

..... / /

.

(SCA GCA)

F₁

W_r (a = - /)

:

.....

.()

.()

(GCA)

(SCA)

.()

.()

()

i)

(

.()

SCA GCA

.()

Ô

Ô Ô Ô

Ô

Ô Ô

Ô

Ô

Ô

HAYMAN $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$

$\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$

F₁

$$\begin{aligned} & (\bar{x} = \hat{\theta} / \hat{c}) \\ (\bar{x} = \hat{\theta} / \hat{b}) & \quad (\bar{x} = \hat{\theta} / \hat{b}) \\ & (\bar{x} = \hat{\theta} / \hat{a}) \end{aligned}$$

$\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ \times $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ \times
 $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $(\hat{\theta})$

$\hat{\theta}$

$\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}_F$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $(\hat{\theta})$ $\hat{\theta}$ $(\hat{\theta})$
 $\hat{\theta}$ $\hat{\theta}$ $(\hat{\theta})$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$

$$\begin{aligned} & (\bar{x} = \hat{\theta} / \hat{b}) \\ & (\bar{x} = \hat{\theta} / \hat{c}) \\ (\bar{x} = \hat{\theta} / \hat{c}) & \quad (\bar{x} = \hat{\theta} / \hat{c}) \end{aligned}$$

SCA

GCA

$\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$

$(\hat{\theta})$ $(\hat{\theta})$ $\hat{\theta}$ t

$H_0 : b = 1$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$
 $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$ $\hat{\theta}$

MS		
$\bar{\theta}^{**}$	$/^{**}$	
\hat{i}/\hat{i}^{**}	\hat{i}/\hat{i}^{**}	GCA
$/\hat{i}^{**}$	$\check{\theta}/\hat{i}^{**}$	SCA
$\bar{\theta}^{ns}$	$/^{ns}$	
$/$	$\hat{i}\check{\theta}$	
$\hat{i}/$	$/$	%CV

.ns :**

(g_i)

GCA

(g_i)

()

(g_i)

(g_i)

$\hat{O} (s_{ij})$

() (g_i)

() -

$/^{**}$	$-/^{**}$	$/^{**}$	$-/^{*}$	$-/^{ns}$
$\hat{i}\hat{i}^{ns}$	$/^{**}$	\hat{i}^{**}	$/^{ns}$	
$/^{*}$	\hat{i}^{ns}	$-/^{**}$		
$-/^{**}$	$/^{ns}$			
$/^{**}$				
			$/$	SE(g_i)
			\hat{i}	SE(s_{ij})

.ns \hat{i} :** *

$$h^2 = \frac{\delta_A^2}{\delta_P^2}$$

$$\frac{MS_{GCA}}{MS_{SCA}}$$

SCA GCA

					$\frac{MS_{GCA}}{MS_{SCA}}$
()					
×	/	î	/	î	ns
×	/	î	/	î	ns

.ns

î H₂ H₁ F D

$$\frac{MS_{GCA}}{MS_{SCA}}$$

(D)
(H₂ H₁)

$$\left(\sqrt{\frac{H_1}{D}}\right)$$

()

()

F (î)

$\bar{\delta}$ / /

()

(\hat{h}) F .

- \hat{h}

$\frac{\sqrt{(4DH_1)+F}}{\sqrt{(4DH_1)-F}}$	$\frac{H_2}{4H_1}$	$\sqrt{\frac{H_1}{D}}$	Error	\hat{h}_2	H_2	H_1	F	D
/	/ \hat{h}	\hat{h} \hat{h}	\hat{h} \hat{h}	\hat{h} /	\hat{h} /	\hat{h} / \hat{h}	\hat{h} /	\hat{h} /
\hat{h}	/	/	/	\hat{h} /	\hat{h} /	\hat{h} / \hat{h}	- /	\hat{h} /

(\hat{h})

) $\frac{H_2}{4H_1}$

(

/ \hat{h}

()

F

$$\left[\frac{\sqrt{(4DH_1)+F}}{\sqrt{(4DH_1)-F}} \right]$$

- / $\bar{\delta}$

Wr

\hat{h}

()

()

$$\left[\frac{\sqrt{(4DH_1)+F}}{\sqrt{(4DH_1)-F}} \right] \frac{H_2}{4H_1} F$$

)

\hat{O}

\hat{O}

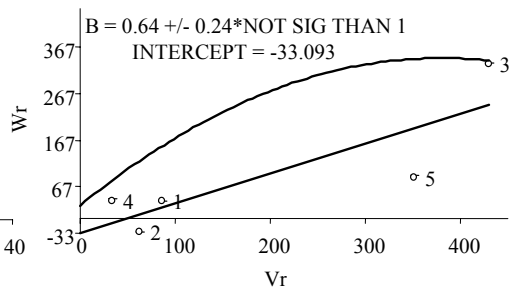
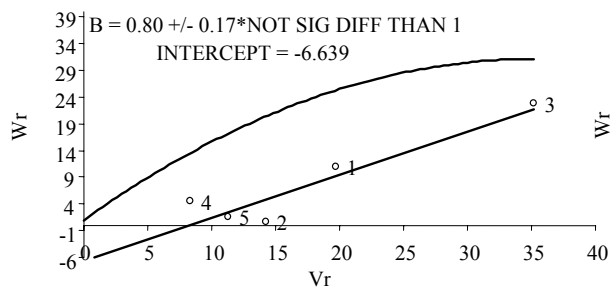
(

- / ∂ W_r

()

()

()



()

()

()

()

(- i - - - :)

SCA

x

x

F₁

x

x

GCA

i / /

ô ô ô ô

ô ô

ô

1. Can, N.D., S. Nakamura and T. Yoshida. 1997. Combining ability and genotype x environment interaction in early maturing grain sorghum for summer seeding. *Jan. J. Crop Sci.*, 66: 698-705.
2. Gravois, K.A. and R.W. McNew. 1993. Combining ability and heterosis in U.S. southern long-grain rice. *Crop Sci.*, 33: 83-86.
3. Griffing, B. 1956a. A generalized treatment of the use of diallel crosses in quantitative inheritance. *Heredity* 10, 31-50.
4. Griffing, B. 1956b. Concept of general and specific combining ability in relation to diallel crossing systems. *Aust. J. Biol. Sci.*, 9: 463-493.
5. Hayman, B.I. 1954a. The analysis of variance of diallel tables. *Biometrics* 10, 235-244.
6. Hayman, B.I. 1954b. The theory and analysis of diallel crosses. *Genetics* 39, 789-809.
7. Herrmann, M. 2007. A diallel analysis of various traits in winter triticale. *Plant Breeding*, 126: 19-23.
8. Kobayashi, S., Y. Fukuta, T. Sato, M. Osaka and G.S. Khush. 2003. Molecular marker dissection of rice (*Oryza sativa* L.) plant architecture under temperate and tropical climates. *Theor. Appl. Genet.*, 107: 1350-1356.
9. Seshu, D.V. 1988. Standard evaluation system for rice. The International Rice Testing Program. The International Rice Research Institute. Los Banos. Philippines. p. 1-54.
10. Singh, N.K. and A. Kumar. 2004. Combining ability analysis to identify suitable parents for heterotic rice hybrid breeding. *International Rice Research Notes*, 29: 21-22.
11. Singh, R.K. and B.D. Chaudhary. 1985. *Biometrical Methods in Quantitative Genetic Analysis*. Kalyani Pub., Ludhiana, New Delhi, Revised Ed., 300 pp.
12. Torres, E.A. and I.O. Geraldini. 2007. Partial diallel analysis of agronomic characters in rice (*Oryza sativa* L.). *Genetics and Molecular Biology*, 30(3): 605-613.
13. Verma, O.P. 2003. Diallel analysis in rice (*Oryza sativa* L.) for physiological traits. *Madras Agric. J.*, 90(10-12): 637-642.
14. Verma, O.P. and H.K. Srivastava. 2004. Genetic component and combining ability analyses in relation to heterosis for yield and associated traits using three diverse rice growing ecosystems. *Field Crops Res.*, 88: 91-102. review. *Oryza*, 35: 1-7.

Determination of Gene Effects and Combining Ability of Early Maturity and Yield Traits In Rice

N.A. Bagheri¹, N.A. Babaeian-Jelodar² and E. Hasan-Nataj³

Abstract

Five rice genotypes (Hassani, Dailamani, Shastak-mohammadi, Sange-tarom and Daei-shastak) and their 10 hybrids obtained through half a diallel set were evaluated for combining ability and gene effects studies of early maturity and yield traits. Single seedlings of each entries were transplanted at 20×20 cm spacing in 2×4 m² plots using a randomized block design with three replications during 2004-2005 at research station of Sari Agricultural Sciences and Natural Resources University. General combining ability (GCA) and specific combining ability (SCA) were calculated for these agronomic traits. The results showed significant difference between general (GCA) and specific combining ability (SCA) for the investigated characters. This indicates the role of additive and non-additive gene effects in inheritance of the traits. Also the results showed that selection for early maturity and yield characters can't well succeed, because of there were a high amount of non-additive gene effects in the genetic variance. Thus, these characters were important for production of hybrid variety and application of heterosis. In this study, investigation of graphic W_r-V_r analysis for early maturity indicated overdominance effect because the regression line intercepted the W_r axis at negative point ($a = -6.64$). The GCA effects of each parent for these traits showed that the Daei-shastak is good general combiner for yield.

Keywords: Combining ability, Gene action, Rice, Diallel cross

1- Instructore, Sari Agricultural Sciences and Natural Resources University

2- Professor, Sari Agricultural Sciences and Natural Resources University

3- B. Sc., Sari Agricultural Sciences and Natural Resources University