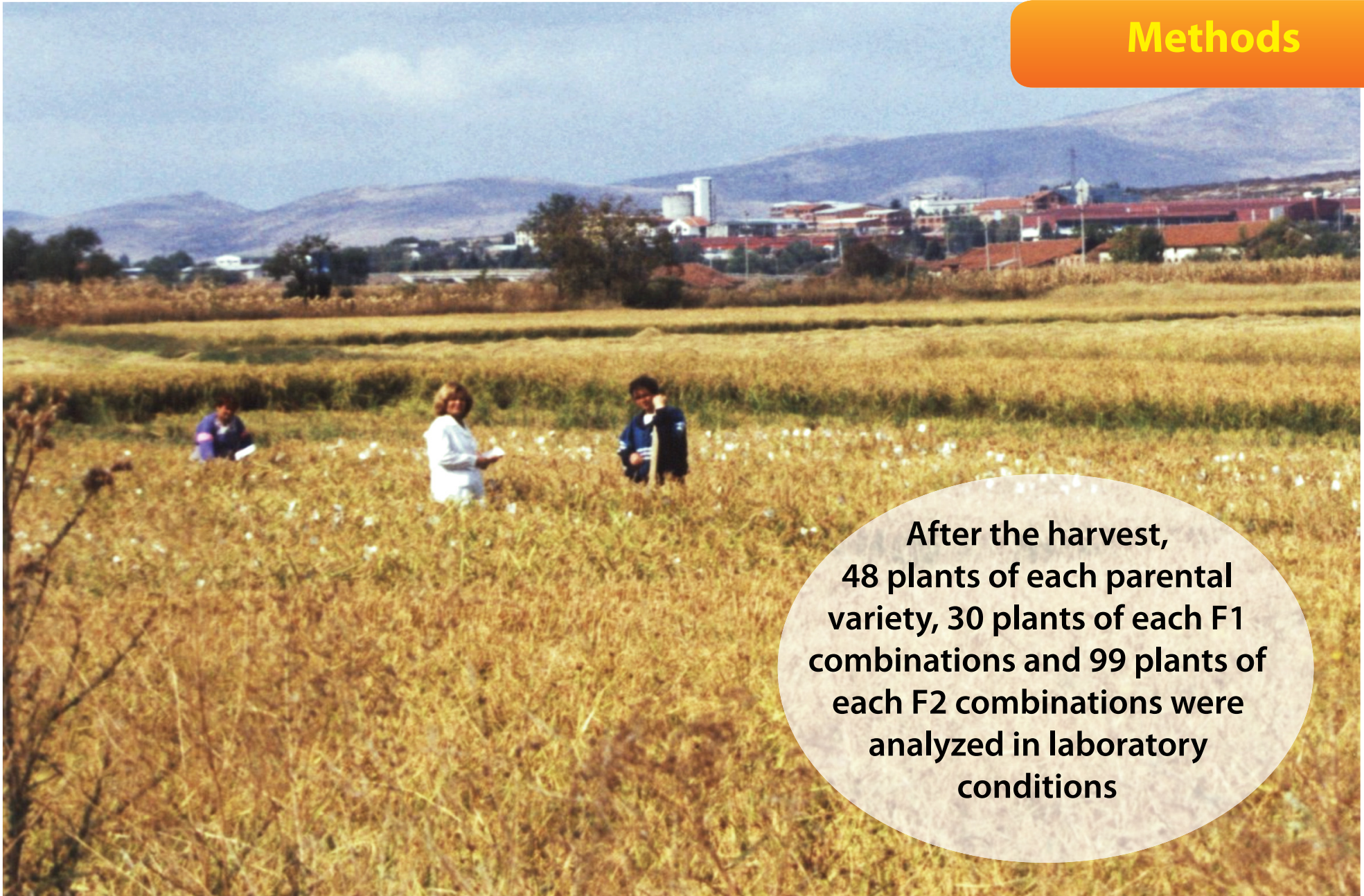


Fig. 2. Harvest of the experimental material

Methods

Experimental material

Seven varieties of rice, type japonica (Biser-2, Medusa, S-136, Arborio Bjanko, Ranka, Baldo and Loto) and their hybrid progenies of F1 and F2 generations obtained with their diallel crossing (without reciprocal combinations)

Data processing

The obtained results were analyzed by analysis of variance method and calculated standard error. Diallel analysis for general and specific combining ability was carried out according Griffing (1956) metod 2, model I

RESULTS

Length of panicle - In both generation (Tab.1) analysis of variance shows that are obtained high significant differences, for general combining ability (GCA) and for specific combining ability (SCA) for this property. In addition, additive component of variance has a dominant role, because in the F1 generation the ratio GCA / SCA is 4.19 times greater in favor of the GCA, and in F2 11.62 times. Positive highly significant values for GCA were obtained in varieties S-136, Ranka and Biser-2 in both hybrid generations (Tab. 2). In both generations with a positive value, but not significant, was characterized Baldo variety. Other varieties have shown negative effect in F1 and F2 generations. As a weakest combinatorial was show variety Loto, which panicle is the shortest in terms of panicle of parental varieties used. From the tested combinations positive effect for SCA have 11 in F1 and 8 in F2 generation (Tab 3). Hybrids from combination of Biser-2 x Baldo and Medusa x Loto in F1 have significant positive SCA value, and negative in F2 generation. The worst SCA in F1 generation has a combination Medusa x Baldo, and F2 Medusa x S-136.

Table 1. ANOVA for combining ability in the F1 and F2

Sources of variance	Degrees of freedom	F _α					
		Panicle length		Number of grains per panicle		Grain mass per panicle	
		F ₁	F ₂	F ₁	F ₂	F ₁	F ₂
GCA	6	59.55**	63.28**	8.60**	28.28**	20.53**	53.26**
SCA	21	14.20**	5.45**	7.45**	5.53**	6.51**	5.34**
E	54						
GCA/SCA		4.19	11.62	1.15	5.12	3.15	9.98

Number of grains per panicle – Based on the results of the analysis of variance for combinative ability in both studied generations can be concluded that there are high significant differences for GCA and SCA. (Tab 1). That means that in the inheritance of the number of grains per panicle acted genes with additive and genes with non-additive effect. In the F1 generation, as the best combinatorial for the number of grains per panicle is variety S-136 and its only GCA value is significantly different (Tab 2). The varieties Baldo, Ranka and Biser-2 have positive values, but not significant. The other three parental varieties (Medusa, Loto and Arborio bjanko) have negative GCA values. However the weakest combinatorial for this property in F1 and F2 is the variety Arborio bjanko.

Grains mass per panicle - The values obtained from the analysis of variance of combining ability for grains mass per panicle show that there are highly significant differences for GCA and SCA. Higher GCA values from the SCA values show that in both studied generations the dominance belongs to the recessive genes. In the F1 generation their role is 3.15, and in F2 9.98 times higher than the role of dominant genes. The effect of general combining ability of parents can be seen from the values presented in Tab 2. In both generations, as the best combinatorial for the grains mass per panicle is rang the variety Biser-2, and immediately thereafter variety Baldo. In F1 with positive but not significant GCA value is variety S-136, and in F2, variety Medusa. The weakest combinatorial for this property in F1 and F2 generations proved variety Loto. Combining ability of each crossing separately is expressed through the SCA values, shown in Tab 3. The highest SCA values, highly significant in F1 generation have combinations Arborio bjanko x Baldo (1.16) and Medusa x Loto (0.82). In the F2 generation of all tested combinations, 11 were with positive SCA values. With the highest SCA value is combination Ranka x Loto.

That means that good combination between this parental pair refers specifically to this combination. The other two combinations Arborio bjanko x Baldo and Biser-2 x Arborio bjanko have highly significant SCA values. Both combinations were obtained by hybridization of one parent with good and one with bad GCA. One parent with good and one with bad are creators of the combination Biser-2 x Medusa, which SCA value is significant.

In the F1 generation superior hybrids were obtained with combinations Arborio bjanko x Loto and Ranka x Baldo for length of panicle, and Medusa x Loto, S-136 x Loto and Arborio bjanko x Baldo for number of grains per panicle. Combinations Medusa x Loto and Arborio bjanko x Baldo are promising for further monitoring and selection in relation to the mass of grains per panicle.

In the F2 generation most promising hybrid combinations are Ranka x Loto, whose units are superior to all tested properties, Arborio bjanko x Baldo for length of panicle and mass of grains per panicle, and Biser-2 x Arborio bjanko for number of grains per panicle and mass of grains per panicle. At most of these combinations one parent has good and the other parent has bad to average GCA.

Table 2. General combining ability of the parents

Parents	Panicle length		Number of grains per panicle		Grains mass per panicle	
	F ₁	F ₂	F ₁	F ₂	F ₁	F ₂
Biser-2	0.46**	0.75**	2.21	10.76**	0.48**	0.81**
Medusa	-1.04	-0.30	-2.03	2.44	-0.21	0.02
S-136	1.04**	0.65**	6.03*	0.97	0.06	-0.15
A. bjanko	-0.04	-0.28	-10.89	-15.63	-0.05	-0.20
Ranka	0.57**	0.48**	3.21	7.69**	-0.11	-0.10
Baldo	0.17	0.16	4.54	-0.65	0.28**	0.16*
Loto	-1.17	-1.47	-3.08	-5.59	-0.44	-0.55
LSD 0.05	0.30	0.14	5.63	4.65	0.19	0.16
0.01	0.40	0.27	7.48	6.18	0.26	0.22

Table 3. Specific combining ability of the hybrid combinations for panicle length, number of grains per panicle and grains mass per panicle

Combinations	Panicle length		Number of grains per panicle		Grains mass per panicle	
	F ₁	F ₂	F ₁	F ₂	F ₁	F ₂
Biser-2 x Medusa	-1.34	-0.59	18.15*	21.15**	0.20	0.53*
Biser-2 x S-136	-0.59	0.08	-17.31	-3.40	-0.68	-0.39
Biser-2 x A.Bjanko	-0.07	-0.44	1.47	14.46*	0.31	0.65**
Biser-2 x Ranka	-0.04	0.68	-21.26	-6.57	-0.77	-0.27
Biser-2 x Baldo	1.05*	-0.10	-1.45	-7.12	0.18	0.29
Biser-2 x Loto	-1.51	-0.89	4.26	1.32	-0.15	-0.21
Medusa x S-136	-1.26	-0.95	-28.24	-11.45	-0.77	-0.14
Medusa x A.Bjanko	-0.81	0.38	10.31	10.09	0.00	0.37
Medusa x Ranka	-0.65	-0.50	-15.89	-5.71	-0.48	-0.35
Medusa x Baldo	-2.45	-0.76	-1.25	5.13	-0.25	0.04
Medusa x Loto	0.98*	-0.07	26.00**	9.50	0.82**	0.16
S-136 x A.Bjanko	0.68	-0.77	11.05	-3.41	0.51*	-0.16
S-136 x Ranka	0.41	-0.34	15.26*	6.82	0.53*	0.17
S-136 x Baldo	0.40	0.70	-7.90	-7.02	-0.39	-0.31
S-136 x Loto	0.10	-0.46	21.61**	-5.53	0.58*	-0.09
A.Bjanko x Ranka	0.55	0.61	9.41	1.30	0.23	-0.13
A.Bjanko x Baldo	0.45	1.69**	24.03**	9.71	1.16**	0.67**
A.Bjanko x Loto	1.12**	-0.16	-11.77	-7.52	-0.64	-0.30
Ranka x Baldo	1.48**	-0.18	17.15*	1.36	0.47	0.05
Ranka x Loto	-0.25	0.99**	-4.47	22.70**	0.28	1.00**
Baldo x Loto	0.24	0.14	1.74	8.60	0.20	0.25
LSD 0.05	0.80	0.73	14.89	12.29	0.51	0.43
0.01	1.06	0.97	19.80	16.35	0.68	0.57