Photosynthesis Response and Yield with Soil Flooding in Soybean

Jin-Woong Cho*, Jung-Joon Lee, Young-Jin Oh, Mi-Ja Lee, Moon-Soo Park, Sang-Bok Lee, and Soo-Dong Kim

National Honam Agricultural Experiment Station, Iksan, 570-080, Korea

Objectives

This study carried out to investigate on the change of photosynthesis and it's factors with flood stress in soybean

Materials and Methods

Soybean cultivars : Hannamkong and Saebyeolkong

Treatments : Soil flooding at the vegetative (V4~V5) stages and reproductive (R2; flowering stage) stage

Results and Discussion

The photosynthetic rates of two soybean cultivars with flooding declined progressively in compared with the non-flooding at both stages (Fig. 1). Declined photosynthetic rates showed 55% in Saebyeokong and 63 % in Hannamkong at 5 days after flooding at the V4~V5 trifoliolate leaf stages. And at the flowering stage, those showed 39 % on Saebyeokong and 58 % on Hannamkong repectively. Transpiration rate on 9 days after flooding showed approximate 32 % and 28 % at the V4~V5 trifoliolate leaf stages and the flowering stage in Hannamkong, respectively, and showed 56 % and 58 % at the V4~V5 trifoliolate leaf stage and the flowering stage in Saebyeolkong, respectively (Fig. 2). The Fv/Fm ratio with flooding was lower in Saebyeolkong than in Hannamkong at both of growth stages (Fig. 3). The pod number per plant showed significant reduction when plants were subjected to flooding at the V4~V5 and the flowering stages and showed no difference between two soybean cultivars at both of stages. The effect of flood stress on the yield per plant showed the reduction when flood stress for 9 days was applied at the V4~V5 and the flowering stages (Table 1).

*Corresponding author E-mail : jinwoong@rda.go.kr, Phone : +82-63-840-2252

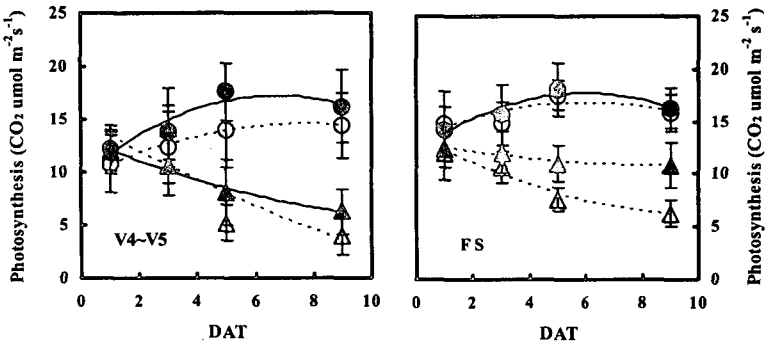

Fig. 1. Photosynthesis two soybean cultivars over an 9 days flood treatment at V4~V5 and flowering stages. Solid lines show Hannamkong and dashed lines Saebyeolkong. ● & ○ show controlls, and ▲ & △ flooded plants. Means are shown ±SE, n = 6.

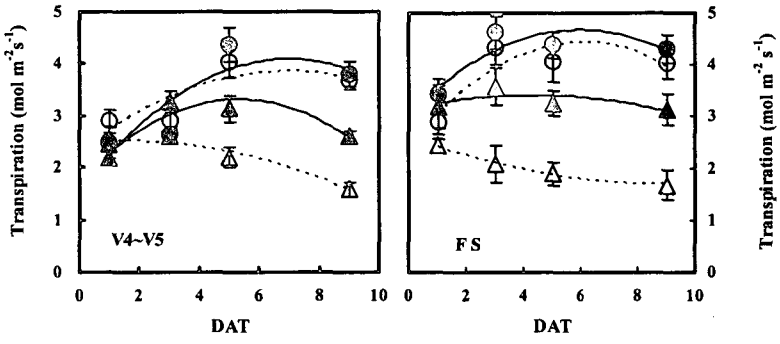

Fig. 2. Transpiration in two soybean cultivars over an 9 days flood treatment at V4~V5 and flowering stages. Solid lines show Hannamkong and dashed lines Saebyeolkong. ● & ○ show controlls, and ▲ & △ flooded plants. Means are shown ±SE, n = 6.

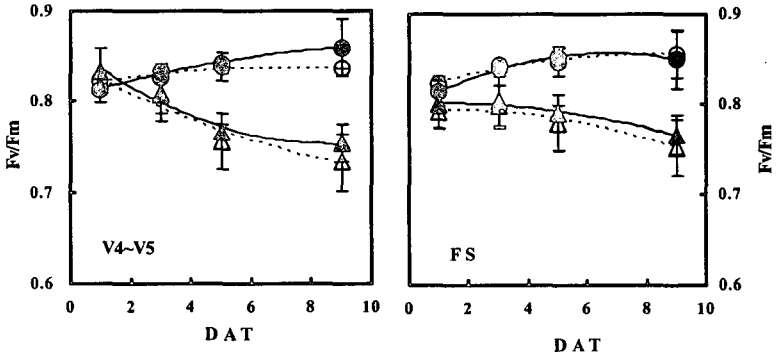

Fig. 3. Fv/Fm ratio in two soybean cultivars over an 9 days flood treatment at V4~V5 and flowering stages. Solid lines show Hannamkong and dashed lines Saebyeolkong. ● & ○ show controlls, and ▲ & △ flooded plants. Means are shown ±SE, n = 6.

Table 1. Yield and yield component according to soil flooding for 10 days in different soybean stages

Cultivars	Treatment	Pod no. (plant^{-1})	Yield (g plant^{-1})	100 seed weight (g)
Hannamkong	Non-flood	45.2±8.8	10.9±2.1	11.9±0.9
	Flood V4-V5	32.5±6.7	7.6±1.7	10.1±0.6
	Flood F S ⌋	29.8±2.7	6.7±0.5	9.9±0.6
Saebyeolkong	Non-flood	44.0±3.1	11.3±1.2	12.1±0.8
	Flood V4-V5	34.7±7.2	7.9±1.0	11.1±0.5
	Flood F S	27.7±6.1	4.5±0.5	8.5±0.4

⌋ flowering stage. Means ± SE, n = 9.