MEASURING THE LEAF ELECTRICITY OF LIVING PLANT

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1. Introduction

Speaking Plant Approach (SPA) is a strategic approach to understand what the plant needs under variations in its environment when measuring the plant responses as its tactics. Leaf electricity is one of the living plant responses to the environmental variations. The work has focused on how to measure the leaf electricity and how to understand its signals in order to meet the demand of living plants.

2. Measuring System Developed

Required is to pick up the small signals of plant embedded in a lot of noise and is to reduce the damage to the plant enabling a long term living-plant-measurement.

The measuring system was composed of three parts. The one was a sensing device with electrodes. These electrodes didn’t injure the plant because of their gel paste interface. Putting the one electrode on the stem nearby the ground surface as reference, and setting the other on the plant leaf, provided difference in electric potential between the stem and leaf. The second part was the amplifier of IC chip for enlarging the electric potential difference. Reducing the noise level in this part is the key point in this system. To keep unexpected current from emerging, two condensers were put into the circuit. The third part was the data acquisition/logging system of a lap-top computer with a PC-card recorder.

3. Method

The experiment was conducted in the bio-photochamber under 25 °C constant temperature. Light intensity was kept at 3000 lux. Three different intervals for illumination were adopted there: 6-min-light and 720-min-dark, 6-min-light and 360-min-dark, and 6-min-
light and 6-min-dark. The test plant was Crassura, a family of cactus. The test repetition was 5 and the appearance of leaf electricity resulted in fair repeatability.

4. Results and Discussion

The results obtained from the experiments are shown in Figs 2, 3, and 4.

Tests 6-min-light and 720-min-dark resulted in fluctuated but periodical patterns of leaf electricity as shown in Fig. 2. The difference between sharp peak and trough potentials was about 12.2 mV.

Tests 6-min-light and 360-min-dark also gave periodical patterns as shown in Fig. 3. When the illumination was turned on, the electric potential decreased quickly and rose again. Then, it decreased moderately with time. The difference between sharp peak and trough potentials was about 13 mV. The variation pattern was similar to that of 6-min-light and 720-min-dark.

In 6 min illumination intervals, the potential patterns were almost sinusoidal with 12 min period as shown in Fig. 4. The differences between maximum and minimum potentials were about 1.7 mV.

The results obtained showed that the leaf electricity varied with illumination interval variations. Further tests and analysis are undergoing.

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![Fig. 2 Variation of leaf electricity at 6-min-light and 720-min-dark.](image)

![Fig. 3 Variation of leaf electricity at 6-min-light and 360-min-dark.](image)

![Fig. 4 Variation of leaf electricity at 6-min-light and 6-min-dark.](image)