

Dissertation Abstract

Report no.	(Course-based) No. 1041	Name	DE SILVA KOKGE THILINI KANCHANA MUTHUMALI
Dissertation title	INVESTIGATION OF NANOMETRIC GROWTH DYNAMICS OF PLANTS UNDER THE INFLUENCE OF HEAVY METALS USING STATISTICAL INTERFEROMETRY TECHNIQUE (統計干渉法を用いた重金属影響下の植物のナノメータ成長動態の研究)		
<p>Abstract</p> <p>※ <i>The abstract should be in keeping with the structure of the dissertation (objective, statement of problem, investigation, conclusion) and should convey the substance of the dissertation.</i></p> <p>Plant growth apart from being complex and highly dynamic, is dependent on its immediate environment changes. Leaf expansion measurements using Statistical Interferometry Technique (SIT), a sensitive interferometric technique at nanometric accuracy and at second levels revealed the presence of characteristic nanometric intrinsic fluctuations (NIF). In this research, we demonstrate that the NIF are sensitive enough that they change under exposure of heavy metal, namely essential micronutrient zinc (Zn) and non-essential element cadmium (Cd) at relatively low concentrations in the leaves of Chinese chives (<i>Allium Tuberosum</i>). NIFs of leaves were observed for three days under four different Cd concentrations, 0, 0.001, 0.01, and 0.1mM, and for 24hrs under three different Zn concentrations, 0, 0.15, and 0.75mM. Results showed significant reduction of NIFs for all Cd concentrations, and in contrast significant increase of NIFs for all Zn concentrations. In addition, results showed significant reduction of NIFs for Cd exposure of concentration of 0.001mM for even an hour, and significant gradual increment of NIFs for 0.75mM Zn concentration even within an hour exposure. For comparison, oxidative stress markers, superoxide dismutase (SOD), peroxidase (POD), catalase (CAT), and H₂O₂ concentration, and metal uptake were also measured. In comparison to NIF, no significant change could be seen in the oxidative stress markers within 4hrs under smaller concentrations. The results imply that NIF can be not only used as a measure for heavy metal stress but also it can be more sensitive to detect the toxic as well as positive effects of heavy metals on plants at an early stage.</p>			