

# Yield and functional components of soybean by the strong salted wind

Honam Agricultural Research Institute, NICS : Sang-Bok Lee\*,  
Mi-Ja Lee, Chul-Hyun Yoo, Jae-Duk Kim

## Objectives

This study conducted to investigate effects of the salt concentration on functional components and yield of soybean cause by a typhoon "Russa" in Jeju island.

## Materials and Methods

- Typhoon date : August 31. 2002
- Wind speed : maximum average → 41.0m/s, maximum instantaneous → 56.7m/s
- Experimental region : from seashore to 7km in Gosan-ri, Hyunkyong-myon Jeju
- Soybean cv. and planted date : Pungsannamul-kong, June 15 to 20.
- Sample analysis
  - Isoflavone extraction : Methanol/water(80:20 v/v), 80 °C, 15 hr.  
HPLC condition : Isoflavone - photodiode array(PDA) detector(210 ~ 400nm) and RP column(4.6×250mm, 5- $\mu$ m particle size), 254nm.
  - Amino acid : hydrolysis with 6N HCl, 110 °C, 20hr.  
HPLC condition : Fluorescence Detector(Waters 2475), 254nm

## Results and Discussion

- The salt concentration of plant caused by the salt wind damage in less than 1, 1.5, 3, 5, and 7km distance from the seashore was 3.76, 3.07, 2.80 and 2.65%, respectively.
- The rate of defoliation in soybean was 33% to 92%, the rate of empty pod was 6.1% to 40.9% and the rate of immature seed was 12.9% to 56.7%.
- As the result of that damage in soybean, the normal 100 seeds weight was 11.0g, but those of Gosan area in Jeju caused by salt damage was 5.8 g to 8.3 g. The yield of soybean in 1, 3, 5 and 7 km place from seashore was 420, 1,110, 1,370 and 1,530 kg ha<sup>-1</sup>, respectively.
- The germination rate of soybean seed in 1, 3, 5 and 7 km place from seashore was 30, 80, 85 and 100%, respectively.
- Total amino acids in soybean was 353.8 to 479.4 mg g<sup>-1</sup>, total isoflavones was 369.4 to 1054.2  $\mu$ g g<sup>-1</sup>. The place from the seashore was more near, the salt wind damage of soybean was more serious.

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Corresponding author E-mail: leesbok@rda.go.kr , Phone: 063-840-2268

Table 1. Yield and its components of soybean by the salted wind.

Distance from the seashore	Salt concentration in plant	Defoliation rate	Yield and its components				Yield index
			Rate of empty pod	Rate of immature seed	100 seed weight	Yield	
km		----- % -----			g	kg/ ha	
<1	3.76	92	40.9	56.7	5.8	420	28
1.5	3.54	85	37.7	55.2	6.1	530	35
3	3.07	71	10.6	10.0	8.1	1,110	73
5	2.80	50	7.1	14.8	8.3	1,370	90
7	2.65	33	6.1	12.9	8.3	1,530	100

Table 2. The contents of isoflavone in soybean caused by the salted wind. (ug/g)

Isoflavones	Distance from the seashore				
	< 1km	1.5km	3km	5km	Control
Daidzin	107.9	119.3	250.3	261.7	532.0
Glycitin	55.8	69.2	102.0	108.7	123.7
M.Glycitin	n.d	20.5	n.d	22.4	30.2
Genistin	118.6	111.9	350.5	326.5	704.8
A.Daidzin	6.8	12.0	n.d	n.d	25.4
A.Glycitin	19.5	21.3	17.0	17.7	23.4
M.Genistin	21.2	16.4	15.0	14.8	13.2
A.Genistin	25.2	16.4	16.2	15.6	14.1
Glyeitein	2.8	8.8	8.6	8.2	20.1
Daidzein	7.3	11.1	10.2	9.3	8.2
Genistein	4.4	1.8	2.9	2.6	4.1
Total	369.4	408.7	772.6	787.4	1499.2

Table 3. The contents of amino acid in soybean caused by the salted wind. (g/mg)

Amino acid	Distance from the seashore			
	< 1km	1.5km	3km	5km
Asp	31.1	30.6	43.3	38.3
Ser	16.3	15.9	21.0	19.3
Glu	47.8	46.9	66.8	60.3
Gly	14.3	13.5	16.7	16.4
Hts	12.6	10.1	13.9	13.2
Arg	34.0	31.9	39.4	35.8
Thr	16.7	16.0	21.8	20.7
Ala	17.3	17.5	25.3	24.0
Pro	21.7	21.4	28.8	26.9
Cys	3.7	3.7	4.5	4.3
Tyr	14.8	14.7	19.0	18.3
Val	19.4	17.6	24.4	23.1
Met	7.0	7.0	9.0	8.8
Lys	27.2	29.4	55.6	52.0
Ile	18.2	16.5	22.7	21.5
Leu	31.6	30.7	42.7	40.3
Phe	20.4	18.7	24.4	23.1
Total	353.8	342.4	479.4	446.3