

## Effects of NO gas fumigation and NO plasma irradiation to seeds on plant growth

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Recently, we have found that atmospheric air plasma irradiation to seeds of plants can induce continuous growth enhancement of the plants after their germination for several days [1-2]. We have also revealed that NO<sub>x</sub> gas molecules of 10-400 ppm in concentration are generated by our scalable dielectric barrier discharge (DBD) devices [2]. Nitric oxide (NO) is a key signaling molecule in plants and it can promote plant growth [3]. Here, we have studied effects of NO gas fumigation and NO plasma irradiation to seeds on plant growth promotion.

The scalable DBD device consisted of 20 electrodes of a stainless rod of 1 mm in diameter and 60 mm in length covered with a ceramic tube of 2 mm in outer diameter. The electrodes were arranged parallel with each other at a distance of 0.2 mm. The discharge voltage and frequency were 10 kV and 10 kHz, respectively. To study the effects of NO gas, 10 seeds of *Raphanus sativus* L. were fumigated for 5 min. and 20 min. in N<sub>2</sub> diluted NO gas environment. The concentration of NO was 990 ppm. For NO plasma treatments, the seeds were arranged horizontally at 5 mm and below 3 mm outside the electrodes. The discharge duration was 3 min. After the NO treatments, these seeds were cultivated for 7 days in an incubator under 22 °C and 60 % relative humidity in the dark with pure water. Their total length from primary root to stark was measured. Statistical significance of the total length was evaluated.

Figure 1 shows time evolution of average length of *Raphanus sativus* L. after cultivation for control, gas fumigation and plasma irradiation. Seedling after treatments in first 3 days has no significant difference. For 3 min. NO plasma irradiation, the maximum average length of seedling after 7 days is 60 % longer than that of control. For 5 min. NO fumigation, the maximum length after 7 days is 20 % longer than that of control whereas for 20 min. NO fumigation, the maximum length is 10% shorter than without control.

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## References

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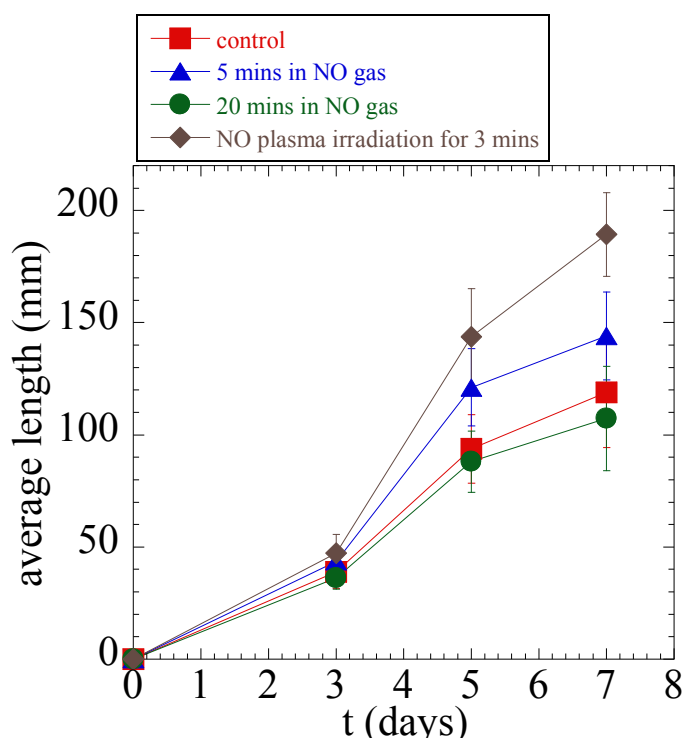


Fig.1. Time evolution of average length of *Raphanus sativus* L. for 5 and 20 min. NO gas fumigation, 3 min. NO plasma irradiation, and control.