

Crossing species barriers to expand the white clover gene-pool

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White clover (*Trifolium repens* L.) is probably an allotetraploid, although the ancestral species remain unknown. As such, it is one of only five probable hybrid species in the genus and one of only 24 polyploids among nearly 250 species. It is genetically isolated in nature, forming no fertile hybrids with any other species. Not surprisingly then, it is generally held that interspecific hybridisation in the genus *Trifolium* is rare and difficult and is unlikely to provide solutions for genetic improvement through plant breeding. However, the close relatives of white clover have a range of potentially useful traits including heat and drought tolerance, and resistances to major pests and diseases. Accordingly, several research groups have attempted wide hybridization and to-date have made partially fertile artificial hybrids between white clover and five other species (*T. uniflorum*, *T. ambiguum*, *T. occidentale*, *T. nigrescens* and *T. isthmocarpum*). Although few have been progressed, there are prospects for the development of some of these hybrids into commercially useful varieties. In all cases either embryo rescue or ploidy manipulations or both were required to achieve fertility.

Recent publication of a species phylogeny of *Trifolium* based on nuclear ITS and chloroplast trnL intron DNA sequence data (Ellison et al., 2006) has provided further insight into the close relatives of white clover. In particular, it has shown that two alpine species from Europe, *T. thalii* and *T. pallescens* are very close relatives. Based on this analysis, we undertook a programme of interspecific hybridisation and embryo rescue among the close relatives of white clover. We report and describe eight new fertile F1 hybrid combinations and their F2 progenies. We present a step-wise breeding strategy whereby traits from eleven taxa can now potentially be transferred across genetic bridges and introgressed into white clover. Because at least one of these species is outside the white clover complex, the phylogenetic limits of interspecific hybridisation in *Trifolium* remain undefined and, conceivably, it may be possible to transfer traits across species bridges spanning even wider genetic distances.

Reference

Ellison N.W., Liston A., Steiner J.J., Williams W.M., Taylor N.L. 2005. Molecular phylogenetics of the clover genus (*Trifolium* – Leguminosae). *Molecular Phylogenetics and Evolution* 39:688-705.