Deutscher Tropentag, October 8-10, 2003, Göttingen

"Technological and Institutional Innovations
for Sustainable Rural Development"

A Rapid Way of Physical Mapping in Coconut and Oil Palm

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Abstract

Coconut (*Cocos nucifera* L.) and oil palm (*Elaeis guineensis* Jacq.) are the two most important perennial oil crops. Both crops are being studied in an EC-funded INCO-DEV (International Cooperation with Developing Countries) project with the title: "Construction and exploitation of high density DNA marker and physical maps in the perennial tropical oil crops coconut and oil palm: from biotechnology towards marker-assisted breeding" (LINK2PALM). The objectives are (i) to provide the methodological basis and molecular tools for improving the breeding efficiency in both crops, (ii) to develop DNA marker-based breeding strategies in collaboration with the most important countries in coconut and oil palm production and (iii) to directly transfer to developing countries small-scale technological solutions for the genetic improvement of these tropical oil crops. As a basis to achieve these objectives, high-density (HD) molecular linkage reference maps are being developed for standard mapping populations in coconut and oil palm. These individual reference maps serve for (i) their integration into a general reference map for both crops, (ii) QTL analyses and (iii) physical mapping approaches. Usually in a physical map, defined individual DNA fragments of the crop's genome are ordered and anchored on a linkage map in a way that contiguous regions of overlapping sequences are formed. These maps are useful for genome-wide gene discoveries like map-based cloning of interesting genes, and provide an efficient prerequisite tool to enable marker-assisted selection on important traits in future breeding programs. To develop a physical map, genomic libraries of oil palm and coconut have been constructed consisting of more than 120,000 individualized cosmid clones each (2–3 genome equivalents). Out of these libraries, in house developed software and commercial robots were used to assemble 28,800 individualized COS clones into 30 8-dimensional pools which are currently used for associating single COS clones of genomic DNA to linkage-mapped AFLP markers. With such a multi-dimensional pooling system a minimum of PCR reactions is required. In this efficient way it seems to be feasible to speed up the time-consuming process of physical mapping, and, so far, the time expense to create new breeding lines based on targeted genomic information.

Keywords: Cosmid library, linkage maps, molecular marker, oil crops, physical mapping, pools

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