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## Development of an Automated Control System for Micropropagation of *Lillium* Oriental Hybrid 'Casa Blanca' Using Bioreactor

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### Objectives

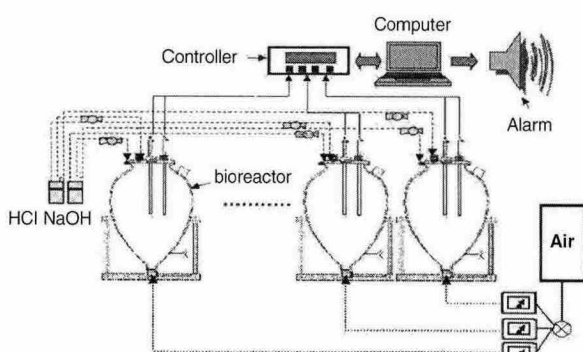
This research was conducted to develop an automated control system for micropropagation of lillium oriental hybrid 'casa blanca' using airlift bioreactor.

### Materials and Methods

1. Materials: Airlift bioreactor used for micropropagation *lillium* oriental hybrid 'casa blanca'
2. Methods: Development of method of controlling pH density and air flow rate in bioreactor to be suitable for growing

### Results and Discussions

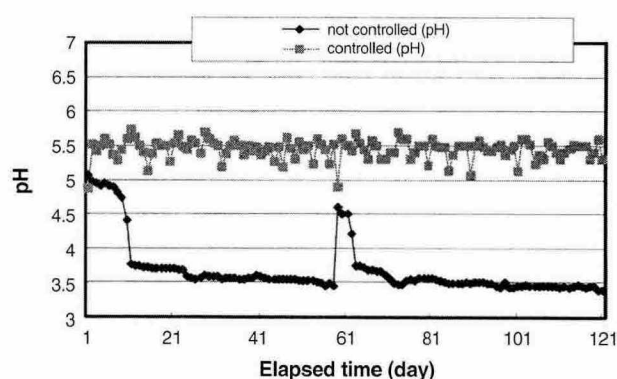
The pH was controlled by comparing the setting values with the measured values and then injecting the acid and the base solution. This system uses the stepping motor for the injection pump to improve the control efficiency and micro amount of injection



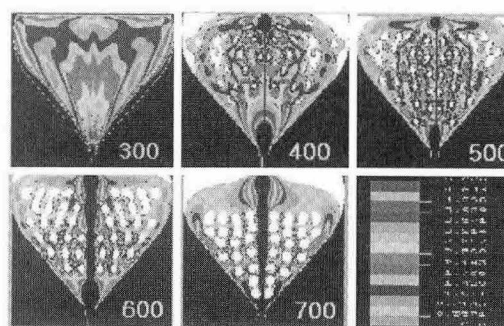
**Figure 1.** Schematic diagram of an automated control system of bioreactor

(Figure 1). The result of actual pH controlled by this system indicates that the control performance was excellent as shown in Figure 2.

It is necessary to control the air flow rate which enters into the bioreactor as the bulblets grow up. Therefore, we simulated the circulation of mediums in the bioreactor according to the change of the air flow rate using a commercial CFD program (Figure 3). Then we established the control standards of the pH and air flow rate suitable for this system. Now the experiment was carried out to clarify the effect of the control of the pH and the air flow rate on the growth of bulblets using the system. The results of the experiment are scheduled to be reported next time.



**Figure 2.** Result of the pH control using the system



**Figure 3.** Result of the simulation of mediums circulation in bioreactor (cc/min)