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Effects of dry heat treatment on Seed Germination and Seedling Vigor in Barley

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Objectives

- Investigation of the tolerance and extinction temperatures to dry heat temperatures
- Differences in the seed germination and seedling vigor following dry heat treatment of barley seeds

Materials and Methods

Materials : 8 barley varieties

Methods : Investigation of seed germination and seedling vigor following 95°C dry heat treatment for 24 hours.

Dry heat tolerance : evaluation after exposing to different levels of dry heat (90, 95, 100, 105 and 110°C) for 24 hours.

Water content of seed was 7.5±0.2% after predrying for 48 hours at 40°C.

Results

The purpose of dry-heat treatment for seeds is to control the external and internal seedborne pathogens including fungi, bacteria, virus and nematodes. The effect of dry heat treatment on seed germination depended on dry-heat intensity and duration of exposure. To investigate the extinction temperatures and varietal differences in the seed germination and seedling vigor of Korean barley varieties to the dry-heat temperature, eight barley varieties were exposed to various dry-heat temperatures for 24 hours after predrying for 48 hours at 40°C. The dry heat treatment at lower temperatures (70°C-80°C) had no adverse effects. In 95°C dry-heat treatment, percentage germination, percentage emergence, seedling height, and dry weight were significantly reduced compared with the control. Varietal differences in seed germination, seedling emergence, seedling height, and dry weight were revealed at 95°C. When water content of seed was 7.5±0.2% after predrying for 48 hours at 40°C, the seed germinability of tolerance (var. Tapgolbori) and susceptible variety (var. Oweolbori) to the dry-heat completely disappeared in 110°C and 105°C exposures for 24 hours, respectively. The lethal temperature of barley seeds was 110°C under 24 hours of exposure.

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Table 1. Effect of dry heat treatment on percentage germination of eight barley varieties.

Temperature (°C) [†]	Variety (%) [‡]							
	TB	SB	KB	OB	SSB	NSB	KSB	HSB
Control	98.3	98.0	95.8	95.3	96.8	95.3	95.5	95.8
70	98.3	97.5	94.5	94.8	95.5	93.8	93.5	91.5
75	97.0	96.8	92.5	90.8	93.3	90.5	89.8	86.3
80	96.8	96.0	89.0	87.8	90.5	85.5	85.3	81.5
85	96.5	95.8	84.8	76.5	87.3	77.5	78.8	71.5
90	94.3	92.8	64.3	62.5	79.0	76.5	60.3	58.5
95	91.3	89.5	40.5	36.5	75.8	71.3	33.8	31.3
100	77.8	63.8	15.5	12.5	45.3	20.5	19.3	16.3
105	21.5	3.5	0.3	0.0	7.5	4.3	2.0	0.8
LSD(5%, 1%)	Temperature (T)		2.7,	3.7				
	Variety (V)		2.1,	2.8				
	T×V		6.4,	8.5				

[†]Seeds were treated for 24hrs in a dry oven; water content of seed was about 7.5±0.2% after predrying for 48 hours at 40°C.

[‡]TB:Tapgolbori, SB:Saolbori, KB:Kangbori, OB:Oweolbori, SSB:Saessalbori, NSB:Naehanssalbori, KSB:Kwanghwalssalbori, HSB:Hinchalssalbori

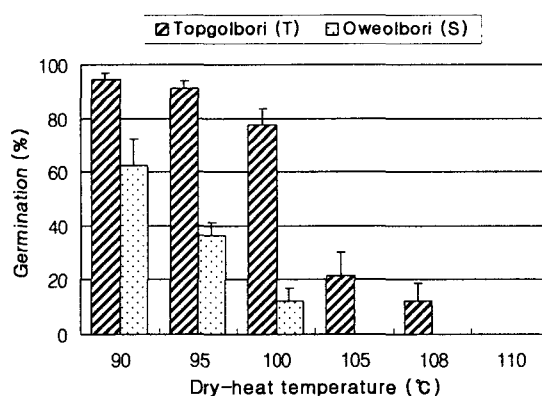


Fig. 1. Effect of dry-heat temperature on percentage germination in dry-heat tolerance (T) and sensitive (S) varieties, Topgolbori and Oweolbori. Seeds were treated for 24hrs in a dry oven; water content of seed was 7.5±2% after predrying for 48 hours at 40°C.