Auxin/nitrogen interaction in root development

Cell separation processes that underlie fruit abscission and shedding//in oil palm (Elaeis guineensis Jacq)

ABSTRACT

The current thesis provides new insights into the molecular and
cellular mechanisms underlying fruit abscission in the oil palm (Elaeis guineensis Jacq). Molecular and cellular approaches were used to examine
the events during abscission zone (AZ) development and function. First, a field experimental system was setup and used to define the precise timing of cell separation, and to examine the response of oil palm fruit at different stages of development to ethylene. The results indicate the response to ethylene is developmentally regulated, with the ripest fruit beginning to separate first within 9 h. The search for polygalacturonase (PG) genes expressed in the fruit base containing the AZ led to the identification of fourteen transcripts that encode PGs. One PG transcript (EgPG4) increases 700-5000 fold during the ethylene treatment time course with the confirmation by in situ hybridization indicating a preferential increase in the AZ cell layers in the base of the fruit in response to ethylene prior to cell separation. Histological analysis of the oil palm fruit base reveals that AZ cells undergo periclinal cell divisions, while the adjacent mesocarp and pedicel cells divide anticlinally resulting in 10-12 AZ cell layers with aligned centrally localized nuclei during fruit development. The AZ cells accumulate large amounts of pectic substances during development, which is lost from the cells after separation suggesting a possible relation to the capacity for AZ function. Ultrastructural analysis indicates a polarized vesicle accumulation at the tip of AZ cells occurs during development, while immunohisto-analysis indicates an increase in the JIM5 epitope in the AZ layers during ethylene treatments prior to separation is observed, followed by a polarized increase in both JIM5 and JIM7 on the separated cell surfaces. The results obtained from diverse approaches allow an integrated view of the fruit abscission process in oil palm and a schematic model of AZ development and function during shedding has been developed.

Keywords : Model, Palm tree, fruit, 1. Exclu de la photothèque

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PERSPECTIVES

Overall, the results of the thesis project identified a number of originalities of the cell separation and abscission process in oil palm. The main perspectives are both applied and fundemental. There are two important initiatives that are underway during 2012 as follows: (1) RNA-seq analysis and bioinformatics

analysis of the abscission time course samples and (2) the phenotypage of the interspecific backcross (Elaeis guineensis x hybrid E. guineensis/E. oleifera) population. The objective of the first inititive is to have a detailed molecular insight into the signal transduction systems that underlying the functional originalities of oil palm fruit shedding, to be able to compare with the most common cell separation model systems, tomato and Arabidopsis. The interest of the second inititative is to take advantage of a population that is the basis of a genetic map of the interspecific backcross, and the hybrid is reported to be non shedding. The objective is to use a bio-assay developed during the PhD project of Peerapat Roongsattham for phenotyping and searching for non-shedding genetic material for use in elite breeding programs.