Bavarian State Research Center for Agriculture

Institute of Crop Science and Plant Breeding

Genome Analysis - an Important Tool to Support Classical Hop Breeding

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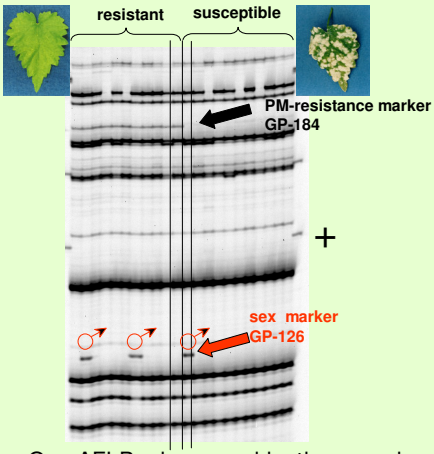
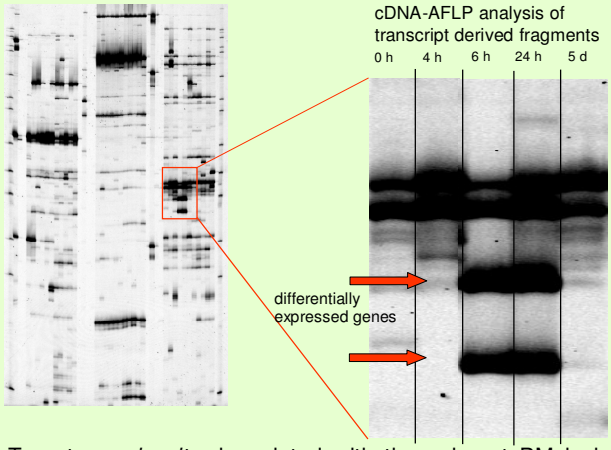
Molecular markers for powdery mildew resistance and sex determination

The main focus of the genome diagnostic work at the Hop Research Center Hüll is to identify molecular markers for known and new resistance genes for powdery mildew (PM). So far using the AFLP technique several markers in close linkage to the R2 gene from Wye Target and also sex differentiating markers have been identified. In addition to this efficient method, a differential display approach in combination with the cDNA-AFLP method was performed in order to detect markers for genes directly related to the resistance reaction. Moreover by applying this technique there is also the chance to get more information about the mechanism of the R2 gene based resistance.



One AFLP primer combination reveals a marker for PM resistance and a sex specific marker for males as well.

The detached leaf assay provides reliable resistance data as basis for the AFLP and cDNA-AFLP analysis.



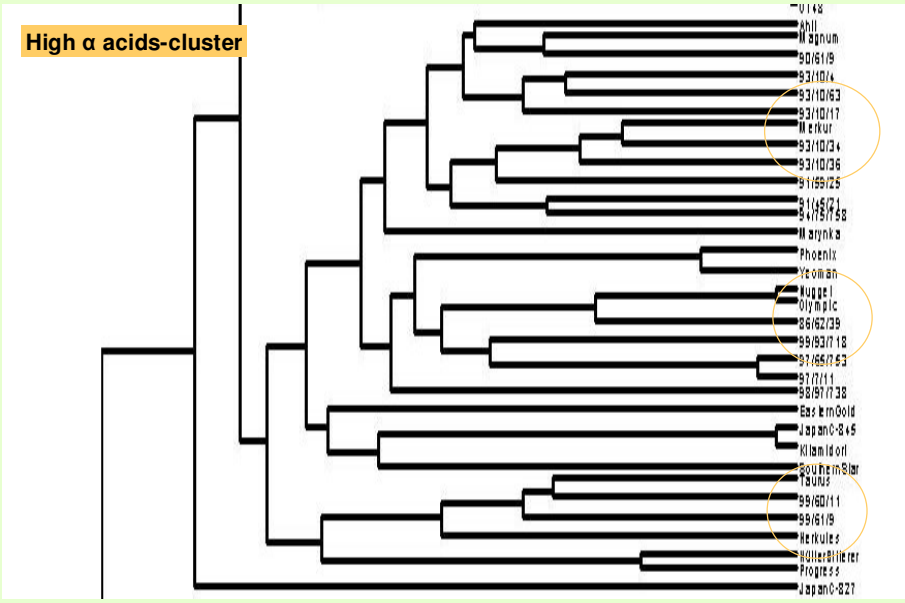
Wye Target was *in vitro* inoculated with the aviruent PM isolat BU10. For RNA isolation leaves were harvested after different points of time. Transcript derived fragments expressed 6-24 h after fungal attack are assumed to be involved in the defense reaction.

Estimation of the genetic diversity of important breeding lines and varieties

Using the AFLP technique the genetic relationship between the Hüll breeding lines and the world hop germplasm could be determined. Knowledge obtained from these studies allows a specific, more precise selection of crossing partners for special breeding strategies. In addition, the genetic fingerprint of hop varieties can help to ensure high quality which is crucial to the hop and brewing industry.

The figure shows a cluster with varieties and breeding lines characterized by high alpha acids content. The breeding lines 93/10/17, 93/10/34, 93/10/36 and 93/10/63 are closely related to their sister the Hüll variety Merkur. In addition, Herkules, the recently released Hüll high alpha variety, is grouped in the direct vicinity to its mother Taurus.

The extensive AFLP database built up during this work is also useful for a reliable and rapid identification of varieties.



Part of a dendrogram: Main cluster with hops containing high alpha acids content

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