

MANAGING GENETIC DIVERSITY IN THE CONSTRUCTION OF ALFALFA SEMI-HYBRIDS

SCOTTI C., CARELLI M., GAUDENZI P.

CRA-FLC, Fodder and Dairy Productions Research Centre, Viale Piacenza 29, 26900 Lodi (Italy)

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The construction of narrow genetic based varieties – and in particular semi-hybrids – in alfalfa asks for an effective handling of genetic diversity. A part of genetic diversity in this forage crop is in relation to subspecies subdivision (*falcata/sativa*); non dormant germplasm from Sahara oases could represent a putative ‘pure’ cultivated ssp. *sativa* and its crossing with the european germplasm is likely to express heterotic effects. In order to test this hypothesis, S₂ parental families selected for vigour in four Italian ecotypes and in four landraces collected in the Siwa oasis (Egypt) were crossed to produce 58 simple hybrids (SH) S₂xS₂: 13 Egyptian x Egyptian (EE), 33 Egyptian x Italian (EI) and 12 Italian x Italian (II). The bio-agronomic test of SHs (in general 80 plants/SH; 6400 plants in total) was carried in outdoor condition in microplots 25x80 cm (20 plants/plot) with density equivalent to 400 plants.m⁻². The data of the sowing year 2010 (5 harvests) are reported.

The S₂ parental families (1-9 plants/family, in bulk) were analysed by means of 68 SSR markers: the average diversity among the two germplasm sources Egyptian and Italian was 0.4723, while within-germplasm diversity resulted 0.4178 and 0.4698 respectively for the Egyptian and Italian source. The absence of a clear subdivision between the two germplasm sources was confirmed by UPGMA tree. On the contrary, it was evident an important increase in the among-families diversity following the two generations of selfing and selection: in fact the distance, estimated on a subset of 31 SSR markers, among the original four Egyptian landraces was 0.0326 compared to the value of 0.4585 for the derived S₂ parental families.

Dry matter yield (DMY) of the three groups of SHs (EE, EI, II) was not significantly different except for the 5th harvest (October) in which the EI group produced more than EE and II. A subset of 15 SHs derived from the diallel crossing of three Egyptian and three Italian S₂ families was examined by diallelic analysis. General combining ability (GCA) was highly significant and consistent through harvests for DMY, stem height and earliness, while specific combining ability (SCA) was never significant except in the 5th harvest for DMY and stem height. The parental S₂ family derived from the Italian ecotype ‘Friulana Premariacco’ showed significant and positive GCA effect for DMY and earliness, while a family derived from Siwa landrace 13 for stem height.

A clear heterotic pattern between the two germplasm sources (Egyptian and Italian) was not put in evidence. On the contrary, the crossing of S₂ families with positive GCA effects from the two germplasm sources seems suitable to effectively combine features implied in vigour (persistence, DMY, stem elongation rate).