Grape breeding supported by molecular tools – what can we expect?

Rudolf Eibach, Reinhard Töpfer and Erika Maul
JKI – Institute for Grapevine Breeding Geilweilerhof
D-76833 Siebeldingen
e-mail: rudolf.eibach@jki.bund.de

Grape cultivars belonging to the species V. vinifera are known all around the world for their high potential to produce quality wines. On the other hand all cultivars belonging to the gene pool of V. vinifera are highly susceptible against various pests and diseases. Especially the mildew diseases require a high level of plant protection which is harmful not only on an economical but also on an ecological point of view. That is why breeding programmes in various countries are focused on developing new cultivars with high quality and improved resistance levels. Using traditional selection methods this is an exhausting and time consuming procedure. Now new molecular techniques provide a powerful tool to increase breeding efficiency.
One of the most promising molecular tools is the marker assisted selection (MAS). For example in crosses with different resistance sources of the parents against diseases like downy or powdery mildew by MAS those offsprings can be identified which carries both resistant correlated markers. It can be expected that the resistance level in these genotypes with pyramided resistance is higher resp. the resistance is more stable. Furthermore the evaluation of the genetic resources by suitable resistance correlated markers allows a precise characterization of the gene pool used for breeding and hence a targeted selection of suitable parents in order to achieve optimized combinations for pyramiding resistance genes.
By selfing breeding lines with resistance loci the molecular markers allow the selection of genotypes with homozygous resistance loci. These one used as breeding lines for further crosses lead to the fact that the whole progeny carries the resistance loci and hence the whole genetic variation can be used for selecting other traits like for example quality traits.

In summary it can be stated that marker assisted selection opens the door to switch step by step from empirical breeding to knowledge based breeding. The incorporation of these molecular tools into breeding programmes may reduce the time frame for developing a new cultivar for about 10 years.