JKI

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Development of a method for phenotyping Black Rot resistance (*Guignardia bidwellii*) on grapevine (*Vitis spec.*)

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Young Scientists Meeting, Julius Kühn-Institut in Quedlinburg, Germany (2010)

Sources of grapevine *Vitis* spec.

~ 30

Americ. species

1 spec.

V. vinifera

~ 40

Asian species

Grapevine

The European grapevine *Vitis vinifera*

... is susceptible for pathogens

... is propagated vegetatively

... a generation takes 3 years

... breeding a new cultivar needs 25 – 30 years

The *V. vinifera* genome

... is heterozygot

... has a size of ~ 487 Mb

... consists of 19 chromosomes

... has been sequenced in 2007

Grapevine breeding

Use of molecular markers

By using molecular markers, breeders are able to score juvenile plants and shorten the process of grapevine breeding up to 10 years

Requirements:

- Availability of genetic maps
- Availability of phenotypic data
- QTL analyses (quantitative trait locus)
- Knowledge about the positions of the markers needed

Black Rot diseases

- caused by the ascomycete *Guignardia bidwellii* (Ellis)
anamorph:
Phyllosticta ampellicida
- is native to North America
- 1885 described in France
for the first time

Black Rot on berries

Black Rot diseases

- until 2002 in German vineyards without significant effects
- since 2002: significant yield losses in the region of Moselle and infections in all German wine-growing areas

Black Rot on leaves

Guignardia bidwellii

AMTRA, Nyon, formed by v. W. Siegfried,
Ullrich C. 2009

The project

The aim of the project:

Development of a molecular marker correlating with Black Rot (*Guignardia bidwellii*) resistance useable for grapevine breeding performing MAS (Marker assisted selection)

Questions:

How can the pathogen be cultivated and spores be produced?

Can a greenhouse test system be established to characterize a lot of genotypes?

How can the genotypes be classified?

Which regions of the genome carry factors determining the resistance?

The population

Grapevine variety **V3125**
(‘Trollinger’ x ‘Riesling’):
susceptible

Rootstock cultivar ‘**Börner**’
(*V. riparia* x *V. cinerea*):
resistant

Crosspopulation V3125 x ‘Börner’

202 Genotypes from 1998 and 2001
segregates

A first genetic map is published
(Zhang et al. 2009) and has been
improved (Iris Fechter, in prep.).

Guignardia bidwellii

- Cultivated on oat-meal agar
- Spore suspension after 2 - 3 weeks

Isolate Moselle 2005

10^3 conidia/ml

Isolate Geilweilerhof 2010

10^4 - 10^5 conidia/ml

Inoculation experiments

200 genotypes (= 600 plants) have been scored

Scoring:

- in the second and third week after inoculation
- 3 plants per genotype
- 5 leaves per plant
- date of first symptoms, infected leaf area in percent of the whole leaf

Results greenhouse

- 2009: 60 genotypes have been characterized
- 2010: all genotypes have been characterized (3 replicates)

Results field evaluation

Scoring of Black Rot on leaves:

- 0 : no symptoms
- 1 : one lesion without pycnidia
- 2 : one lesion with pycnidia
- 3 : multiple lesions

Results

- Phenotyping data sets are complete
- Data of the field evaluation and the greenhouse trials were consistant using the local *Guignardia bidwellii* strain
- Trials using the Moselle strain deviated from the results

1: no symptoms
2: few symptoms
3: susceptible

Summary and perspective

- Field evaluation is done
- Three sets of data were collected
- Experiments will be repeated in 2011
- QTL analyses can now be done
- Fine mapping of the QTL region in the genetic map
- Development of a molecular marker usable for grapevine breeding

Thanks to

The Institute for grapevine breeding Geilweilerhof

Reinhard Töpfer

Ludger Hausmann

Rudolf Eibach

Eva Zyprian

Iris Fechter

And all colleagues

The Institute for Plant Protection in Fruit Crops and Viticulture

Christoph Hoffmann

Forschungsring des Deutschen Weinbaus (FDW)

Institute for grapevine breeding Geilweilerhof, Siebeldingen, Friederike Rex