

Supplementary materials

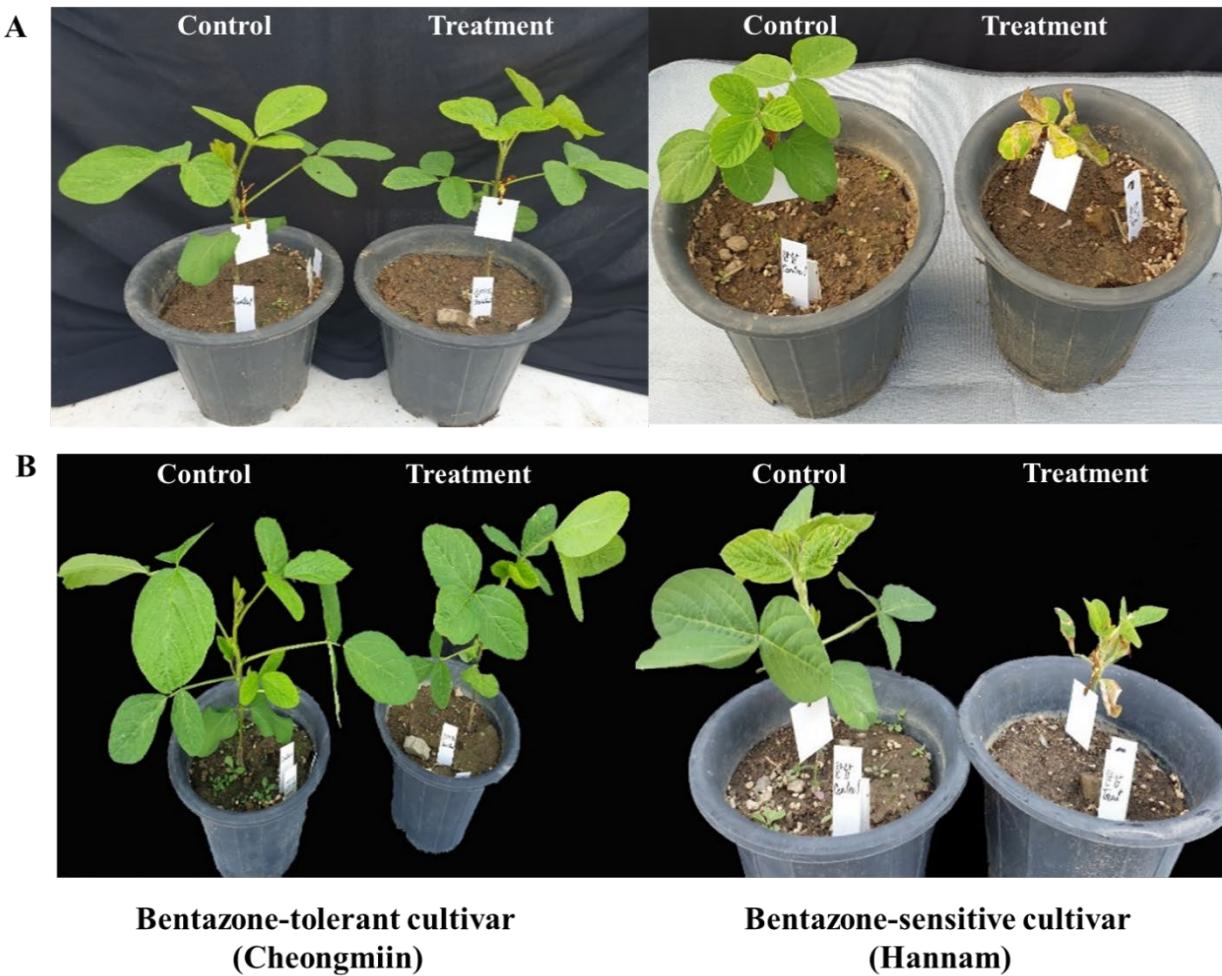


Figure S1. Bentazone reaction of bentazone-tolerant cultivar and -sensitive cultivar. A. Bentazone treated and untreated soybeans after 5 days. B. Bentazone treated and untreated soybeans after 14 days.

Table S1. List of Korean soybean cultivars and their response to bentazone treatment in two different evaluations

Entry	Cultivar name	Visual score			Determination of response to bentazone
		Test 1	Test 2	Average	
1	Jangyeob	1.1	2.0	1.6	T
2	Hwangkeum	2.2	3.1	2.7	MT
3	Baegun	2.0	2.6	2.3	MT
4	Saeal	1.9	3.0	2.5	MT
5	Dankyeong	2.4	3.5	3.0	MT
6	Pokwang	4.3	4.0	4.2	S
7	Muhan	2.3	2.9	2.6	MT
8	Danweon	3.6	4.0	3.8	S
9	Jangsu	2.0	2.9	2.5	MT
10	Samnam	1.6	2.5	2.1	MT
11	Taekwang	2.3	2.5	2.4	MT
12	Danbeak	2.2	3.0	2.6	MT
13	Jinpum	1.7	2.0	1.8	T
14	Dajang	2.2	2.5	2.4	MT
15	Alchan	2.5	3.5	3.0	MT
16	Jinpum 2	2.1	2.5	2.3	MT
17	Daewon	2.4	2.5	2.5	MT
18	Jangmi	1.7	2.5	2.1	MT
19	Daepung	1.8	2.5	2.2	MT
20	Daemang	1.7	2.9	2.3	MT
21	Shingi	1.7	2.0	1.9	T
22	Daemang 2	1.9	2.0	2.0	T
23	Mansu	2.4	2.6	2.5	MT
24	Nampung	2.5	2.5	2.5	MT
25	Cheonsang	3.2	3.0	3.1	MT
26	Jungmo 3003	1.9	2.0	2.0	T
27	Saedanbaek	2.3	3.0	2.6	MT
28	Uram	2.3	3.5	2.9	MT
29	Neulchan	3.0	3.5	3.3	MT
30	Jinpung	1.7	2.5	2.1	MT
31	Geomjeong 1	2.1	2.0	2.1	MT
32	Ilpumgeomjeong	1.5	--	1.5	T
33	Geomjeong 3	1.6	3.0	2.3	MT
34	Geomjeong 4	1.8	2.5	2.1	MT

35	Cheongdu 1	2.4	2.2	2.3	MT
36	Cheonja3	1.7	2.0	1.8	T
37	Ilpumgeomjeong2	2.5	3.0	2.8	MT
38	Socheong	1.7	2.1	1.9	T
39	Heugmi	2.0	3.5	2.8	MT
40	Daeheug	3.0	--	3.0	MT
41	Heugseong	1.3	1.0	1.2	T
42	Geomjeong 5	2.0	2.0	2.0	T
43	Socheong 2	1.6	2.0	1.8	T
44	Seokryangput	2.0	--	2.0	T
45	Mirang	2.1	--	2.1	MT
46	Nokwon	2.6	2.0	2.3	MT
47	Sangwon	2.5	2.5	2.5	MT
48	Hanol	2.0	--	2.0	T
49	Hwangkeumol	2.0	4.0	3.0	MT
50	Eunha	1.8	2.5	2.2	MT
51	Namhae	1.6	2.0	1.8	T
52	Bukwang	4.8	--	4.8	S
53	Kwangan	1.7	3.0	2.4	MT
54	Pureun	1.5	3.0	2.3	MT
55	Hannam	4.7	4.0	4.4	S
56	Myeonjunamul	2.3	3.0	2.7	MT
57	Sobaegnamul	2.6	3.0	2.8	MT
58	Iksannamul	2.1	2.1	2.1	MT
59	Pungsannamul	2.0	3.0	2.5	MT
60	Tawon	1.7	2.0	1.9	T
61	Doremi	1.6	2.0	1.8	T
62	Sorog	2.7	2.5	2.6	MT
63	Dagi	2.6	3.5	3.1	MT
64	Dachae	4.5	4.0	4.3	S
65	Seonam	4.7	4.9	4.8	S
66	Anpyeong	3.0	3.0	3.0	MT
67	Bosug	2.6	2.0	2.3	MT
68	Sojin	1.8	2.0	1.9	T
69	Nogchae	2.8	--	2.8	MT
70	Sokang	2.2	2.5	2.4	MT
71	Wonhwang	2.3	3.0	2.7	MT
72	Jangki	1.9	2.8	2.4	MT
73	Jonam	2.9	3.5	3.2	MT

74	Pungwon	1.5	2.0	1.8	T
75	Sinhwa	1.7	2.1	1.9	T
76	Wongwang	2.1	3.0	2.6	MT
77	Hoseo	2.1	2.9	2.5	MT
78	Galchae	2.2	2.1	2.2	MT
79	Sohwang	1.8	2.8	2.3	MT
80	Singang	1.8	3.0	2.4	MT
81	Jungmo 3002	2.4	2.6	2.5	MT
82	Wonheug	2.9	2.5	2.7	MT
83	Joyang 1	2.6	3.0	2.8	MT
84	Haepum	1.1	3.0	2.1	MT
85	Taeseon	2.0	3.0	2.5	MT
86	Seonpung	1.4	2.0	1.7	T
87	Saegeum	2.0	2.5	2.3	MT
88	Cheongmiin	1.0	1.0	1.0	T
89	Daepung 2	1.7	3.0	2.4	MT
90	Socheongja	2.0	2.2	2.1	MT
91	Haewon	2.1	2.5	2.3	MT
92	Jungmo 3012	2.1	3.5	2.8	MT
93	Jungmo 3013	2.3	3.5	2.9	MT
94	Soyeon	2.3	2.5	2.4	MT
95	Cheongja 4	1.6	2.0	1.8	T
96	Aram	2.0	2.0	2.0	T
97	Taecheong	2.3	2.0	2.1	MT
98	Nuriol	2.0	3.0	2.5	MT
99	Danyeob	2.0	3.0	2.5	MT
100	Deokyu	2.0	2.7	2.4	MT
101	Paldal	1.8	2.3	2.1	MT
102	Namcheon	2.1	2.8	2.5	MT
103	Pangsa	2.0	3.0	2.5	MT
104	Chirumu	2.2	--	2.2	MT
105	Cheongja	2.6	--	2.6	MT
106	Kwangdu	2.0	2.5	2.3	MT
107	Haman	2.1	1.1	1.6	T
108	Hamahn	2.3	2.5	2.4	MT
109	Baekchun	4.5	4.5	4.5	S
110	Hwangkeun	4.9	3.5	4.2	S
111	Seonheuk	3.5	3.0	3.3	MT
112	Songhag	2.0	2.5	2.3	MT

113	Daeha 1	1.6	2.5	2.1	MT
114	Jungmo 3008ho	2.5	3.0	2.8	MT
115	Jungmo 3009ho	2.0	2.7	2.4	MT
116	Sinpaldal	1.0	1.5	1.3	T
117	Soyang	1.8	2.8	2.3	MT
118	Sodam	2.5	2.0	2.3	MT
119	Ilmi	1.7	2.0	1.9	T
120	Saeol	2.5	3.0	2.8	MT
121	Jinmi	2.5	2.0	2.3	MT
122	Hojang	3.0	--	3.0	MT
123	Jungmo 3004	2.0	1.8	1.9	T
124	Jungmo 3006	2.8	--	2.8	MT
125	Jungmo 3007	2.5	2.2	2.4	MT
126	Jungmo 3008	2.1	3.0	2.6	MT
127	Jungmo 3010	1.5	2.5	2.0	MT
128	Somyeong	2.0	2.5	2.3	MT
129	Sowon	1.5	2.2	1.9	T
130	Soho	1.7	2.5	2.1	MT
131	Saebyeol	1.6	2.1	1.9	T
132	Sowon 2010	1.6	2.0	1.8	T
133	Jinyul	2.1	2.5	2.3	MT
134	Geomjeong 3	2.0	2.5	2.3	MT
135	Jungmo 3005	2.0	2.3	2.1	MT
136	Jungmo 3009	1.2	1.0	1.1	T
137	K132314	2.2	2.0	2.1	MT
138	Daechan	1.6	1.5	1.6	T
Mean		2.2	2.6	2.4	
Range		1.0 ~ 4.9	1.0 ~ 4.9	1.0 ~ 4.8	
Standard deviation		0.7	0.7	0.7	
LSD (5%)		0.2	0.2	0.1	
CV		33 %	26 %	27 %	

T, MT, and S indicate tolerant, moderately tolerant, and sensitive, respectively; -- indicates missing of that cultivar in the respective test.

Table S2. Technical specifications of hyperspectral camera

Feature	Value
Spectral camera	VNIR 400-1000 nm (CMOS)
Wavelength band	400-1000 nm
Spectral resolution FWHM	7 nm
Spatial Sampling	512 pix
Spectral bands	204

Table S3. Descriptive statistical analyses for normalized difference vegetation index of bentazone treated and control plants

Trait	DAT	Cheongmiin		Cheongja 3		Seonam		Hannam		LSD (5%)
		Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	
NDVI	0	0.77±0.02a	0.76±0.02ab	0.76±0.02abc	0.74±0.03cd	0.73±0.02d	0.70±0.03e	0.75±0.03bc	0.75±0.02bc	0.02
	1	0.78±0.01a	0.78±0.02a	0.76±0.02b	0.75±0.02b	0.70±0.06c	0.72±0.02c	0.75±0.02b	0.75±0.03b	0.02
	2	0.78±0.01a	0.77±0.01a	0.73±0.01bc	0.74±0.02b	0.66±0.04e	0.72±0.01c	0.69±0.03d	0.73±0.03bc	0.02
	3	0.74±0.11a	0.74±0.03a	0.73±0.02a	0.74±0.03a	0.63±0.06b	0.73±0.02a	0.66±0.05a	0.75±0.02b	0.04
	4	0.77±0.01a	0.75±0.02a	0.75±0.02a	0.76±0.02a	0.60±0.12c	0.74±0.02a	0.68±0.05b	0.76±0.02a	0.04
% Reduction		-2.7 %		1.3 %		18.9 %		10.5 %		

Mean value ± standard deviation having a different letter in the same rows are significantly different at $P < 0.05$ by least significant difference (LSD) from each other between and within cultivar(s) and treatment(s). DAT, days after bentazone treatment; NDVI, normalized difference vegetation index. % Reduction= (Control - Treatment) / Treatment × 100.

Table S4. Descriptive statistic of photosynthesis-related traits of bentazone treated and control plants

Trait	DAT	Chengmiin		Cheongja 3		Seonam		Hannam		LSD (5%)
		Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	
Photosynthetic rate ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	0	14.84±0.76a	15.94±0.81a	15.74 ±0.83a	15.66 ±0.81a	16.35±0.66a	16.33±0.53a	17.18±0.94a	17.76±0.87a	3.56
	1	9.44±1.46c	20.24±0.62a	8.33±1.49c	18.23±0.58ab	1.23±0.29d	15.16±0.49b	2.05±0.55d	17.44±0.72ab	3.90
	2	13.44±0.75bc	18.65±0.53a	11.45±0.72c	16.81±1.18ab	1.83±0.42d	16.79±0.64ab	2.29±0.39d	18.51±1.33a	3.62
	3	16.75±0.66b	21.88±0.50a	16.30±0.57a	18.92±0.59ab	1.71±0.31c	16.72±0.57b	4.63±0.82c	19.22±1.01ab	2.97
	4	17.49±0.84b	22.59±0.87a	17.77±1.14b	19.46±1.37ab	2.72±0.45d	17.65±1.11b	7.57±1.35c	20.05±1.04ab	4.77
% Reduction		22.6 %		8.7 %		84.6 %		62.2 %		
Transpiration ($\text{mol H}_2\text{O m}^{-2} \text{s}^{-1}$)	0	0.0036±0.0005a	0.0042±0.0006a	0.0039±0.0006a	0.0036±0.0005a	0.0048±0.0003a	0.0047±0.0007a	0.0054±0.0003a	0.0055±0.0003a	0.002
	1	0.0042±0.0006b	0.0061±0.0003a	0.0043±0.0005b	0.0058±0.0003ab	0.0007±0.0001c	0.0059±0.0017ab	0.0010±0.0002c	0.0058±0.0003ab	0.002
	2	0.0050±0.0003a	0.0053±0.0005a	0.0051±0.0007a	0.0049±0.0007a	0.0004±0.0002b	0.0063±0.0020a	0.0013±0.0003b	0.0067±0.0004a	0.002
	3	0.0058±0.0005a	0.0068±0.0005a	0.0070±0.0005a	0.0063±0.0006a	0.0008±0.0002b	0.0059±0.0014a	0.0025±0.0006b	0.0066±0.0004a	0.002
	4	0.0051±0.0004ab	0.0063±0.0004a	0.0058±0.0006a	0.0051±0.0007ab	0.0015±0.0004c	0.0063±0.0015a	0.0031±0.0006bc	0.0071±0.0003a	0.002
% Reduction		19.0 %		13.7 %		76.2 %		56.3 %		
Stomatal conductance of water vapor ($\text{mol m}^{-2} \text{s}^{-1}$)	0	0.29±0.05b	0.35±0.05ab	0.31±0.05b	0.29±0.05b	0.42±0.03ab	0.42±0.03ab	0.51±0.03a	0.53±0.04a	0.19
	1	0.33±0.06a	0.47±0.04a	0.32±0.05a	0.45±0.04a	0.04±0.01b	0.48±0.04a	0.06±0.01b	0.48±0.04a	0.18
	2	0.47±0.04a	0.50±0.06a	0.47±0.07a	0.46±0.08a	0.02±0.001b	0.60±0.04a	0.09±0.03b	0.67±0.07a	0.25
	3	0.51±0.07a	0.61±0.06a	0.67±0.06a	0.59±0.07a	0.06±0.02b	0.52±0.03a	0.19±0.05b	0.64±0.05a	0.24
	4	0.52±0.05ab	0.67±0.05a	0.62±0.07a	0.54±0.08ab	0.13±0.04c	0.65±0.04a	0.28±0.06bc	0.74±0.06a	0.27
% Reduction		22.4 %		14.8 %		80.0 %		62.2 %		
Total conductance of CO₂ ($\text{mol m}^{-2} \text{s}^{-1}$)	0	0.24±0.02a	0.27±0.02a	0.27±0.02a	0.26±0.02a	0.24±0.02a	0.24±0.01a	0.29±0.02a	0.30±0.02a	0.08
	1	0.19±0.03b	0.29±0.01a	0.18±0.03b	0.26±0.02ab	0.03±0.01c	0.27±0.02ab	0.04±0.09c	0.27±0.02ab	0.09
	2	0.27±0.02a	0.28±0.03a	0.35±0.03a	0.35±0.03a	0.01±0.001b	0.34±0.02a	0.06±0.02b	0.36±0.04a	0.11
	3	0.29±0.03a	0.33±0.03a	0.37±0.03a	0.33±0.04a	0.04±0.01b	0.29±0.02a	0.11±0.03b	0.35±0.03a	0.12
	4	0.29±0.03a	0.37±0.02a	0.33±0.04a	0.33±0.04a	0.07±0.02b	0.36±0.02a	0.14±0.04b	0.39±0.03a	0.13
% Reduction		21.6 %		0.0 %		79.4 %		64.1 %		

Mean value ± standard error having a different letter in the same rows are significantly different at $P < 0.05$ by least significant difference (LSD) from each other between and within genotype(s) and treatment(s). % Reduction was calculated by using formula, % Reduction= (Control - Treatment) / Treatment × 100.