

**Cell Turgor Measurement – Probe Electrospray Ionization (PESI)  
Mass Spectrometry for Molecular Profiling Techniques**

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**【Outline of survey】**

A cell pressure probe measures cell turgor of plants, and can extract cell solution directly from actively growing plants. The pressure probe technique and the probe electrospray ionization (PESI) mass spectrometry (MS) can be combined together in order to analyze cell molecular components in intact growing crops. By using physiological molecular information, environmental conditions can be adjusted optimally to grow crops in plant growth factories. Such a control method using physiological information to optimize energy efficiency and product quality control in plant growth factories is called as the speaking plant approach (SPA). The needle probe tip in PESI will be made to a scale as small as tens nanometers in tip diameter. The probe tip can be used to pick up molecules from cells. The thickness of cell walls of plants is about 200 nm, and if some molecules can be picked up from intact growing cells with the PESI probe, molecular components reflecting plant growth can be monitored. In the present project, the nano-precision PESI-MS technique will be developed for the purpose of introducing SPA in plant factories (i.e., Nano-Precision Agriculture).

**【Expected results】**

The pressure probe-combined PESI-MS will offer nano-scale resolution of molecular profiling in cells, leading to nano-precision agriculture for automated greenhouses. PESI can induce ionization of mixture samples with no special sample preparations. Nano-scale cell manipulation and MS analyses will make it possible to get physiological information for SPA in plant growth factories, resulting in high efficiency of energy usage and high quality production.

**【References by the principal investigator】**

- Nonami, H. 2001. Water Relations in Plant Physiology (Japanese). Yokendo Ltd., Tokyo, pp.263.

**【Term of project】** FY2008 – 2012

**【Budget allocation】**

**124,300,000 yen** (direct cost)

**【Homepage address】** [http://web.agr.ehime-u.ac.jp/%7Epbb/Grant-in-Aid%20\(S\).html](http://web.agr.ehime-u.ac.jp/%7Epbb/Grant-in-Aid%20(S).html)