D13 Identification of RFLP Markers Associated with Ozone Resistance in Rice

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Objectives

The objectives of this study were to identify the QTLs markers associated with O_3 resistance and to provide useful information for improvement of O_3 resistance by marker-assisted selection(MAS) in rice.

Materials and Methods

o. Plant materials

-. 28 rice cultivars and F_2 populations from 'Milyang 23/Chucheongbyeo' and 'Milyang 23/Daeribbyeo 1'.

o. Evaluation of O_3 resistance

-. 21-day-old seedlings were fumigated for 3 hrs at 0.3 ppm O_3 concentration.

o. Linkage map : NIAST map(Cho et al, 1998).

o. QTL analysis : QGENE(Nelson, 1997).

Results and Discussion

The F_1 plants from the crosses between a resistant cultivar 'Milyang 23' and susceptible cultivars, 'Chucheongbyeo' or 'Daeribbyeo 1', showed intermediate reactions to O_3. The segregation mode for O_3 resistance in the F_2 populations of two crosses, 'Milyang 23/Chucheongbyeo' and 'Milyang 23/Daeribbyeo 1', revealed a nearly normal distribution with their mean values slightly toward the resistant side of the midparents value. The estimates of broad-sense heritability for O_3 resistance were 84.5% and 88.3% in the two crosses. Relationship between O_3 resistance and QTLs markers were analyzed in 28 rice cultivars and F_2 populations derived from 'Milyang 23/Chucheongbyeo' and 'Milyang 23/Daeribbyeo 1'. One of the markers, RG109, was revealed polymorphic and significantly distingushed resistance and susceptibility to O_3 of the F_2 populations derived from them(Table 1, 2, Fig. 1, 2).

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Table 1. Relationship between O_3 resistance and RFLP markers in the F_2 population derived from a rice cross, 'Milyang 23/Daeribbyeo 1'

RFLP markers	Ozone resistance(Mean±SD)		t-value[a)]
	Milyang 23 allele	Daeribbyeo 1 allele	
RG 109	2.83±1.34	6.08±3.01	3.42**
C 507	4.40±3.27	6.29±2.51	1.40

[a)] t-values for estimated leaf injury to O_3 associated with three RFLP markers.
** : significant at 1% levels.

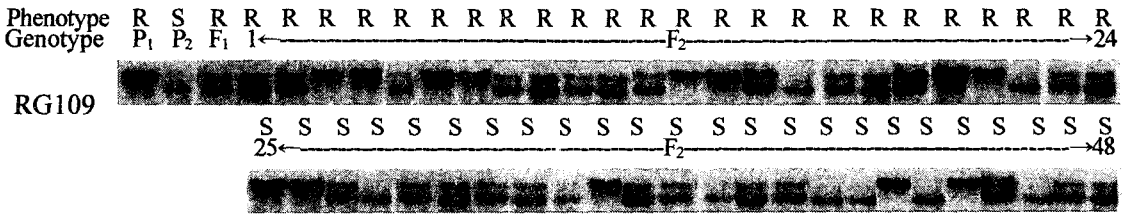

Fig. 1. Autoradiography of southern hybridization of *Bgl* II digest of rice DNAs with radiolabelled probe RG109 in F_2 population derived from a cross, 'Milyang 23(P_1)/ Chucheongbyeo(P_2)'. Phenotype: R=resistant, S=susceptible to O_3. Genotype: 1~48=F_2 plants.

Table 2. Relationship between O_3 resistance and RFLP markers in 28 rice cultivars

RFLP markers	Ozone resistance(Mean±SD)		t-value[a)]
	Milyang 23 type	Gihobyeo type	
RG 109	3.64±1.44	5.82±1.98	3.16**
C 507	3.82±1.60	5.47±2.03	2.59*
RG 1094	3.67±1.58	5.58±2.01	2.51*

[a)] t-values for estimated leaf injury to O_3 associated with three RFLP markers.
*, ** : significant at 5% and 1% levels, respectively.

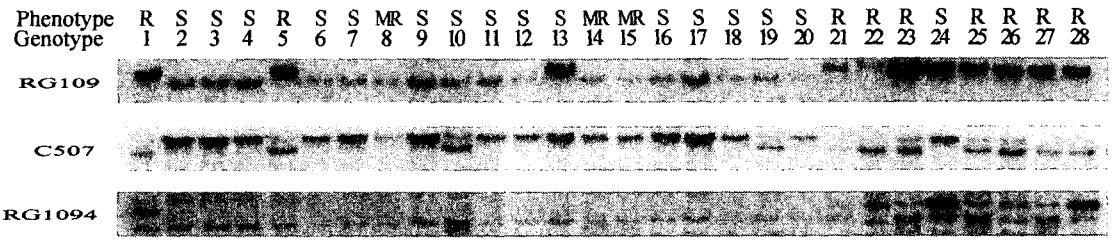

Fig. 2. Varietal difference of rice in response to O_3 of 28 rice cultivars. Autoradiography of southern hybridization of *Bgl* II, *BamH* I and *EcoR* I digest of rice DNAs with radiolabelled probes, RG109, C507, and RG1094, respectively. Phenotype: R=resistant, MR=moderate resistant, S=susceptible to O_3.

1.Milyang23, 2.Gihobyeo, 3.Geumobyeo, 4.Nagdongbyeo, 5.Nonganbyeo, 6.Daeribbyeo 1, 7.Dongjinbyeo, 8.Donghaebyeo, 9.Sambaegbyeo, 10.Sangnambatbyeo, 11.Sangjubyeo, 12.Yeongnambyeo, 13.Ilmibyeo, 14.Ilpumbyeo, 15.Janganbyeo, 16.Jinmibyeo, 17.Chucheongbyeo, 18.Hwayeongbyeo, 19.Koshihikari, 20.Sasanishiki, 21.Gayabyeo, 22.Namcheonbyeo, 23.Dasanbyeo, 24.Milyang63, 25.Samgangbyeo, 26.Cheongcheongbyeo, 27.IR29, 28.IR36.