

# 몇가지 種子處理에 따른 초롱꽃과 藥用作物의 發芽率

## 1. 光質, 照明時間, prechilling 및 priming에 따른 變化

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### Effect of Several Seed Treatments on Germination of *Campanulaceae* Seed

#### 1. Germination of *Campanulaceae* Seed as Affected by Light Quality, Prechilling and Priming

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1. 실험목적: 光質, prechilling 및 priming이 우리나라에서 재배 면적이 가장 많은 초롱꽃과 약용작물인 도라지, 더덕 그리고 만삼 발아에 미치는 어떤 영향을 미치는가를 파악하고, 발아율이 저조한 만삼에 있어서 발아율 향상 방안을 모색하고자 실시하였음.
2. 재료 및 방법: 도라지, 더덕 그리고 만삼을 공시재료로 petri dish에 여과지를 깔 후 반복당 100립씩 치상하여 3반복으로 20℃로 고정하여 실시하였으며, 발아는 유근이 1mm이상 돌출한 것을 기준으로 9일간 매일 조사하였다. 광질처리는 적색광 (peak 656nm, half band 10nm, MELLES GRIOT CO.), 백색광 (halogen lamp) 및 암상태 3개처리로 구분하였다. 각 시험별 처리내용은 다음과 같다
  - 1) 試驗 1. 光質과 日中照明時間에 따른 發芽率  
→ 照明時間 (light/dark hours of daily): 8/16, 12/12, 16/8
  - 2) 試驗 2. Prechilling과 光質에 따른 發芽率  
→ Prechilling 期間 (日): 0, 4, 8
  - 3) 試驗 3. Priming 處理에 따른 發芽率
    - 1) Priming 劑의 종류:  $\text{KNO}_3$ ,  $\text{Ca}(\text{NO}_3)_2$
    - 2) 濃度 (mM): 0, 50, 150, 300
    - 3) 處理期間 (日): 1, 2
  - 4) 試驗 4. Priming과 光質에 따른 發芽率  
→ Priming 濃度 [ $\text{Ca}(\text{NO}_3)_2$ , mM]: 0, 150
3. 결과 및 고찰
  - 1) 더덕은 12/12 또는 16/8 日中照明 처리의 암조건에서 발아율이 높았으며, 만삼은 적색광의 8/16처리에서 발아가 억제되는 경향을 보였다.
  - 2) 4일간의 prechilling과 적색광 처리가 도라지와 더덕은 초기 발아율이 높은 반면, 만삼은 시간이 경과함에 따라 발아율이 향상되었다.
  - 3) 암상태에서  $\text{Ca}(\text{NO}_3)_2$ 로 priming 처리를 가한 만삼종자는 처리기간에 관계없이 발아율이 80%까지 증가하였다.
  - 4)  $\text{Ca}(\text{NO}_3)_2$ 로 priming 처리를 가한 만삼종자는 백색광에서는 적색광 또는 암상태에서의 발아율과 비교하여 낮은 것으로 나타났다.

TABLE 1. Percent germination of *Caryophyllaceae* seed as influenced by light quality and hours of daily irradiation.

Parameter	Level	Germination							
		3 <sup>†</sup>	4	5	6	7	8	9	
Species (S)	PG <sup>‡</sup>	4.0	17.4	50.3	72.9	86.0	90.9	92.7	
	CL	1.7	12.7	31.4	46.5	56.1	62.9	68.4	
	CP	1.3	6.5	14.1	28.7	41.1	52.2	59.9	
	LSD <sub>0.05</sub>	0.7	2.3	2.2	2.7	1.9	1.9	2.0	
Light (L) quality	Red	1.2	7.4	25.1	45.9	64.7	73.7	78.8	
	White	1.9	14.9	32.6	44.0	52.2	58.4	63.1	
	Dark	3.9	14.4	34.1	55.2	66.3	71.9	75.1	
	LSD <sub>0.05</sub>	0.7	2.3	2.2	2.7	1.9	1.9	2.0	
HDI (H) <sup>††</sup>	8/16	2.6	10.7	26.9	43.7	58.0	66.3	70.9	
	12/12	4.0	15.3	37.4	49.7	58.0	64.6	69.6	
	16/8	0.5	10.8	31.5	52.8	67.0	73.2	76.6	
	LSD <sub>0.05</sub>	0.7	2.3	2.2	2.7	1.9	1.9	2.0	
S × L	**	**	**	**	**	**	**		
S × H	**	**	**	**	**	**	**		
L × H	**	**	**	**	**	**	**		
S × L × H	**	**	**	**	**	**	**		

<sup>†</sup> Days after seeding.  
<sup>‡</sup> PG: *Platycodon grandiflorum* CL, *Codonopsis lanceolata* CP, *Codonopsis pilosula*.  
<sup>††</sup> HDI: hours of daily irradiation, light/dark.  
 ns, \*, \*\* Nonsignificant or significant at 0.05 or 0.01 probability, respectively.

Table 2. Percent germination of *Caryophyllaceae* seed as influenced by prechilling duration and light quality.

Parameter	Level	Germination							
		3 <sup>†</sup>	4	5	6	7	8	9	
Species (S)	PG <sup>‡</sup>	2.5	9.7	30.4	55.8	78.1	90.3	94.2	
	CL	1.0	6.1	21.7	38.8	51.7	63.6	72.4	
	CP	0.8	4.7	12.5	24.5	35.6	47.7	53.5	
	LSD <sub>0.05</sub>	0.4	1.1	1.8	2.0	2.2	3.3	2.0	
Prechilling duration (P, day)	Control	3.4	14.4	33.7	46.0	54.2	61.0	66.2	
	4	0.4	4.0	14.2	29.5	45.6	61.9	68.5	
	8	0.8	3.4	18.4	44.8	64.4	78.9	83.6	
	LSD <sub>0.05</sub>	0.4	1.1	1.8	2.0	2.2	3.3	2.0	
Light (L) quality	Red	1.9	10.3	33.1	51.2	65.8	75.3	79.3	
	White	1.2	5.4	15.1	32.4	45.8	59.9	67.8	
	Dark	1.2	4.2	14.4	33.7	52.6	65.2	72.4	
	LSD <sub>0.05</sub>	0.4	1.1	1.8	2.0	2.2	3.3	2.0	
S × P	**	**	**	**	**	*	**		
S × L	**	**	**	**	**	**	**		
P × L	**	**	**	**	**	**	**		
S × P × L	**	**	**	**	**	**	**		

<sup>†</sup> Days after seeding.  
<sup>‡</sup> PG: *Platycodon grandiflorum* CL, *Codonopsis lanceolata* CP, *Codonopsis pilosula*.  
 ns, \*, \*\* Nonsignificant or significant at 0.05 or 0.01 probability, respectively.

Table 3. Percent germination of *Caryophyllaceae* seed as influenced by priming chemicals, their concentration and priming duration.

Parameter	Level	Germination							
		3 <sup>†</sup>	4	5	6	7	8	9	
Species (S)	PG <sup>‡</sup>	0.9	11.9	31.7	58.4	77.8	88.1	90.7	
	CL	2.1	10.6	22.8	33.5	42.8	49.8	53.7	
	CP	0.0	3.1	32.1	54.3	69.4	75.5	78.4	
	LSD <sub>0.05</sub>	0.5	0.6	1.4	3.7	3.4	2.6	2.4	
Priming (P) chemical	PN <sup>‡</sup>	1.0	6.8	23.6	45.0	62.5	71.4	74.7	
	CN	1.0	10.4	34.1	52.4	64.2	70.9	73.8	
	Ca(NO <sub>3</sub> ) <sub>2</sub>	ns	1.2	3.0	3.0	2.7	2.1	2.0	
	LSD <sub>0.05</sub>	ns	1.2	3.0	3.0	2.7	2.1	2.0	
Concentration (C, mM)	0	1.1	8.4	26.6	47.2	62.9	68.6	71.3	
	50	1.7	8.5	29.8	51.6	65.9	74.1	77.3	
	150	1.1	11.4	32.5	50.5	65.4	74.5	77.3	
	LSD <sub>0.05</sub>	0.5	0.6	1.7	4.3	3.9	3.0	2.8	
Priming (D) duration	1	0.8	7.9	28.0	48.0	63.6	71.2	74.1	
	2	1.1	9.2	29.8	49.4	63.1	71.1	74.4	
	LSD <sub>0.05</sub>	ns	1.2	ns	ns	ns	ns	ns	
	S × P	**	**	**	**	**	**	**	
S × C	**	**	**	**	**	**	**		
S × D	**	**	**	**	**	**	**		
P × C	ns	ns	ns	ns	ns	ns	ns		
P × D	ns	ns	ns	ns	ns	ns	ns		
C × D	**	**	**	**	**	**	**		
S × P × C	**	**	**	**	*	ns	ns		
S × P × D	ns	ns	ns	ns	ns	ns	ns		
S × C × D	**	**	**	**	**	**	**		
P × C × D	**	**	**	**	**	**	**		
S × P × C × D	ns	*	ns	ns	ns	ns	ns		

<sup>†</sup> Days after seeding.  
<sup>‡</sup> PG: *Platycodon grandiflorum* CL, *Codonopsis lanceolata* CP, *Codonopsis pilosula*.  
<sup>††</sup> Priming chemical: PN, KNO<sub>3</sub>; CN, Ca(NO<sub>3</sub>)<sub>2</sub>.  
 ns, \*, \*\* Nonsignificant or significant at 0.05 or 0.01 probability, respectively.

Table 4. Percent germination of *Caryophyllaceae* seed as influenced by priming concentration and light quality.

Parameter	Level	Germination							
		3 <sup>†</sup>	4	5	6	7	8	9	
Species (S)	PG <sup>‡</sup>	0.5	6.4	31.7	62.9	83.2	89.2	91.7	
	CL	0.3	13.4	35.5	55.0	68.2	74.1	78.9	
	CP	0.0	0.2	8.1	24.3	37.8	45.8	52.7	
	LSD <sub>0.05</sub>	0.3	2.1	6.2	6.5	6.0	5.1	4.7	
Concentration (C, mM)	0	0.3	8.4	27.4	47.6	62.7	69.2	73.5	
	150	0.1	4.8	22.8	47.2	63.4	70.9	75.4	
	LSD <sub>0.05</sub>	ns	1.7	5.0	ns	ns	ns	ns	
	S × C	ns	ns	ns	ns	ns	ns	ns	
Light (L) quality	Red	0.3	3.6	20.5	47.2	66.0	74.2	78.4	
	White	0.3	9.1	28.5	43.3	55.8	62.2	65.5	
	Dark	0.2	7.1	29.3	51.7	67.4	73.7	78.4	
	LSD <sub>0.05</sub>	0.3	2.1	6.2	6.8	6.0	5.1	4.7	
S × C	ns	**	**	**	**	**	**		
S × L	ns	ns	ns	ns	ns	ns	ns		
C × L	ns	ns	ns	ns	ns	ns	ns		
S × C × L	ns	ns	ns	ns	ns	ns	ns		

<sup>†</sup> Days after seeding.  
<sup>‡</sup> PG: *Platycodon grandiflorum* CL, *Codonopsis lanceolata* CP, *Codonopsis pilosula*.  
 ns, \*, \*\* Nonsignificant or significant at 0.01 probability, respectively.

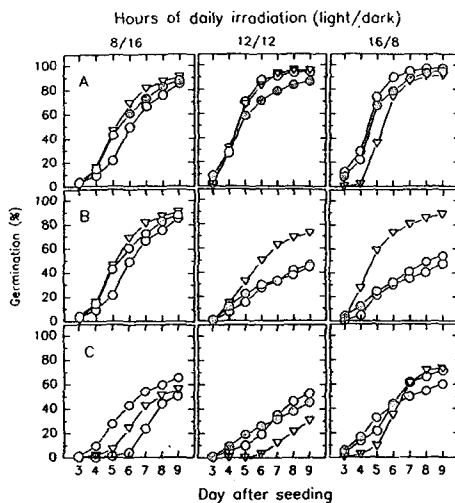


Fig. 2. Daily germination of *Caryophyllaceae* seed as influenced by light quality and hours of daily irradiation. Symbols indicate O, red; □, white; ▽, dark and letters do A, *Platycodon grandiflorum*; B, *Codonopsis lanceolata*; C, *Codonopsis pilosula*.

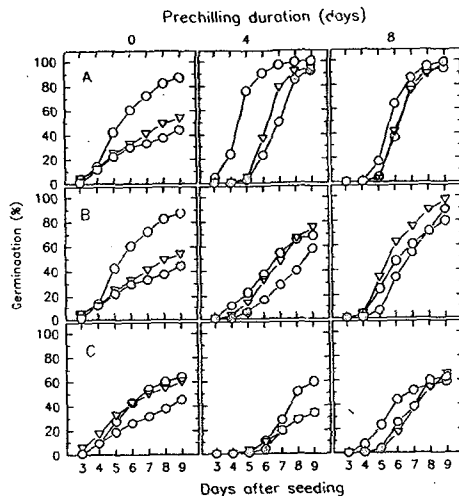


Fig. 3. Daily germination of *Caryophyllaceae* seed as influenced by prechilling duration and light quality. Symbols indicate O, red; □, white; ▽, dark and letters do A, *Platycodon grandiflorum*; B, *Codonopsis lanceolata*; C, *Codonopsis pilosula*.

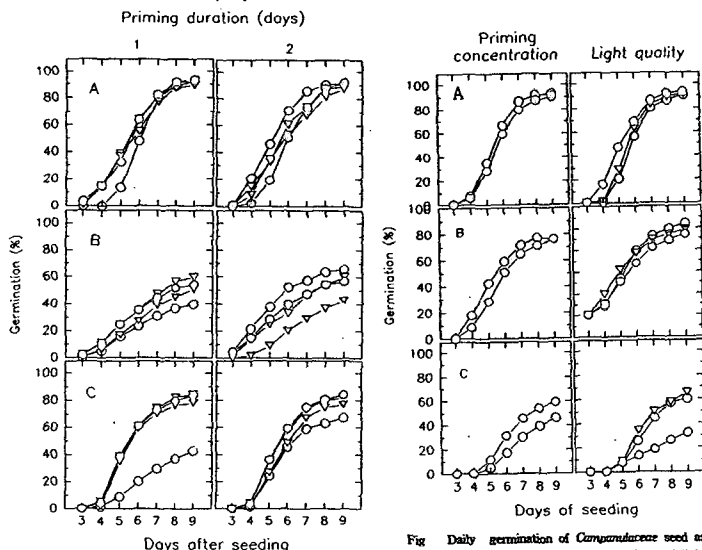


Fig. 4. Daily germination of *Caryophyllaceae* seed as influenced by priming concentration and light quality. Symbols indicate O, □, 150 μM within the left side and O, red; ▽, dark within the right side, and letters do A, *Platycodon grandiflorum*; B, *Codonopsis lanceolata*; C, *Codonopsis pilosula*.