Responses of Growth Characteristics of Sesame (*Sesamum indicum* L.) to Waterlogging Stress

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Introduction

In Korea, crops are introduced into the paddy fields through crop rotation in order to increase the utilization of arable land and increase income. The cycle of returning from paddy to field has been continuously increasing since 2008. Recently, the cultivation area and production of sesame are also increasing every year, and accordingly, the cultivation of sesame in the rice fields is increasing drastically. However, most field crops, including sesame, displayed very sensitive to waterlogging stress, so there are concerns about a decrease in yield due to waterlogging stress when grown in paddy fields or soil with poor drainage. Therefore, this study was conducted to determine the growth characteristics of sesame seeds most sensitive to immersion stress.

Materials and Methods

The seeds of sesame (*Sesamum indicum* L. var. Gunback) were collected from the RDA, Korea. Experiments were carried out in a greenhouse of paddy soil condition. The seedlings were exposed to waterlogging stress for 5-days at 2-and 10-leaf stage maintaining 2 cm flooding above the soil surface. For each experimental group, stem length, chlorophyll content (SPAD-502 plus, Konica Minolta, Japan), stem diameter, and leaf thickness were measured immediately after over-humidity treatment and every 24 hours after treatment, from day 0 to day 5. All growth characteristics were investigated based on the topmost leaf of the plant.

Results and Discussions

As a result of investigating changes of stem length under waterlogging stress, the most significant difference was observed in the 2- and 10-leaf stages. Chlorophyll content was significantly decreased in all treatments regardless of growth stage. Leaf thickness was increased initially and temporarily decreased due to swelling. Though there was no statistical significance in the difference of stem diameter under waterlogging stress compared to untreated plants.

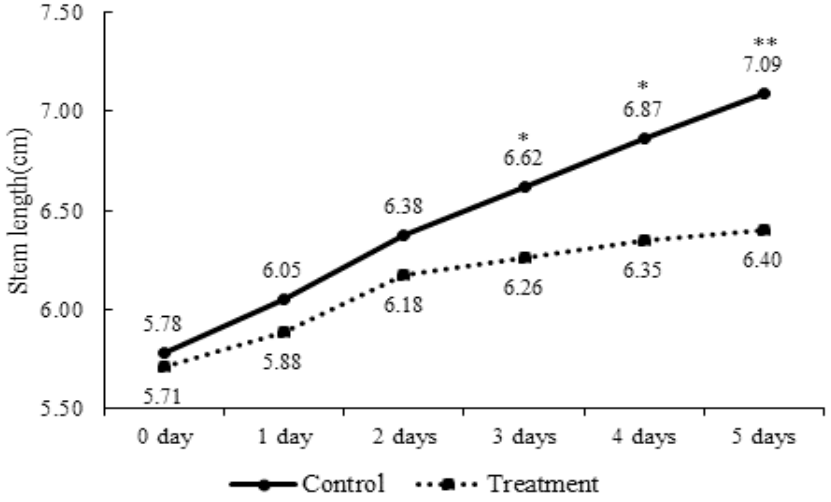

Fig. 1. Effect of waterlogging stress on stem length at 2-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at $p < 0.05$ and $p < 0.0.1$(t-test).**

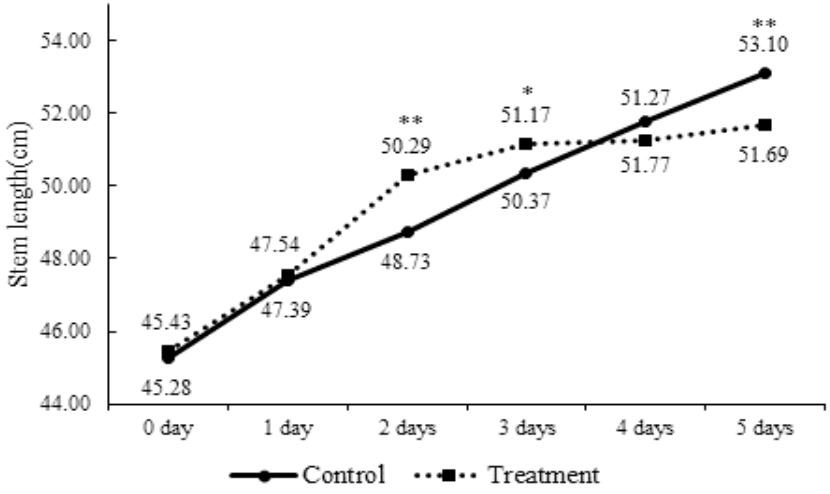

Fig. 2. Effect of waterlogging stress on stem length at 10-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at $p < 0.05$ and $p < 0.0.1$(t-test).**

Results and Discussions

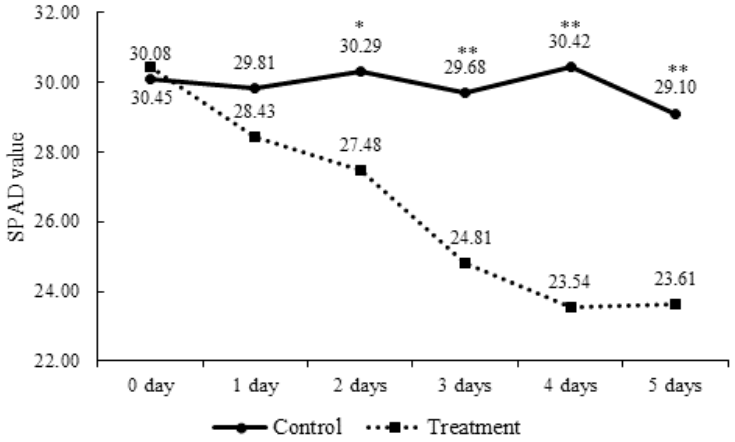

Fig. 3. Effect of waterlogging stress on chlorophyll content at 2-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

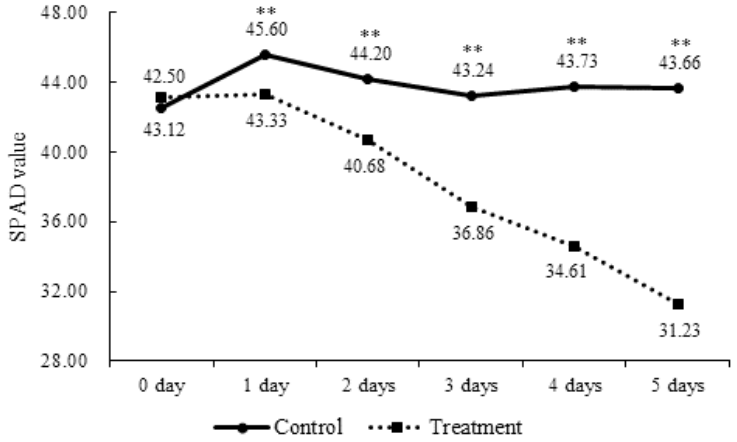

Fig. 4. Effect of waterlogging stress on chlorophyll content at 10-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

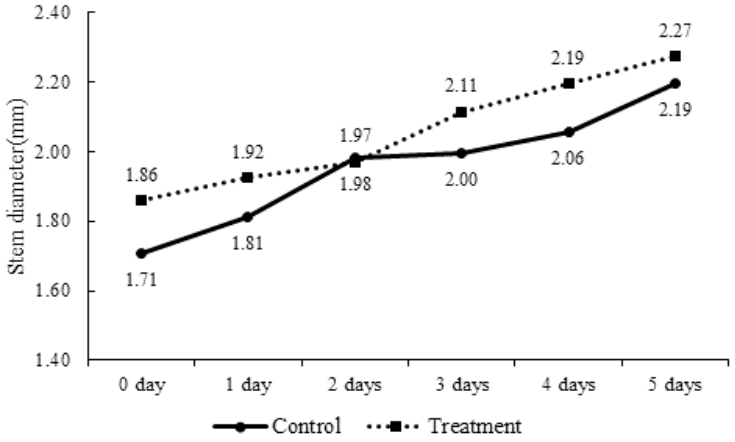

Fig. 5. Effect of waterlogging stress on stem diameter at 2-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

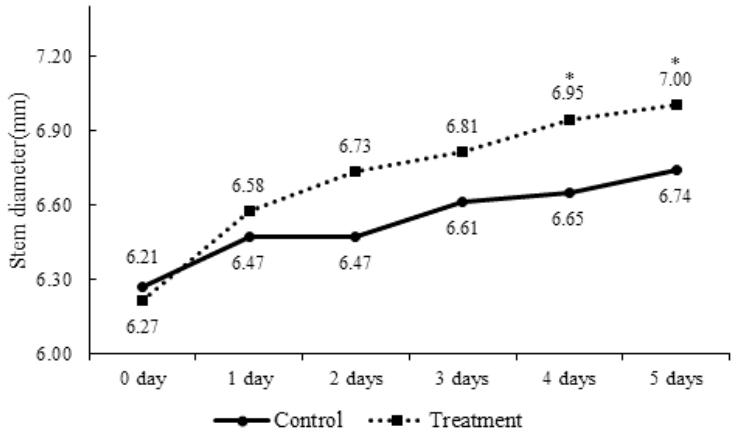

Fig. 6. Effect of waterlogging stress on stem diameter at 10-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

Results and Discussions

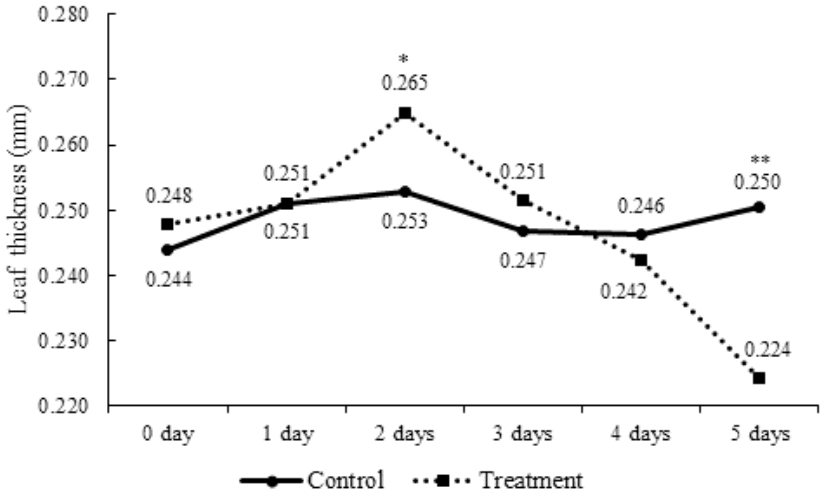

Fig. 7. Effect of waterlogging stress on leaf thickness at 2-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

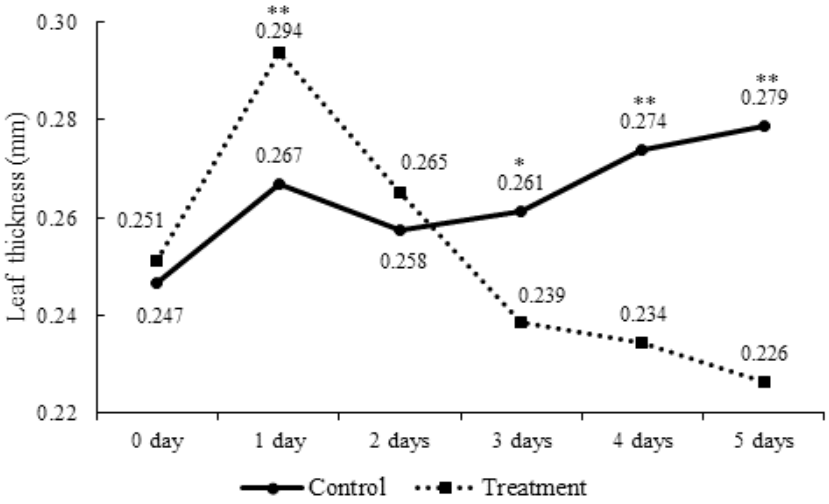

Fig. 8. Effect of waterlogging stress on leaf thickness at 10-leaf stage. The asterisks "*", "" indicates significant differences between untreated seedlings and waterlogging stress at p < 0.05 and p < 0.0.1(t-test).**

Acknowledgement

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