Combining Ability Studies for Salinity Tolerant Traits in Rice (Oryza Sativa L) in Different Seasons under Saline Conditions

K. Nagendra Rao[1], Y. Suryanarayana[2] and T. Anuradha[3]

[1]K. Nagendra Rao, Plant Breeding, Agricultural Research Station, Acharya N.G. Ranga Agricultural University, Machilipatnam - 521002, Andhra Pradesh, India
kaki.phd14@gmail.com
[2]Y. Suryanarayana, Plant Breeding, Agricultural Research Station, Acharya N.G. Ranga Agricultural University, Nellore, Andhra Pradesh, India
Surya_vijetha@yahoo.co.in
[3]T. Anuradha, Plant Breeding, Agricultural Research Station, Acharya N.G. Ranga Agricultural University, Machilipatnam - 521002, Andhra Pradesh, India
anuprasadkattoju@gmail.com

ABSTRACT

Combining ability study of salinity tolerant traits from diallel analysis of 10 genotypes in different seasons under saline conditions revealed the mean squares due to *gca* and *sca* indicated the importance of both additive and non-additive gene actions. In general, MTU 1061 and MTU 1001 were noticed to be good general combiners in all the seasons for grain yield and salinity tolerance traits, indicating their potential in development of high yielding varieties with resistance to salinity. Further, BPT 2231 was noticed to be a good general combiner for grain yield during normal *kharif*, while NLR 40024 was noticed to be a good general combiner for grain yield, and shoot dry weight during late *kharif* and normal *rabi* seasons. However, NLR 33358 was observed to be a good general combiner for grain yield, root length, root dry weight, shoot dry weight and shoot sodium content during normal *rabi*, while NLR 33359 was noticed to be a good general combiner for grain yield and shoot sodium content during both *rabi* seasons. Hence, these parents could be exploited for development of salt tolerant high yielding varieties.

Keywords: Combining ability, Rice, Salinity, Seasons.

1. INTRODUCTION

Rice is an important cereal crop in India. It is grown mainly in tropical and subtropical zones. The productivity of rice is being affected by biotic and abiotic factors. Among the various abiotic factors, salinity is an important yield limiting factor in coastal saline areas. Salinity and sodicity are gradually becoming constraints to rice production in coastal region of Andhra Pradesh. Investigation of the effects of salinity on rice have been under way for more than 50 years and attempts to enhance the salt tolerance in rice through breeding started from the early 1970s (Akbar *et al.*, 1972). Genetic information about the combining ability of parents and hybrids and nature of gene action involve in the inheritance of a trait would be of immense value to plant breeders in the choice of parents and to identify potential crosses of practical use.

2. MATERIAL AND METHODS

In the present investigation ten genotypes viz., NLR-3041, NLR-33358, NLR-33359, NLR-40024, NLR-33671, NLR-33057, BPT-2231, MTU-1061, MTU-1001 and PUSA-1121 were selected as parents based on D^2 statistic. 45 single crosses without reciprocals in 10 x10 full-diallel were attempted and successfully produced around 45-50g seed of each of the executed crosses. The experiment was conducted in 2 environments each in *kharif* and *rabi* seasons of 2011.

Each season is further divided in to normal and late sowing situations prevailing in Agricultural Research Station, Machilipatnam, Krishna District depending on the release of canal water. Accordingly, the parents and their 45 F_1 hybrids were studied in these 4 environments *viz.*, Normal *Kharif*, Late *Kharif* in 2011, Normal r*abi* 2011-12 and Late r*abi*, 2012. The Statistical analysis for estimating the combining ability was carried out as per model I and method II (F_1s + parents) (fixed effects) of Griffing (1956a)

3. RESULTS AND DISCUSSION

The mean squares due to *gca*, *sca* and their interactions with seasons for different characters studied is presented in Table 1. Mean squares due to *gca* and *sca* were found significant for all traits across the seasons. These results revealed the importance of both additive and non-additive gene actions for different traits studied during the four seasons. Similar results were also reported earlier for root length (Price *et al.*1997 and Shehata, 2004), root dry weight (Shahid *et al.*1994 and Shehata, 2004), shoot length (Shehata, 2004) and shoot dry weight (Shahid *et al.* 1994 and Shehata, 2004). Further variance ratio of *gca*:*sca* indicated the pre-dominant role of non-additive gene action for all characters studied in the present investigation. Similar pre-ponderant role of non-additive gene action for shoot sodium content (Lee *et al*. 1996 and Shanthi *et al*. 2011), shoot potassium content (Shanthi *et al*. 2011) and grain yield plant^{-1} (Dalvi and Patel, 2009, Salgotra *et al*. 2009 and Kumar Babu *et al*. 2010).

3.1 General Combining Ability Effects

The general combining ability effects (*gca*) for various characters studied in different seasons in the present investigation are presented in Table 2.

3. 1.1 Shoot length at seedling stage

During normal *kharif*, four parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot length during the season. During late *kharif*, five parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot length during the season. General combining ability effects for shoot length in normal *rabi*, in desired direction were recorded by MTU 1001 and MTU1061 and hence, were identified as good combiners for shoot length during the season. During late rabi season NLR33359, MTU1061 and MTU1001 had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot length during the season.

3.1.2 Shoot dry weight at seedling stage

During normal *kharif*, two parents (MTU 1061 and MTU 1001) had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot dry weight during the season. Significant *gca* effects in desired direction was recorded for this trait in six parents, hence, were identified as good combiners for shoot dry weight during the season. Among the parents in normal *rabi*, the estimates of *gca* effects were significant and positive for NLR33358, NLR40024, NLR33671, MTU1061 and MTU1001 and hence, were identified as good combiners for shoot dry weight during the season. During late *rabi*, four parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot dry weight during the season.

3.1.3 Shoot sodium content at maximum tillering stage

During normal *kharif*, NLR33057, NLR33358, NLR33359, MTU1061 and MTU1001 had recorded significant and negative *gca* effects, desirable for the character and hence were recognized as good combiners for the trait during normal *kharif* season. In late *kharif*, NLR33057, NLR33358, NLR33359, MTU1061 and MTU1001 had recorded significant and negative *gca* effects, desirable for the character and hence were recognized as good combiners for the trait during late *kharif* season. Among the parents NLR33057, NLR33358, NLR33359, MTU1001 and MTU1061 had recorded significant negative *gca* effects for this trait and hence were recognized as good combiners for the trait during normal *rabi* season. During late *rabi*, NLR 33358, NLR33359, MTU1061 and MTU1001 had recorded significant and negative *gca* effects for the character and hence were recognized as good combiners for the trait during late *rabi* season.

3.1.4 Shoot potassium content at maximum tillering stage

During normal *kharif*, two parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot potassium content. Further, significant *gca* effects in desired direction was recorded for this trait in MTU 1001 and MTU1061 and hence, were identified as good combiners for shoot potassium content during late *kharif* season. Among the parents in normal *rabi*, the estimates of *gca* effects were significant and positive for MTU1061 and MTU1001 and hence, were identified as good combiners for shoot potassium content during the season. During late *rabi*, two parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for shoot potassium content during the season.

3.1.5 Root length at seedling stage

During normal *kharif*, four parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for root length. Estimates of *gca* effects in late *kharif*, in desired direction were recorded for this trait in NLR33359, NLR40024, MTU 1001 and MTU1061 and hence, were identified as good combiners for root length during the season. Among the parents in normal *rabi*, the estimates of *gca* effects were significant and positive for NLR33358, MTU 1061 and MTU1001 and hence, were identified as good combiners for root length during the season. During late *rabi*, three parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for root length during the season.

3.1.6 Root dry weight at seedling stage

During normal *kharif*, two parents (MTU1061 and MTU 1001) had recorded significant *gca* effects for the trait during the season and hence, it was identified as good combiner for root dry weight. In late *kharif*, significant *gca* effects in desired direction was recorded for this trait in MTU 1061 and MTU1001 and hence, were identified as good combiners for root dry weight during the season. Among the parents in normal *rabi*, the estimates of *gca* effects were significant and positive for NLR33358, MTU1061 and MTU1001 and hence, were identified as good combiners for root dry weight during the season. During late *rabi*, three parents (NLR33358, MTU 1061 and MTU 1001) had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for root dry weight during the season.

3.1.7 Grain yield plant^{-1} (g)

During normal *kharif*, three parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for grain yield plant^{-1}. In late *kharif*, significant *gca* effects in desired direction were recorded for this trait in NLR40024, MTU 1061 and MTU1001 and hence, were identified as good combiners for g grain yield plant^{-1} during the season. Among the parents in normal *rabi*, the estimates of *gca* effects were significant and positive for NLR33358, NLR33359, NLR40024, MTU1061 and MTU1001 and hence, were identified as good combiners for grain yield plant^{-1} during the season. During late *rabi*, three parents had recorded positive and significant *gca* effects for the trait and hence, were identified as good combiners for grain yield plant^{-1} during the season. High *gca* effects for this trait was reported by Pradhan and Singh (2008).

In general, MTU 1061 and MTU 1001 were noticed to be good general combiners in all the seasons for grain yield and salinity tolerance traits studied under saline conditions in the present investigation, indicating their potential in development of high yielding varieties with resistance to salinity. Further, BPT 2231 was noticed to be a good general combiner for grain yield during normal *kharif*, while NLR 40024 was noticed to be a good general combiner for grain yield, and shoot dry weight during late *kharif* and normal *rabi* seasons. However, NLR 33358 was observed to be a good general combiner for grain yield, root length, root dry weight, shoot dry weight and shoot sodium content during normal *rabi*, while NLR 33359 was noticed to be a good general combiner for grain yield and shoot sodium content during both *rabi* seasons studied in the present investigation.

3.2. Specific combining ability

The specific combining ability (*sca*) effect is an average performance of a cross expressed as a deviation from the population mean and is correlated with parental *gca* effects (Saidaih *et al*. 2010a). Specific combining ability effects of the 45 hybrids studied for salinity tolerant traits, and grain yield in different seasons are presented in Table 3.

3.2.1 Shoot length at seedling stage

During normal *kharif*, the *sca* effects were noticed to range from -9.92(NLR 33057 X NLR 33671) to 11.63 (NLR 33671 X BPT 2231). Nine hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot length during the season. Specific combining ability effects for shoot length in late *kharif*, varied from -12.80 (NLR 40024 X BPT2231) to 16.55 (NLR 33359 X MTU1001). Sixteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot length during the season. Estimates of *sca* effects in normal *rabi*, ranged from -13.06 (NLR 33057 X NLR 33671) to 8.19 (MTU 1001 X BPT 2231). Seven hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot length during the season. During late *rabi*, the *sca* effects were noticed to range from -5.49 (NLR 33358 X NLR 40024) to 8.97 (MTU 1061 X MTU 1001). Three hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot length during the season.

3.2.2 Shoot dry weight at seedling stage

During normal *kharif*, the *sca* effects were noticed to range from -0.21(MTU 1001 X PUSA 1121) to 0.48 (MTU 1061 X MTU 1001). Twenty eight hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot dry weight during the season. Specific combining ability effects for shoot dry weight in late *kharif*, varied from -0.13 (NLR33359 X NLR40024) to 0.22 (NLR 33359 X MTU1001). Thirteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot dry weight during the season. Estimates of *sca* effects in normal *rabi*, ranged from -0.17 (MTU1061 X PUSA1121) to 0.48 (MTU 1061 X MTU1001). Fourteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot dry weight during the season. During late *rabi*, the *sca* effects were noticed to range from -0.15 (NLR 33359 X MTU1001) to 0.53 (MTU 1061 X MTU 1001). Fifteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot dry weight during the season. Sanjay singh *et al*. (2008) reported high *sca* effects for shoot dry weight.

3.2.3 Shoot sodium content at maximum tillering stage

For shoot sodium content in normal *kharif*, exhibited *sca* effects for crosses from -0.53 (MTU 1061 X BPT2231) to 0.41 (NLR33057 X PUSA1121). Twenty three hybrids had recorded significant and negative *sca* effects for the character and hence were recognized as good specific combiners during normal *kharif* season. Specific combining ability effects for shoot sodium content in late *kharif*, varied from -0.49 (PUSA1121 X BPT2232) to 0.51 (NLR 33359 X PUSA1121). Twenty five had recorded significant and negative *sca* effects for the character and hence were recognized as good specific combiners during late *kharif* season. Estimates of *sca* effects in normal *rabi*, ranged from -0.39 (MTU1061 X BPT2231) to 0.44 (NLR33358 X NLR40024). Twenty four hybrids had recorded significant and negative *sca* effects for the character and hence were recognized as good specific combiners during normal *rabi* season. During late *rabi*, the *sca* effects were noticed to range from -0.42 (MTU1061 X BPT2231) to 0.78 (NLR33057 X PUSA1121). Twenty five hybrids had recorded significant and negative *sca* effects for the character and hence was recognized as good specific combiners during late *rabi* season.

3.2.4 Shoot potassium content at maximum tillering stage

For shoot potassium content in normal *kharif*, exhibited *sca* effects for crosses from -0.29 (NLR33359 X NLR33671) to 0.61 (NLR33359 X MTU1061). Fifteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot potassium content during the season. Specific combining ability effects for shoot potassium content in late *kharif*, varied from -0.45 (MTU1001 X BPT2231) to 0.62 (NLR 33671 X MTU1061). Thirteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot potassium content during the season. Estimates of *sca* effects in normal *rabi*, ranged from -0.29 (NLR40024 X NLR3041) to 0.78 (MTU1061 X MTU1001). Fifteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot potassium content during the season. During late *rabi*, the *sca* effects were noticed to range from -0.27 (PUSA1121 X BPT2231) to 0.54

(NLR33671 X MTU1061). Fifteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for shoot potassium content during the season.

3.2.5 Root length at seedling stage

During normal *kharif*, the *sca* effects were noticed to range from -3.02 (NLR33057 X NLR33671) to 2.81 (NLR3041 X MTU 1061). Twelve hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for root length during the season. Specific combining ability effects for root length in late *kharif*, varied from -3.66 (MTU1001 X PUSA1121) to 3.23 (NLR40024 X MTU1001). Eleven hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for root length during the season. Estimates of *sca* effects in normal *rabi*, ranged from -2.69 (MTU1001 X PUSA1121) to 2.57 (NLR3041 X MTU1001). One hybrid (NLR 3041 X MTU1001) had recorded positive and significant effects and hence, was identified as good specific combiners for root length during the season. During late *rabi*, the *sca* effects were noticed to range from -3.51 (MTU1001 X PUSA1121) to 2.89 (NLR3041 X PUSA1121). One hybrid (NLR3041 X PUSA1121) had recorded positive and significant effects and hence, was identified as good specific combiners for root length during the season.

3.2.6 Root dry weight at seedling stage

During normal *kharif*, the *sca* effects were noticed to range from -0.03 (NLR33359 X MTU1061) to 0.04 (NLR3041 X MTU 1061). Only one hybrid i.e., NLR3041 X MTU 1061(0.04) among the forty five hybrids had recorded significant and positive effects and hence, was identified as good specific combiners for root dry weight during the season. Specific combining ability effects for root dry weight in late *kharif*, varied from -0.05 (NLR33359 X NLR40024) to 0.05 (NLR 33359 X BPT2231). Four hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for root dry weight during the season. Estimates of *sca* effects in normal *rabi*, ranged from -0.05 (NLR33057 X NLR40024) to 0.04 (NLR33057 X NLR3041, NLR33057 X MTU1001, NLR33358 X PUSA1121 and NLR3041 X MTU1001). Four hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for root dry weight during the season. During late *rabi*, the *sca* effects were noticed to range from -0.04 (NLR33057 X NLR3041 and NLR33057 X NLR33671) to 0.04 (NLR33057 X PUSA1121 and NLR33359 X NLR33671). Two hybrids i.e., NLR33057 X PUSA1121 and NLR33359 X NLR33671 (0.04) had recorded positive and significant effects and hence, were identified as good specific combiners for root dry weight during the season.

3.2.7 Grain yield plant^{-1}

During normal *kharif*, the *sca* effects were noticed to range from -2.31 (MTU1001 X PUSA1121) to 5.09 (MTU1001 X BPT2231). Twelve hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for grain yield plant^{-1} during the season. Specific combining ability effects for grain yield plant^{-1} in late *kharif*, varied from -4.19 (NLR33359 X NLR40024) to 8.95 (NLR33359 X MTU1001). Eight hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for grain yield plant^{-1} during the season. Estimates of *sca* effects in normal *rabi*, ranged from -5.53 (MTU1001 X PUSA1121) to 13.93 (NLR33359 X MTU1001). Fifteen hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for grain yield plant^{-1} during the season. During late *rabi*, the *sca* effects were noticed to range from -5.76 (MTU1001 X PUSA1121) to 15.99 (NLR33359 X MTU1001). Eight hybrids had recorded positive and significant effects and hence, were identified as good specific combiners for grain yield plant^{-1} during the season. Rahimi *et al.* (2010) reported significant and positive *sca* effects for grain yield plant.$^{-1}$ A high *sca* effect for grain yield per plant was reported by Pradhan and Singh (2008).

In general, the hybrids, NLR 33359 X MTU 1001, NLR 40024 X MTU 1061 and NLR 40024 X MTU 1001 were noticed to be good specific combiners across all the seasons studied with regards to grain yield and salinity tolerance traits, namely, shoot potassium and sodium content, indicating their potential as promising hybrids for saline conditions. The hybrids, NLR 33057 X NLR 3041, NLR 33057 X MTU 1061 and MTU 1001 X BPT 2231 were also noticed to be good specific combiners for normal and late *kharif* seasons studied with regards to grain yield and few other traits studied. The hybrid, NLR 40024 X PUSA 1121 was noticed to be a good specific combiner for normal *kharif* and *rabi* in addition to late *rabi*

with regards to grain yield and shoot sodium content. Further, the hybrids NLR 33358 X MTU 1061, NLR 33358 X MTU 1001 and NLR 33359 X MTU 1061 were noticed to be good specific combiners for both normal and late *rabi* with regards to grain yield and shoot sodium content.

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Table .1 Mean squares due to *gca*, *sca* and their interactions with seasons for salinity tolerant traits and grain yield in rice under saline conditions

Source of variation	df	Shoot length at seedling stage				Shoot Dry weight at seedling stage				Shoot sodium content at Maximum tillering stage			
		Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
gca	9	123.93**	155.89**	146.41**	168.32**	0.06**	0.03**	0.06**	0.05**	0.2**	0.15**	0.33**	0.34**
sca	45	52.51**	54.70**	33.06**	19.69**	0.05**	0.01**	0.02**	0.02**	0.08**	0.08**	0.06**	0.06**
Error	108	32.12	4.03	7.1	7.12	0.0003	0.0009	0.0008	0.00072	0.0004	0.00086	0.0006	0.0003
σ^2gca		9.43	12.66	11.61	13.43	0.005	0.002	0.005	0.004	0.02	0.01	0.03	0.028
σ^2sca		41.8	50.67	25.96	12.57	0.046	0.009	0.021	0.02	0.08	0.08	0.06	0.06
σ^2gca /σ^2sca		0.23	0.25	0.45	1.07	0.12	0.24	0.24	0.23	0.21	0.16	0.49	0.45

Table.1 Contd….

Source of variation	df	Shoot potassium content at Maximum tillering stage				Root length at seedling stage				Root Dry weight at seedling stage			
		Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
gca	9	0.88**	0.69**	0.98**	0.82**	5.04**	11.54**	7.85**	12.51**	0.0006	0.0016**	0.003**	0.003**
sca	45	0.11**	0.12**	0.11**	0.08**	3.17**	4.12**	2.56**	2.8**	0.0003	0.0006*	0.0007**	0.0006**
Error	108	0.0005	0.002	0.0003	0.00096	0.2	0.2	1.09	1.45	0.0003	0.0004	0.0003	0.0004
σ^2gca		0.073	0.06	0.08	0.07	0.4	0.95	0.56	0.92	0.00002	0.0001	0.0002	0.0002
σ^2sca		0.104	0.12	0.11	0.08	2.97	3.91	1.47	1.35	0.00005	0.0002	0.0004	0.0002
σ^2gca /σ^2sca		0.701	0.51	0.75	0.86	0.14	0.24	0.38	0.68	-0.66	0.46	0.5	0.87

*Significant at 5 per cent level **Significant at 1 per cent level

Table 1 Contd….

Source of variation	df	Grain yield plant^{-1}			
		Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
gca	9	61.38**	12.81**	47.13**	55.74**
sca	45	7.08**	6.97**	21.21**	18.23**
Error	108	0.26	0.63	0.45	0.79
σ^2gca		5.09	1.01	3.89	4.58
σ^2sca		6.82	6.34	20.76	17.45
σ^2gca /σ^2sca		0.75	0.16	0.19	0.26

Table. 2 General combining ability effects of the parents for salinity tolerance traits and grain yield in different seasons under saline conditions

Parent	Shoot Length at seedling stage				Shoot Dry weight at seedling stage				Shoot sodium content at M.T.S			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
NLR33057	-1.57	1.75**	-0.75	0.87	-0.03**	0.03**	-0.01	0.02**	-0.05**	-0.03**	-0.04**	0.02**
NLR33358	0.02	2.19**	1.07	0.13	0.01	0.03**	0.03**	0.02**	-0.09**	-0.06**	-0.07**	-0.07**
NLR33359	-1.89*	-1.32*	0.45	1.71*	-0.04**	0.01	0.01	0.01	-0.05**	-0.03**	-0.06**	-0.06**
NLR40024	2.00*	1.85**	1.41	0.75	-0.01	0.03**	0.05**	-0.05**	0.02**	0.05**	0.02**	0.02**
NLR3041	2.38**	-0.20	-0.33	0.98	-0.01	0.03**	-0.06**	0.01	0.01**	0.03**	0.01	-0.01
NLR33671	-1.40*	-6.57**	-0.18	0.60	-0.03**	-0.09**	0.03**	0.01	0.04**	0.05**	0.01	0.01*
MTU1061	5.23**	4.05**	4.63**	3.39**	0.12**	0.04**	0.09**	0.05**	-0.06**	-0.13**	-0.23**	-0.25**
MTU1001	3.18**	4.38**	4.63**	4.48**	0.13**	0.04**	0.07*	0.11**	-0.16**	-0.19**	-0.16**	-0.18**
PUSA1121	-5.74**	-4.83**	-4.25**	-4.74**	-0.11**	-0.08**	-0.12**	-0.07**	0.01*	0.17**	0.20**	0.16**
BPT2231	-2.21*	-1.30*	-6.69**	-8.17**	-0.03**	-0.03**	-0.09**	-0.10**	0.32**	0.13**	0.34**	0.35**
SE (g_i) $\pm$	0.90	0.55	0.73	0.73	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Significant at 5 per cent level **Significant at 1 per cent level

Table. 2Contd….

Parent	Shoot potassium content at M.T.S				Root Length at seedling stage				Root Dry weight at seedling stage			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
NLR33057	-0.22**	-0.19**	-0.20**	-0.19**	-0.53**	0.23	-0.13	-0.02	-0.01	0.01	0.01	0.01
NLR33358	-0.13**	-0.09**	-0.11**	-0.10**	-0.38**	0.11	0.64*	0.89**	-0.01	0.01	0.02**	0.02**
NLR33359	-0.05**	0.01	-0.13**	-0.13**	-0.59**	0.44**	0.50	0.51	-0.01	0.01	0.01	0.01
NLR40024	-0.15**	-0.07**	-0.11**	-0.08**	0.39**	0.62**	0.41	0.27	0.01	0.01	0.001	0.01
NLR3041	-0.15**	-0.10**	-0.07**	-0.08**	0.37**	-0.57**	-0.15	-0.52	0.01	0.01	-0.01	-0.01
NLR33671	-0.06**	0.01	-0.13**	-0.11**	-0.01	-2.21**	-0.68*	-0.68*	0.01	-0.02**	-0.01	-0.01*
MTU1061	0.45**	0.41**	0.51**	0.47**	0.95**	0.77**	1.18**	1.57**	0.01*	0.01*	0.02**	0.01*
MTU1001	0.55**	0.45**	0.56**	0.52**	0.92**	1.36**	0.58*	0.89**	0.01*	0.01**	0.01*	0.01*
PUSA1121	-0.06**	-0.18**	-0.11**	-0.10**	-0.98**	-0.59**	-1.35**	-1.38**	-0.01*	-0.01*	-0.02**	-0.02**
BPT2231	-0.19**	-0.24**	-0.22**	-0.20**	-0.14	-0.16	-1.00**	-1.53**	0.01	-0.01	-0.02**	-0.02**
SE (g_i) $\pm$	0.01	0.01	0.00	0.01	0.12	0.12	0.29	0.33	0.01	0.01	0.01	0.01

*Significant at 5 per cent level **Significant at 1 per cent level

Table. 2Contd….

Parent	Grain yield plant^{-1}			
	Normal *kharif*	**Late *kharif***	**Normal *rabi***	**Late *rabi***
NLR33057	-1.26**	-0.06	-1.65**	-1.80**
NLR33358	-2.24**	-0.09	0.41*	0.47
NLR33359	-1.03**	0.28	1.35**	1.60**
NLR40024	-1.27**	0.94**	0.56**	0.42
NLR3041	-0.57**	-0.06	-2.27**	-0.66**
NLR33671	-0.25	-1.53**	-0.39*	-2.17**
MTU1061	3.65**	0.57**	1.41**	1.37**
MTU1001	4.22**	1.89**	4.07**	4.55**
PUSA1121	-2.12**	-1.48**	-1.29**	-2.46**
BPT2231	0.87**	-0.46*	-2.19**	-1.34**
SE (g_i) $\pm$	0.14	0.22	0.18	0.24

*Significant at 5 per cent level

**Significant at 1 per cent level

Table. 3 Specific combining ability effects of hybrids for salinity tolerance traits and grain yield in different seasons under saline conditions

Hybrids	Shoot Length at seedling stage				Shoot Dry weight at seedling stage				Shoot sodium content at M.T.S			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*
NLR33057 X NLR33358	-4.64	-4.40*	4.47	-4.47	-0.01	-0.09**	0.03	0.03	-0.08**	-0.12**	-0.04	-0.15**
NLR33057 X NLR33359	-4.03	-5.28**	-1.65	4.72	0.04**	0.01	0.07**	0.06*	0.01	-0.04*	0.01	-0.09**
NLR33057 X NLR40024	0.99	-5.06**	5.77*	0.98	-0.18**	0.01	-0.02	0.02	0.03	0.10**	0.13**	0.01
NLR33057 X NLR3041	5.43	7.60**	-4.50	-2.92	0.09**	0.15**	-0.02	-0.06*	0.14**	0.01	0.11**	0.03
NLR33057 X NLR33671	-9.92**	-6.03**	-13.06**	3.40	0.07**	-0.07*	0.04	-0.02	0.02	0.01	0.06**	0.05**
NLR33057 X MTU1061	5.45	2.78	6.12*	2.57	0.12**	0.03	-0.05	0.02	-0.25**	-0.19**	-0.10**	-0.17**
NLR33057 X MTU1001	6.17*	1.82	4.42	4.08	0.01	0.01	0.03	0.23**	-0.06**	-0.04	-0.09**	-0.09**
NLR33057 X PUSA1121	6.15*	-0.77	4.48	0.84	0.09**	0.01	0.09**	0.01	0.41**	0.24**	0.27**	0.78**
NLR33057 X BPT2231	1.72	8.00**	-1.93	-1.00	0.09**	0.08**	0.02	-0.01	0.11**	0.36**	0.09**	0.29**
NLR33358 X NLR33359	-2.75	-11.92**	2.90	-4.87	-0.12**	0.08**	0.17**	0.08**	-0.04*	-0.09**	-0.06**	-0.05**
NLR33358 X NLR40024	-4.24	6.20**	-4.44	-5.49*	-0.08**	0.01	-0.01	-0.14**	0.41**	0.38**	0.44**	0.51**
NLR33358 X NLR3041	1.72	7.16**	-5.04*	0.42	0.10**	0.10**	-0.14**	0.05	0.12**	0.09**	0.14**	0.17**
NLR33358 X NLR33671	4.06	-6.67**	1.95	1.30	-0.14**	0.01	0.04	0.10**	0.17**	0.13**	0.19**	0.14**
NLR33358 X MTU1061	4.63	1.61	4.97*	2.78	0.01	0.07*	0.01	-0.10**	-0.28**	-0.22**	-0.13**	-0.13**
NLR33358 X MTU1001	-3.65	-8.63**	-2.28	2.16	0.47**	-0.11**	0.03	0.01	-0.10**	0.04	-0.11**	-0.10**
NLR33358 X PUSA1121	1.43	0.19	0.33	1.68	-0.06**	-0.09**	0.04	-0.06*	-0.08**	-0.28**	-0.28**	-0.21**
NLR33358 X BPT2231	-0.89	8.26**	-4.43	4.51	0.12**	0.02	-0.02	0.05*	0.11**	0.37**	0.19**	0.18**
NLR33359 X NLR40024	7.16*	-5.85**	3.78	5.40*	0.08**	-0.13**	0.03	0.02	-0.11**	-0.15**	-0.11**	-0.14**
NLR33359 X NLR3041	10.28**	7.47**	1.31	2.30	0.08**	-0.06*	-0.11**	-0.05	0.10**	0.08**	0.15**	0.16**
NLR33359 X NLR33671	-4.42	-4.76*	-3.12	-2.98	0.01	0.04	-0.12**	0.06*	0.10**	0.05	0.13**	0.13**
NLR33359 X MTU1061	6.88*	8.02**	4.62	3.37	0.11**	0.01	0.01	-0.03	-0.23**	-0.06*	-0.18**	-0.16**
NLR33359 X MTU1001	4.17	16.55**	0.44	-0.06	0.10**	0.22**	-0.05*	-0.15**	-0.02**	-0.20**	-0.01*	-0.01*
NLR33359 X PUSA1121	1.05	-4.80*	-1.07	0.05	0.15**	0.09**	-0.03	-0.04	-0.11**	0.51**	-0.27**	-0.23**

*Significant at 5 per cent level **Significant at 1 per cent level

Hybrids	Shoot Length at seedling stage				Shoot Dry weight at seedling stage				Shoot sodium content at M.T.S			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late*rabi*
NLR33359 X BPT2231	5.98	-1.73	-1.36	0.55	0.10**	0.04	0.02	0.10**	0.10**	-0.24**	0.14**	0.25**
NLR40024 X NLR3041	-2.39	6.90**	0.75	3.64	0.14**	0.04	-0.02	0.17**	0.09**	0.36**	0.10**	0.07**
NLR40024 X NLR33671	-0.21	-8.03**	-0.12	-3.12	-0.19**	0.04	-0.05*	-0.11**	0.01	0.01	0.09**	0.11**
NLR40024 X MTU1061	4.65	-0.25	5.10*	3.69	0.40**	-0.04	0.09**	-0.04	-0.32**	-0.13**	-0.12**	-0.12**
NLR40024 X MTU1001	5.33	8.81**	1.88	3.57	0.03	0.16**	0.09**	-0.06*	-0.30**	-0.08**	-0.25**	-0.16**
NLR40024 X PUSA1121	0.19	1.63	-1.01	-0.88	0.07**	-0.01	0.15**	0.01	-0.13**	-0.14**	-0.29**	-0.23**
NLR40024 X BPT2231	0.03	-12.80**	-4.21	-0.51	0.07**	0.03	0.03	0.02	-0.03	-0.27**	0.01	0.02
NLR3041 X NLR33671	-1.16	-9.18**	-2.32	-4.75	0.06**	0.03	-0.03	-0.09**	-0.02	0.27**	0.06*	0.05**
NLR3041 X MTU1061	3.95	-4.90*	5.73*	1.73	0.16**	-0.04	0.20**	0.11**	-0.28**	-0.13**	-0.12**	-0.11**
NLR3041 X MTU1001	1.96	-4.93*	3.58	3.87	0.01	0.12**	0.22**	0.09**	-0.16**	-0.04	-0.08**	-0.07**
NLR3041 X PUSA1121	-4.46	-12.12**	3.86	0.83	-0.17**	-0.05	-0.03	-0.02	-0.13**	-0.25**	-0.28**	-0.27**
NLR3041 X BPT2231	-1.34	-2.05	-1.54	-1.09	0.14**	-0.02	0.18**	0.06*	-0.13**	-0.25**	-0.07**	0.03
NLR33671 X MTU1061	3.03	4.21*	4.67	2.05	0.04**	0.00	0.12**	0.01	-0.34**	0.31**	-0.16**	-0.18**
NLR33671 X MTU1001	4.98	7.44**	2.55	2.10	0.01	-0.05	0.08**	0.07**	-0.18**	-0.21**	-0.12**	-0.13**
NLR33671 X PUSA1121	5.49	-2.45	1.23	1.04	0.14**	-0.12**	0.01	0.07**	-0.03	-0.46**	-0.19**	-0.11**
NLR33671 X BPT2231	11.63**	4.82*	1.38	-1.73	0.10**	0.08**	0.11**	0.01	0.05**	-0.14**	0.13**	0.16**
MTU1061 X MTU1001	8.07*	-0.78	4.75	8.97**	0.48**	0.07*	0.48**	0.53**	-0.02	-0.15**	0.18**	0.20**
MTU1061 X PUSA1121	-0.61	6.13**	-4.21	-1.07	-0.21**	0.18**	-0.17**	0.00	-0.08**	-0.25**	-0.14**	-0.08**
MTU1061 X BPT2231	-3.70	-5.76**	4.30	-2.86	-0.10**	0.03	0.06*	-0.05*	-0.53**	-0.09**	-0.39**	-0.42**
MTU1001 X PUSA1121	8.11**	10.60**	4.50	5.94*	0.11**	-0.05	-0.10**	-0.01	0.04*	-0.24**	-0.19**	-0.14**
MTU1001 X BPT2231	9.20**	-6.03**	8.19**	-1.52	-0.03	0.12**	-0.04	-0.05	-0.35**	-0.05	-0.35**	-0.37**
PUSA1121 X BPT2231	-3.36	4.68*	7.99**	2.77	0.16**	0.03	0.04	0.13**	0.31**	-0.49**	0.13**	0.18**
SE (Sij) ±	3.01	1.85	2.46	2.46	0.02	0.03	0.03	0.03	0.02	0.03	0.02	0.02

*Significant at 5 per cent level **Significant at 1 per cent level

Table. 3 Contd…

Hybrids	Shoot potassium content at M.T.S				Root Length at seedling stage				Root Dry weight at seedling stage			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
NLR33057 X NLR33358	0.09**	0.05	-0.01	-0.03	-0.48	-0.99*	-0.37	-1.02	0.01	-0.01	0.01	0.01
NLR33057 X NLR33359	-0.06**	-0.11**	-0.02	-0.02	0.59	-2.41**	1.06	1.71	0.01	-0.01	0.01	0.03
NLR33057 X NLR40024	-0.05*	-0.12**	-0.18**	-0.19**	0.05	-1.33**	0.12	-0.31	0.01	-0.02	-0.05**	0.02
NLR33057 X NLR3041	-0.01	-0.05	-0.06**	-0.04	1.01*	2.29**	-0.48	-0.82	0.01	0.03	0.04*	-0.04*
NLR33057 X NLR33671	-0.12**	-0.19**	0.12**	0.12**	-3.02**	-1.26**	-0.94	-0.59	-0.02	0.02	0.01	-0.04*
NLR33057 X MTU1061	0.07**	0.09**	-0.05**	-0.06*	0.57	0.67	1.05	0.71	0.01	0.01	0.02	0.02
NLR33057 X MTU1001	0.23**	0.34**	0.16**	0.16**	0.54	-0.06	1.44	1.53	0.01	-0.02	0.04*	0.01
NLR33057 X PUSA1121	-0.22**	-0.07*	0.17**	0.18**	-1.27**	-1.23**	-1.33	0.92	0.01	-0.02	-0.04*	0.04*
NLR33057 X BPT2231	-0.06**	0.05	-0.10**	-0.06*	0.04	1.57**	-0.55	-0.69	0.01	0.02	-0.01	-0.03
NLR33358 X NLR33359	-0.11**	-0.12**	-0.17**	-0.16**	-1.47**	-1.39**	-0.26	0.72	-0.01	-0.02	0.01	0.01
NLR33358 X NLR40024	-0.24**	-0.29**	0.32**	0.38**	-0.77	-2.12**	1.74	-1.07	0.01	-0.03	0.01	-0.01
NLR33358 X NLR3041	0.02	-0.04	-0.14**	-0.12**	0.38	2.24**	-1.11	2.03	0.01	0.02	-0.01	0.03
NLR33358 X NLR33671	-0.22**	-0.27**	-0.22**	-0.24**	-0.18	-0.60	0.35	0.04	0.01	-0.01	0.03	0.01
NLR33358 X MTU1061	-0.04	0.03	-0.14**	-0.10**	0.95*	0.61	1.27	0.92	0.01	-0.01	0.01	0.01
NLR33358 X MTU1001	0.04*	0.15**	-0.03	0.01	-0.56	1.15**	0.77	1.03	0.01	0.02	0.01	0.01
NLR33358 X PUSA1121	-0.10**	-0.01	-0.17*	-0.18**	0.40	-0.90*	0.33	0.04	-0.01	-0.01	0.04*	0.02
NLR33358 X BPT2231	-0.19**	-0.11**	-0.06**	-0.10**	1.87**	-0.39	-0.58	-0.17	-0.01	0.01	-0.01	-0.02
NLR33359 X NLR40024	-0.15**	-0.22**	-0.27**	-0.26**	-0.68	-2.74**	0.02	0.46	0.01	-0.05*	0.02	-0.02
NLR33359 X NLR3041	-0.24**	-0.32**	-0.29**	-0.24**	1.43**	0.80	-0.86	-0.12	0.01	0.01	0.01	0.02
NLR33359 X NLR33671	-0.29**	-0.26**	-0.07**	-0.07*	0.19	-1.50**	1.17	1.51	0.01	-0.02	-0.01	0.04*
NLR33359 X MTU1061	0.61**	0.61**	0.17**	0.16**	1.71**	0.56	0.82	0.90	-0.03*	0.01	0.01	0.02
NLR33359 X MTU1001	0.29**	0.61**	0.25**	0.19**	1.23**	2.85**	0.99	0.99	0.01	0.03	0.01	0.01
NLR33359 X PUSA1121	-0.23**	-0.12**	-0.15**	-0.14**	-2.79**	-0.65	0.65	-0.35	-0.02	-0.03	0.02	-0.02

Table. 3 Contd….

Hybrids	Shoot potassium content at M.T.S				Root Length at seedling stage				Root Dry weight at seedling stage			
	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*	Normal *kharif*	Late *kharif*	Normal *rabi*	Late *rabi*
NLR33359 X BPT2231	-0.22**	-0.19**	-0.09**	-0.08**	-2.85**	2.88**	-0.96	-2.03	-0.01	0.05*	-0.01	-0.04
NLR40024 X NLR3041	-0.15**	-0.19**	-0.29**	-0.26**	-1.46**	2.82**	-1.15	-0.30	-0.01	0.04*	-0.04*	0.01
NLR40024 X NLR33671	-0.24**	-0.30**	-0.22**	-0.24**	-1.20**	-0.50	-1.96*	-1.88	-0.01	-0.01	0.01	-0.04
NLR40024 X MTU1061	0.12**	0.41**	0.26**	0.27**	1.87**	0.43	1.49	2.23	0.03	0.03	0.02	0.02
NLR40024 X MTU1001	0.14**	0.25**	0.04*	0.07*	1.32**	3.23**	1.88	2.12	0.02	0.04*	0.02	0.01
NLR40024 X PUSA1121	-0.10**	0.01	-0.14**	-0.16**	-0.42	-0.44	0.19	0.80	-0.02	0.01	0.02	0.03
NLR40024 X BPT2231	-0.14**	-0.09**	-0.12**	-0.15**	-1.05*	-2.25**	-0.71	0.27	-0.02	-0.02	0.01	0.01
NLR3041 X NLR33671	-0.03	-0.09**	-0.19**	-0.17**	-1.21**	-0.38	-2.04*	-2.01	-0.02	0.01	-0.04*	-0.02
NLR3041 X MTU1061	0.31**	0.34**	0.49**	0.24**	2.81**	-1.87**	1.07	1.09	0.04*	-0.04*	0.01	0.02
NLR3041 X MTU1001	0.31*	0.48**	0.25**	0.32**	1.57**	-1.21**	2.57*	2.89*	0.01	-0.03	0.04*	0.03
NLR3041 X PUSA1121	-0.08**	0.11**	-0.10**	-0.08**	-1.72**	-2.18**	-1.55	-1.33	-0.02	-0.01	-0.01	-0.02
NLR3041 X BPT2231	-0.16**	-0.11**	-0.14**	-0.12**	-0.83*	-1.13**	0.52	-1.90	0.01	-0.02	-0.02	-0.01
NLR33671 X MTU1061	0.59**	0.62**	0.54**	0.54**	-1.11**	0.10	1.10	1.37	-0.01	0.01	0.01	0.02
NLR33671 X MTU1001	0.22**	0.36**	0.23**	0.24**	-0.89*	-0.84*	0.44	0.73	0.01	-0.02	0.01	0.01
NLR33671 X PUSA1121	-0.13**	0.03	-0.04*	0.01	-0.26	-0.56	-1.91	-0.80	-0.01	0.01	-0.03	-0.02
NLR33671 X BPT2231	-0.20**	-0.14**	-0.07**	-0.06*	2.54**	0.85*	0.49	-1.26	0.03	0.01	-0.01	0.01
MTU1061 X MTU1001	0.01	0.16**	0.78**	0.44**	2.19**	2.91**	1.79	1.10	0.02	0.04*	0.01	0.01
MTU1061 X PUSA1121	0.39**	-0.38**	0.14**	0.17**	-1.14**	1.57**	-1.68	-1.93	-0.02	0.03	0.01	-0.02
MTU1061 X BPT2231	-0.11**	-0.15**	-0.06**	0.04	-2.90**	-2.89**	-0.64	0.56	-0.02	-0.01	-0.02	-0.01
MTU1001 X PUSA1121	0.30**	-0.43**	0.15**	0.21**	0.20	-3.66**	-2.69**	-3.51**	0.01	-0.03	-0.04**	-0.04
MTU1001 X BPT2231	0.34**	-0.45**	-0.03*	0.01	-0.36	-2.69**	-1.09	-0.03	-0.01	0.01	-0.02	0.01
PUSA1121 X BPT2231	-0.18**	0.05	-0.26**	-0.27**	-1.39**	-1.49**	-0.35	0.96	-0.01	0.01	0.01	0.01
SE (Sij) ±	0.02	0.03	0.02	0.03	0.41	0.42	0.96	1.11	0.02	0.02	0.02	0.02

Hybrids	Grain yield plant^{-1}			
	Normal *kharif*	**Late *kharif***	**Normal *rabi***	**Late *rabi***
NLR33057 X NLR33358	0.05	-0.15	-1.12	-0.09
NLR33057 X NLR33359	-0.32	-1.81*	6.84**	-3.48**
NLR33057 X NLR40024	-1.80**	-1.88*	-2.18**	-0.85
NLR33057 X NLR3041	1.02*	5.52**	-0.94	0.32
NLR33057 X NLR33671	-1.21*	-1.51*	2.68**	0.25
NLR33057 X MTU1061	3.99**	1.99**	-1.53*	0.07
NLR33057 X MTU1001	1.75**	-4.16**	-1.10	-0.04
NLR33057 X PUSA1121	-0.82	0.03	-1.04	0.99
NLR33057 X BPT2231	-0.46	1.22	-0.61	1.16
NLR33358 X NLR33359	0.07	1.22	-3.54**	-2.43**
NLR33358 X NLR40024	0.48	-0.86	-5.05**	-3.75**
NLR33358 X NLR3041	0.49	2.92**	-2.41**	-0.46
NLR33358 X NLR33671	-0.22	0.03	8.01**	-2.17*
NLR33358 X MTU1061	0.77	-0.07	3.11**	4.44**
NLR33358 X MTU1001	-1.69**	-1.79*	11.64**	12.34**
NLR33358 X PUSA1121	0.74	-0.92	1.24	-1.90*
NLR33358 X BPT2231	-0.85	0.18	-2.76**	0.92
NLR33359 X NLR40024	-1.22*	-4.19**	4.23**	-0.69
NLR33359 X NLR3041	-0.75	-0.51	-3.31**	6.53**
NLR33359 X NLR33671	-2.03**	-1.10	-5.35**	-3.05**
NLR33359 X MTU1061	2.16**	-1.01	1.96**	3.11**
NLR33359 X MTU1001	4.50**	8.95**	13.93**	15.99**
NLR33359 X PUSA1121	0.63	1.60*	-0.01	-1.33

*Significant at 5 per cent level **Significant at 1 per cent level

Hybrids	Grain yield plant^{-1}			
	Normal *kharif*	**Late *kharif***	**Normal *rabi***	**Late *rabi***
NLR33359 X BPT2231	-1.76**	-0.50	-1.89**	-3.80**
NLR40024 X NLR3041	-0.77	0.85	-2.53**	-0.17
NLR40024 X NLR33671	-1.20*	-0.86	5.15**	1.47
NLR40024 X MTU1061	1.30**	2.00**	1.55*	1.80*
NLR40024 X MTU1001	4.23**	7.71**	4.09**	3.74**
NLR40024 X PUSA1121	1.05*	-0.15	2.05**	3.81**
NLR40024 X BPT2231	-0.86	-0.56	-1.11	-2.70**
NLR3041 X NLR33671	-0.99*	-0.90	3.33**	0.40
NLR3041 X MTU1061	3.70**	-1.40	-0.72	-1.48
NLR3041 X MTU1001	1.65**	-0.32	0.72	-2.21**
NLR3041 X PUSA1121	0.19	-3.01**	4.33**	-0.14
NLR3041 X BPT2231	-1.53**	-1.76*	0.58	0.59
NLR33671 X MTU1061	0.51	0.33	-3.50**	-0.49
NLR33671 X MTU1001	0.70	-1.55*	-3.73**	-2.77**
NLR33671 X PUSA1121	-0.64	-1.27	1.03	-0.27
NLR33671 X BPT2231	-0.73	1.23	-1.70**	1.05
MTU1061 X MTU1001	3.96**	-0.49	0.54	-1.34
MTU1061 X PUSA1121	-0.84	1.14	0.43	0.86
MTU1061 X BPT2231	0.76	-0.50	5.41**	-1.37
MTU1001 X PUSA1121	-2.31**	-2.89**	-5.53**	-5.76**
MTU1001 X BPT2231	5.09**	1.81*	-2.36**	0.70
PUSA1121 X BPT2231	0.33	-0.18	0.43	0.57
SE (Sij) ±	0.47	0.73	0.62	0.82

*Significant at 5 per cent level **Significant at 1 per cent level

