INTERSPECIFIC HYBRIDIZATION FOR ASPARAGUS BREEDING


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Six wild species of the genus Asparagus can be found in Italy: A. maritimus Miller (tetraploid, dioecious); A. acutifolius L., A. aphyllus L. (tetraploid, dioecious); A. albus L., A. medeoloides Thun (diploid, eraphrodite); A. stipularis Forsk (diploid, dioecious) (Bozzini, Cariologia, Vol. XII, 1959). They are known for good taste of spear and for adaptation to biotic and abiotic stresses. In particular A. maritimus can grow in salted soil and it is resistant to the fungal disease caused by Puccinia asparagi; A. acutifolius, A. aphyllus, A. albus, A. stipularis are adapted to xerophytic conditions and resistant both to Puccinia asparagi and Stemphylium vesicarium. The cultivated species A. officinalis (diploid, dioecious) display low tolerance to salt and partial resistance to Puccinia asparagi. In Mediterranean climatic conditions, the attacks of P. asparagi and S. vesicarium, and drought are the most important stresses leading to early plant decline and consequent reduction of economic span of the crop. Therefore, interspecific hybridization has been started in order to obtain asparagus lines improved for spear quality and resistance to drought, salt and fungal diseases.

About 2000 crosses were done for each combination tested. Normal diploid A. officinalis genotypes (2n=20 chromosomes) appeared sexually compatible with A. maritimus and gave F₁ (OM) triploid or aneuploid plants; moreover when tetraploid A. officinalis (cv Violettino d’Albenga) plants were used as parent, fertile tetraploid OM offsprings were obtained. The genetic resistance to Puccinia asparagi was a dominant trait as all F₁ plants appeared to be resistant. The following combinations and their reciprocal were sexual incompatible: A. maritimus x A. acutifolius; A. officinalis x A. acutifolius; A. officinalis x A. albus; A. officinalis x A. stipularis.

A bridge-cross using A. maritimus was attempted to overcome the incompatibility between A. officinalis and A. acutifolius. To this purpose OM plants were crossed with A. acutifolius and only one seed from which one male plant (OMO) was obtained. This plant showed intermediate morphological traits with respect the two parents, high level of sterility and resistance to both diseases. When crossed with tetraploid A. officinalis six seeds and two in vitro rescued embryos were obtained (OMOO 1-8). Both seeds and rescued embryos gave normal plants: four male and three female were fertile and morphologically similar to the recurrent parent A. officinalis, while one partially sterile male plant appeared more similar to A. acutifolius.
Isozymes and I-SSR analyses were performed on *A. officinalis, A. maritimus, A. acutifolius* OM, OMO, and OMOO1-8 plants. Both biochemical and molecular techniques allowed to well distinguish the three *Asparagus* species and to demonstrate that reassortment of the two wild species DNA with that of the cultivated species occurred in the OMOO1-8 plants.

Anther culture of OMOO male plants gave positive response and 35 androgenetic clones were regenerated. Chromosome counting are in progress to find dihaploid plants that may allow introgression of the useful agronomic traits into the diploid asparagus gene pool.