P008

# Activities and Isozyme Profiles of Antioxidative Enzymes at the Rice Booting Stage under the Cold Water Stress

Ki-Young Kim[1*], Bo-Kyeong Kim[1], Mun-Sik Shin[1], Jin-Il Choung[1],
Jae-Kweon Ko[1], Jung-Kun Kim[1], Jung-Hyun Lim[2], and Song-Joong Yun[2]
[1]*Honam Agricultural Research Institute, Iksan 570-080, Korea*
[2]*Faculty of biological Resources, and Institute for Agricultural Science and Technology, Chonbuk National University, Chonju 561-756, Korea*

## Objectives

The objectives of this research are to compare the antioxidative enzymes response of chilling-tolerant and -susceptible varieties of japonica rice at the booting stage and to examine whether these enzyme is used to screen chilling-tolerance rice.

## Materials and methods

**Plant material** : Four Japonica rice((Table 1)

- Chilling-susceptible varieties : HR19621-AC6 and Sambagbyeo
- Chilling-tolerant varieties : Hitomebore and Stejaree45

**Treatment conditions** : Auricle distance ranging from -5㎝ to 0㎝ were exposed by 3days and 7days at low water temperature(13℃), respectively. Flag leaf and $1_{st}$ leaf were used to examine antioxidative enzymes and isozymes.

**Protein Extraction**

- Superoxide dismutase(SOD) : Spychalla *et a*l. method(1990),
- Catalase(CAT) and POX(Peroxidase) : Anderson *et al.* method(1995)
- Glutathione reductase(GR) : O'Kane *et al.* method(1996)
- The protein levels were determinated by the methods of Bradford

**Enzyme Assays and Isozyme Analysis**

- SOD : Oderly et al.(1984) and Yun et al. method(1994)
- CAT : Beers et al.(1952) and Woodbury *et a*l. method(1971)
- POX : Chance *et al.*(1955) and Rao et al.(1996)
- GR : O'Kane Method(1996) and Anderson *et al.* method(1995)

## Results and Discussion

We investigated the antioxidative enzymes and isozymes between chilling-tolerant and -susceptible varieties at the booting stage of japonica rice under the cold water stress(13℃). SOD, CAT, POX, and GR activities on the protein basis were found to be important to defense under the cold water stress. Also, SOD and CAT had distinctive differences between chilling-tolerant and -susceptible varieties. Chilling-tolerant varieties were more increased than chilling-susceptible varieties for SOD and CAT activities. One of nine isozyme bands for SOD was inducible after treatment and three isozyme activities for CAT were correlated to defense the cold water stress. POX and GR were improved after cold water stress, but no differences were found between chilling-tolerant and -susceptible varieties.

*Corresponding author: Tel : 063- 840-2162 E-mail : kkyoung@rda.go.kr

Table 1. Comparison of fertility indices among varieties under cold water stress.

| Varieties | Fertility Indices | | |
|---|---|---|---|
| | Inlet | Outlet | Mean |
| HR19621-AC6 | 4.9±6.9 | 65.6±.8 | 35.2 |
| Sambagbyeo | 16.4±8.3 | 57.2±3.9 | 36.8 |
| Hitomeborea | 52.8±5.2 | 92.9±1.6 | 72.8 |
| Stejaree45 | 80.4±4.9 | 96.0±0.4 | 88.2 |
| Mean | 38.6 | 77.9 | 58.3 |
| LSD at 5% level | | | |
| Varieties(V) | 9.1 | | |
| Treatment(T) | 6.4 | | |
| V*T | ** | | |

$$\text{Fertility Indices} = \frac{\text{Arc Sine } \sqrt{\text{Treatment Fertility}}}{\text{Arc Sine } \sqrt{\text{Control Fertility}}} \times 100$$

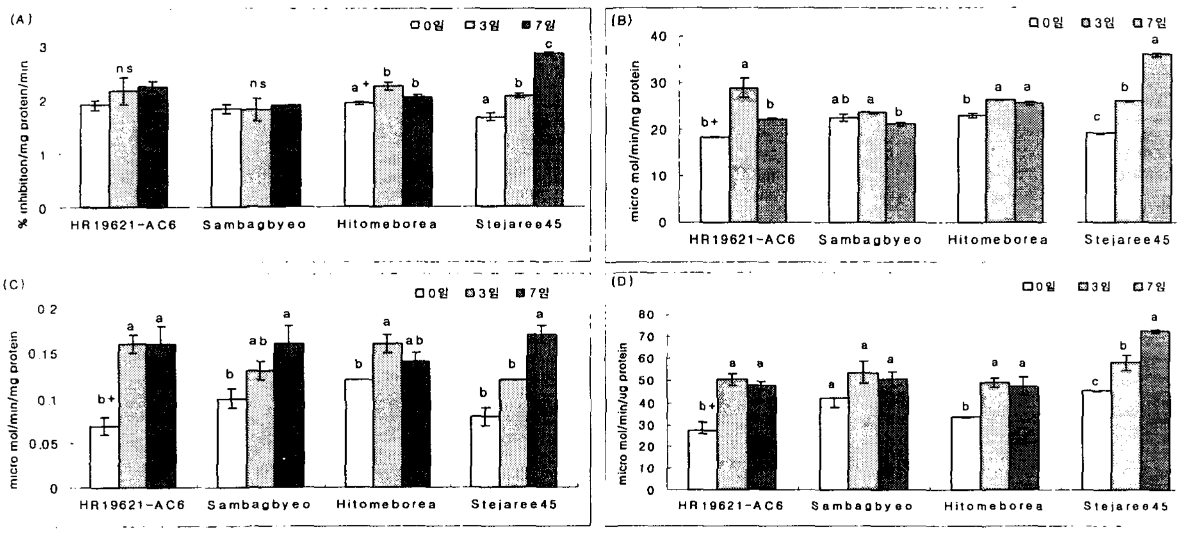


Fig. 1. Changes in (A) SOD, (B) CAT, (C) POX and (D) GR activities of the chilling and -susceptible rice varieties leaves at the booting stages under the low water temperature(13℃). Values represent means±SE of the two replicates. The same letters are not significantly different among treatments within a variety(+) at the 5% level by DMRT

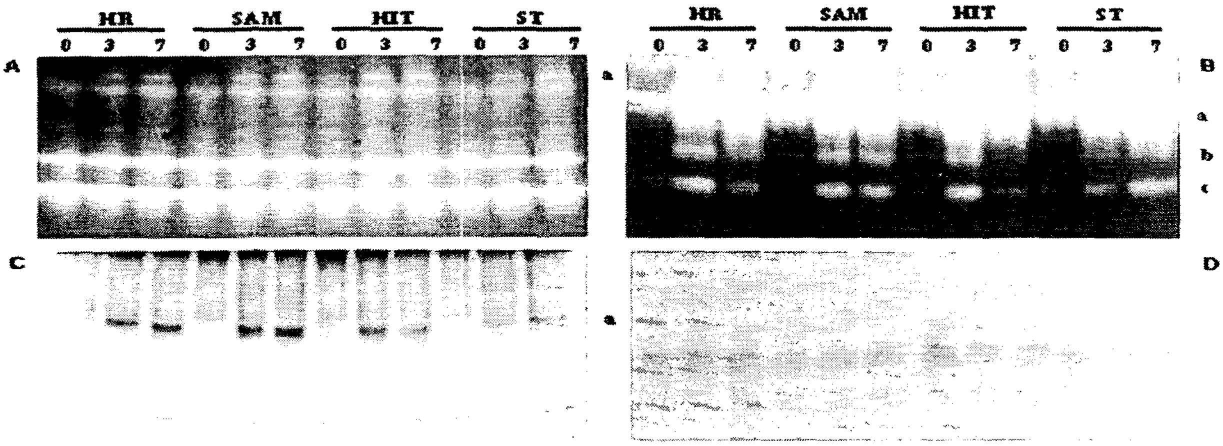


Fig. 2. Changes in (A) SOD, (B) CAT, (C) POX and (D) GR isozyme profiles of the chilling and susceptible rice varieties leaves at the booting stages under the low water temperature(13℃).
0, 3, 7 show days after treatments of the four rice varieties, HR19621-AC6(HR), Sambagbyeo (SAM), Hitomeborae (HIT), and Stejaree45(ST).