A04

Physiological Differences in Rice (*Oryza sativa* L.) Seedlings under UV-B Radiation

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Objectives

In this study, we grew 15 rice cultivars in a controlled environment chamber under supplemental levels of UV-B radiation with the objective to: (1) determine if 15 rice cultivars differed in physiological response to UV-B radiation; and (2) evaluate intra-specific differences in physiological response of 15 rice cultivars to UV-B radiation.

Materials and Methods

- Plants : 15 rice cultivars
- UV-B treatment : Three-week-old rice seedlings were subjected to the control or supplemental UV-B radiation ($1.2W\ m^{-2}$) for 7 hrs daily for 4 days.
- Chlorophyll and carotenoid contents : EtOH extraction → UV/Vis-spectrophometer
  Chl. a = 13.36 × A664 - 5.19 × A648 Chl. b = 27.43 × A648 - 8.12 × A664
  Carotenoid = (1,000 × 4.70 - 2.14 × Chl.a - 97.64 × Chl.b)/209
- Lipid peroxidation : Heath & Packer method (the amount of TBARS)
- Polyamine analysis : Redmond & Tseng method (benzoylation)

Results and Discussion

In UV-B-tolerant, -moderate and -susceptible rice seedlings, carotenoid contents were reduced to 32, 55 and 66% in UV-B radiation compared to the absence of UV-B radiation, respectively. Under UV-B radiation, polyamine biosynthesis for those cultivars with different sensitivity was raised to 85, 20 and 89% that in control, respectively. UV-B radiation exerted a great influence on MDA contents, which were increased by 28, 115 and 374% in proportion to UV-B sensitivity.

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Table 1. Differences in sensitivity to UV-B radiation based on carotenoid, polyamine and MDA contents

UV-B sensitivity	Cultivars	Carotenoid ($\mu g\ g^{-1}fw$)				Polyamine ($nmol\ g^{-1}fw$)			MDA ($nmol\ g^{-1}fw$)			
		-UV-B	+UV-B	%	T-test	-UV-B	+UV-B	%	-UV-B	+UV-B	%	T-test
Tolerant	Woonbongbyeo	682	280	-59.0	**	73	279	284.0	871	890	2.2	ns
	Jinbongbyeo	414	260	-37.3	**	112	99	-10.9	1,103	1,322	19.9	*
	Woonjangbyeo	414	409	-1.3	ns	91	142	56.7	813	1,264	55.6	**
	Odaebyeo	402	288	-28.3	**	66	136	106.2	1,135	1,174	3.4	ns
	Daeyabyeo	488	323	-33.8	**	111	124	11.1	1,322	2,083	57.6	**
	Mean	480±59	312±29	-31.9±10.3		90±11	156±35	89.4±58.9	1,049±104	1,347±222	27.7±13.6	
Moderate	Woondubyeo	434	149	-65.7	**	99	141	12.0	980	1,890	92.8	**
	Seojinbyeo	388	201	-48.2	**	121	103	-14.7	987	1,567	58.8	**
	Sobibyeo	433	181	-58.2	**	123	166	42.9	1,142	1,541	35.0	**
	Donganbyeo	331	136	-59.1	**	129	144	34.4	1,077	2,128	97.6	**
	Gancheokbyeo	395	217	-45.0	**	97	121	25.1	697	2,735	292.6	**
	Mean	396±21	177±17	-55.3±4.2		114±7	135±12	19.9±11.3	976±85	1,972±245	115.4±51.2	
Susceptible	Hwajoongbyeo	567	123	-78.3	**	120	129	7.5	967	2,431	151.3	**
	Yangjobyeo	391	98	-75.1	**	99	140	41.2	929	3,966	327.1	**
	Daecheongbyeo	483	118	-75.5	**	149	100	-33.2	742	2,393	222.6	**
	Chucheongbyeo	418	278	-33.4	*	125	135	8.0	806	3,250	303.2	**
	Anseongbyeo	645	220	-66.0	**	87	127	46.1	813	3,773	364.3	**
	Mean	501±53	167±39	-65.7±9.3		116±12	126±8	13.9±16.0	851±47	3,163±367	373.7±42.9	