

Water Absorption and Seed Viability in Wild Soybean (*Glycine* spp.) with Different Seed Size and Hardness

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Objectives

- To select hard seed strain for maintaining seed viability under adverse storage conditions.
- To clarify the relationship between seed hardness and longevity adverse conditions.

Materials and Methods

- **Seed samples** : Seed from 139 strains of *Glycine* spp.
- **Control of seed moisture equilibrium** : The moisture of test seeds (7.8%) was equilibrated. under 70% RH storage chamber filled with the glycerol solution.
- **Non-aged seed**
 - Measurement of seed size and hardness** : Grain Hardness Tester (Kiya, Japan).
 - Determination of water imbibition velocity** : Thirty seeds of each seed lot were placed on the bottom of a beaker and 100ml of distilled water was added. The moisture content water was measured at 0.0, 0.25, 0.50, 1.0, 2.0, 4.0, 6.0, 8.0, 16.0, 24.0, 36.0, and 48 h after imbibition.
 - Official germination test** : ISTA method.
 - Electroconductivity test** : Conductivity Meter (Consort, 231), ISTA method.
 - Complex stressing vigor test** : Soaking seeds for 48 h at 25 °C followed by another 48 h soak at 5 °C. ISTA method.
- **Aged seed** : Exposes seeds at 41 °C for 72 h according to ISTA method.
 - Germination test** - lab and pot.
 - Electroconductivity test** - ISTA method.

Results and Discussion

1. Germinability investigated with official germination test (OGT) showed that all strains have higher germinability greater than 92%.
2. Hard seed percentages of strain 13125 (B), 10715 (E), 10284 (A), and 13833 (F) were 89, 54, 42, and 1%, respectively. These strains showed lower electroconductivity of seed leachate than other strains that have no hard seed. There were higher relationships among hard seed percentage, 100-seed weight, electroconductivity, and water uptake velocity.
3. The hard-seeded strains, 10284 (A), 10122 (C), and 10715 (E), showed delayed water imbibition speed.
4. Germination rate of hard-seeded strains was significantly lower than that of other strains. A, B, D, less hard-seeded strains, showed relatively higher germination rate, C and E, moderately hard-seeded strains, showed moderate germination rate as compared to hard- and nonhard-seeded strains. Although, no significant correlation was observed between seed size and seed hardness, there was significant correlation between 100-seed weight and electroconductivity.
5. Emergence rate of artificially aged seeds of 10122 (C) and Taekwangkong (H) were 52 and 68%, respectively. This result reflected a drastic decrease in emergence rate by accelerated senescence.
6. The strains A, B, and E with greater seed hardness and viability and lower electroconductivity should have greater seed longevity in storage. Because the seeds of A and B were too small to be practically used, the strain E which has medium size seeds was more suitable genotype for crop improvement.

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Table 1. Differences of morphological characteristics of selected eight wild soybean seeds used in this experiment.

Seed size (100 seed weight, g)	Hardness	GSI No.	Seed coat color
Small (11.5)	Low (5.6)	10284 (A)	Brown
Small (9.2)	High (22.1)	10122 (C)	Orange
Medium (29.8)	Low (7.9)	13815 (D)	Yellow
Medium (28.1)	High (23.4)	10715 (E)	Black
Small (6.8)	Medium (12.2)	13125 (B)	Black
Large (49.1)		13833 (F)	Black
Large (44.8)	High (16.5)	13866 (G)	Black
Medium (26.5)	High (15.6)	Taekwang (H)	Yellow

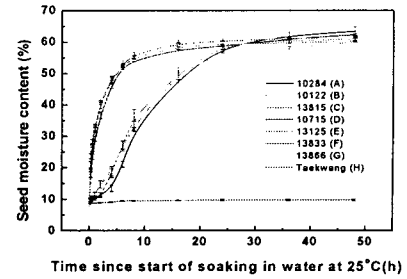


Fig 1. Changes of seed moisture content by seed according to time since start of soaking in water at 25°C in wild soybean.

Table 2. Changes in hardness, viability, conductivity of aged and non-aged seeds from eight soybean strains.

Seed lots	Non-aged seed			CSVT	Aged seed			
	Hard seed (%)	Viability (%)	Conductivity ($\mu\text{Scm}^{-1}\text{g}^{-1}$)	Germination (%)	Hard seed (%)	Lab germination (%)	Pot emergence rate (%)	Conductivity ($\mu\text{Scm}^{-1}\text{g}^{-1}$)
10284 (A)	42	98	10.9	93	27	96	100	18.8
13125 (B)	89	97	7.9	85	93	99	100	7.1
10122 (C)	0	99	18.9	81	1	98	52	30.2
13815 (D)	0	100	16.0	91	0	100	92	21.8
10715 (E)	54	98	11.7	63	23	97	100	18.9
13833 (F)	1	92	26.3	-	0	87	81	32.8
13866 (G)	0	96	26.5	54	0	94	92	25.0
Taekwang (H)	0	98	22.5	78	0	90	68	26.6

Table 3. Correlation coefficients between 100 seed weight, hardness, seed germinability, and water absorption rate of seed.

Variable	Hardness	100 seed weight (g)	Hard seed (% OGT)
Hardness		0.086	-0.114
100 seed weight (g)	0.086		-0.557 *
Hard seed (% OGT)	-0.114	-0.557 *	
GC(OGT)	-0.001	-0.621 **	0.076
Conductivity	0.267	0.773 **	-0.845 **
GC(CSVT)	-0.714 **	-0.701 **	0.151
GC(aged-lab)	-0.284	-0.742 **	0.189
ER(aged-pot)	-0.470	0.071	-0.665 **
Conductivity(aged)	0.277	0.556 *	-0.898 **
Water absorption 0.5hr	-0.068	0.801 **	-0.724 **
1hr	-0.078	0.823 **	-0.729 **
4hr	-0.028	0.836 **	-0.790 **
8hr	0.022	0.794 **	-0.913 **
16hr	0.105	0.671 **	-0.868 **
24hr	0.113	0.502 *	-0.805 **
36hr	-0.252	0.359	-0.880 **
48hr	0.067	0.469	-0.769 **

*, ** symbols are significant at 5% and 1% probability level, respectively.