

Development of *Asparagus virus 1* resistant hybrids between *Asparagus officinalis* and its wild relative *A. amarum*

Susann Plath, Reiner Krämer, Edit Lantos and Thomas Nothnagel

Julius Kühn-Institut, Institute for Breeding Research on Horticultural Crops, Quedlinburg

E-mail of corresponding author: susann.plath@julius-kuehn.de

A. officinalis ($2n = 2x = 20$) is cultivated worldwide and is an economically important species. Because of its perennial growth, *A. officinalis* is infected by several diseases. The virus *Asparagus virus 1* (AV-1) is the most common one and is transmitted by aphids (*Myzus persicae*) or mechanically. 70 to 100 % of the asparagus fields in Germany are infected. The effects of AV-1 are a reduction of yield and a decrease of the spear quality. AV-1 infection cannot be prevented with insecticides; breeding for AV-1 resistance is the best solution. Due to the restricted breeding, the genetic diversity is relatively limited and resistant cultivars aren't available.

In a resistance evaluation study 44 different *A. officinalis* cultivars and 34 different asparagus wild accessions were tested regarding their AV-1 resistance. All cultivars were susceptible to AV-1; however plants from 29 different wild accessions showed high resistance to AV-1.

The AV-1 resistant wild relative *A. amarum* is hexaploid ($2n = 6x = 60$). Its origin is the Mediterranean coast. Using interspecific hybridization AV-1 can be transferred into the genetic background of *A. officinalis*. Interspecific hybridization has a lot of advantages but some

problems like pre- and post-zygotic barriers can occur. We used manual crosses and embryo rescue to overcome the crossing barrier.

In total 109 crosses were carried out between *A. officinalis* and *A. amarum*. All crosses using diploid *A. officinalis* were unsuccessful. Crossing with tetraploid *A. officinalis* resulted in four embryos which were rescued in vitro. During embryo rescue, the plants were partially cloned so that 252 plants were transferred into soil. For resistance evaluation all generated hybrid plants were infected with AV-1 using viruliferous aphids. Six weeks later, DAS-ELISA was carried out to analyze the infected hybrid plants. 22 hybrid plants from two different crossing occurrences showed high resistance to AV-1.

Backcrossing of the resistant F₁ plants with tetraploid *A. officinalis* was successful, 22 embryos were rescued. In the BC₁ generation 79 AV-1 resistant plants from 22 different crossing occurrences were identified. To establish the next backcrossing generation, crossings with diploid and tetraploid *A. officinalis* plants will be carried out. The hybridity of all progenies were analyzed using cytological and molecular methods.