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Evidence of sexual reproduction in New Zealand populations of the facultative apomict, *Hieracium pilosella* L. 1753

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In New Zealand *Hieracium pilosella* L. (*Pilosella officinarum* F.W.SCHULTZ & SCH.BIP.) is a major weed of South Island pastoral and tussock grassland. Because of its high economic cost to the country, it has been studied at the population level since the early 1980s. MAKEPEACE (1981. N.Z. Journ. Bot. 19: 255-257) showed that most populations were pentaploid and apomictic. However, CHAPMAN & LAMBIE (2000. IOPB News, in press) and CHAPMAN et al. (2000. Heredity, in press) have shown that populations are in fact highly variable in morphology, ISSR phenotype and ploidy level.

The aim of this research is to investigate the impact of environmental and biotic pressures on the expression of sexual reproduction in facultative apomictic *H. pilosella*. To achieve this, *H. pilosella* was artificially pollinated with each of two marker pollen sources.

The first of these marker systems used the closely related species, *H. aurantiacum*, which possesses a suite of morphological characters that makes it distinct from *H. pilosella*. *H. pilosella* at six field sites was pollinated with *H. aurantiacum*, and the resulting progeny examined for morphological characters indicating hybridisation. Following this initial identification, hybridisation was further confirmed using genetic and cytological techniques.

All the populations examined possess the potential for sexual reproduction, but variation in hybridisation frequencies is high both within and among sites. It was also found that ploidy level was not indicative of reproductive mode.

The second marker system uses a transgenic (kanamycin resistant [NPT II cassette]) clone of *H. praealtum* as a pollen donor. Progeny were germinated on a kanamycin positive media, on which only sexually produced progeny, those with NPT II, will develop.

The effect of photoperiod on the expression of sexuality in *H. pilosella* has been determined using this system. A typical population from the Canterbury high country was grown under 14 and 16 hour photoperiods, and the amount of sexual reproduction in each case assayed. A higher incidence of sexual reproduction was found with the 14 hour treatment, but the difference was only marginally statistically significant. Transgenic pollen donors will also be used to determine the relative influences of genotype and environment on the expression of sexuality in facultative apomicts. A common garden experiment using plants from the field sites will allow a comparison among the levels of sexual reproduction under uniform (glasshouse) and variable (field) environmental conditions. This will also be replicated with the *H. aurantiacum* system. The transgenic *H. praealtum* will also be used to quantify the effects of a biotic stress, the powdery mildew *Erysiphe cichoracearum*, on the expression of sexual reproduction in *H. pilosella*.

An important application of this research is to improve the understanding of the expression of apomixis, for potential use in gene technology. It may also have implications for potentially increasing the efficacy of bio-control.